



MOSQUE ARCHITECTURE

PRESENT ISSUES AND FUTURE IDEAS

عمارة المسجد:

قضايا الحاضر و أفكار المستقبل







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Editors

Prof. Mashary A. Al Naim | Dr Hani M Al Huneidi | Dr Noor Hanita Abdul Majid



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تتقدم الأمانة العامة لجائزة عبد اللطيف الفوزان لعمارة المساجد بجزيل الشكر لكل من
"الفوزان لخدمة المجتمع" و "مؤسسة صالح حمزة صيرفي الخيرية" على دعمهم
نشر هذا الكتاب







INTRODUCTION

THIS conference is held to assert the stark existence of the ideological, architectural and urban conflict facing contemporary mosques around the world.

This multilayered conflict is traced from the interrelationship between mosques and their surrounding urban contexts, including their visualization and spatial distribution, especially related to daily practice (ablution rooms, shoe lockers, etc.). Therefore, these things reflect the general attitude to prayer and point to the importance of sustainability for water and energy resources. Since mosques are urban buildings of distinguished sanctity (3.6 million mosques), it is natural they are a worthy urban study topic. Therefore, this conference tackles this interdisciplinary issue with the consultation of several experts in one location.

Furthermore, it has been noticed that in the last two centuries, mosques have been forsaken in their role as an urban pivot for arts development in the contemporary Arab and Muslim world. This disconnection started in the first half of the 19th century. Consequently, Mosque Architecture has lost its position in the realm of structural and visual art production.

Therefore, this phenomenon necessitates conducting a thorough historical study in consideration of Mosque Architecture in the 19th and 20th centuries. Moreover, this issue was focused on in a seminar held on 25th July, 2018 in cooperation between AFAMA and Bibliotheca Alexandrina.

It has been admitted that mosques of both centuries are short of authentic and methodological documentation, though most of the mosques around the world were constructed during the previously mentioned period. Thus, it is clear that we are facing a knowledge crisis that has resulted in a clear





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decline in the architectural and cultural influence of contemporary mosque architecture, and in addition is an obvious retreat within the professional and craft value of mosque architecture, which has also affected the economic worth of the architectural industry.

During the golden ages of Muslim history, Mosque Architecture had a remarkable effect on economic and cultural values. Thereby, vast industries flourished to serve these values. This industrial innovation motivated cultural enlightenment and economic development to boost the art and craft professions for several centuries. This creative and innovative progress formulated parallel cultural and professional communities, which were based on Mosque Architecture developments. These had the advantage in the development of other disciplines in general and all genres of architecture in particular. In other words, these successive waves of development of arts and structural systems created a broad market for countless decades.

Consequently, it was the result of the fruition of art and architecture schools including other building prototypes, therefore mosque architecture was the milestone of Muslim civilization, as well as motif of its innovation and the dynamo of its economic growth. Any seeker of knowledge may easily recognize that most Mosque Architecture artistic traits have been simulated in other buildings. Therefore, what is the basis of this innovational and economic ebb? Why have mosques fallen victim to an architectural embargo? A critical investigation is urged for to reconsider the birth and combination of contemporary architecture, studying the role of professional technical and associated issues that sidelined Mosque Architecture as such. AFAMA studies have associated this phenomenon to the civilizational devastation that has swept all over the entire Muslim architectural and cultural domain, and the technical, artistic, and economic influences causing a reduction of local production, leading to a severe deviation worldwide. It followed that the bygone ray of enlightenment was the first to be subdued: is mosques. This necessitates conducting thorough studies and research encompassing various exemplar models. However, there might be other causes behind this discrepancy.

Accordingly, AFAMA has been inaugurated to regain the usurped throne of Mosque Architecture. It is designated to revive the most prominent factor of Muslim civilization, regenerate its artistic and structural innovation and introduce a Mosque Architecture professional community involving related industries and arts. Assuredly, this is not a simple task but one starting





from cognitive data collection and documentation. This would commence by initiating three global networking projects. First, *Mosqpedia*, which is a digital mosque encyclopedia. Second, *Asfaar*, which is a digital scientific library displaying all published documents of mosques. Third, *Mnaber*, which is a digital database gathering all information concerned with Mosque Architecture: architects, artisans, technicians, academic figures, authors, and associations worldwide. The award is targeted at creating a professional community, whereby it rewards the best contemporary Mosque Architecture practices with prizes amounting to million dollars every three years. It is concerned with encouraging ideological and scientific dimensions by collaboration with renowned research institutes. Furthermore, it aims at enhancing Mosque Architecture educational and training aspects. These are the three prime elements to bridge the gap between the former grandeur and contemporary status of mosques worldwide.

This award seeks to be a comprehensive, scientific and professional architectural institution specializing in Mosque Architecture. Henceforth, AFAMA will not be confined to rewarding perfectionism in Mosque Designs, but be extended to include research and specialized architectural studies, sponsored by His Royal Highness Prince Sultan bin Salman bin Abdulaziz, Chairman of the Board of Trustees and with the generous support of the founder of the award Sheikh Abdullatif Al Fozan based on the mass of information collected in each session according to nominated designs. The award has established a multi-database for those concerned with Mosque Architecture to benefit from.

Most importantly, AFAMA designates the Mosque Architecture conference as a specialized forum where specialists, researchers and architects debate crucial Mosque Architecture issues. Imam Abdulrahman bin Faisal from University of Dammam, Saudi Arabia, hosted the first conference, which witnessed a huge local and regional attendance in its three-day session from 5th to 7th December, 2016. Moreover, it contributed to the development of Mosque Architecture in institutional and research respects. The second conference is to be held in the Malaysian capital Kuala Lumpur. It is the very first specialized international event that will tackle important issues.

The futuristic Mosque Form will be the prime discussion point in this conference. It is a multilateral issue comprising the normative Mosque Architecture philosophy and futuristic complex conceptualizations. The mosque-context relationship will be a disputable topic, especially after





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transforming from a physical, tangible state to virtual, digital reality. It will also postulate the manipulation of technological advancements for mosque architectural services. Furthermore, it demands appropriate water and energy consumption. The conference vows to address the revival of the philosophical and social roles of mosques in comparison to those of the golden ages. Formerly, mosques were the nucleus of social activity in cultural and societal municipal parameters. No wonder, as they have been gathering areas for Muslim prayer five times a day all the year. The conference investigates the probability of revitalizing these enlightening and developmental roles in Muslim cities and communities.

This book summarizes some of the architectural horizons regarding Futuristic Mosque Architecture speculations. It documents a fair number of studies and research, disclosing their authors' distinctive content regarding Mosque Architecture worldwide. Being the conference holder and book publisher, it is worth noting that Mosque Architecture will be tackled as the architectural, urban, social, cultural, and civilizational topic of the epoch. This is demonstrated in the multinational numerous attendees to the conference and the international and intellectual debate stirred by it. Additionally, the great interaction and participation of candidates in the Award is not only driven by mosques embracing a nature of beauty and culture, but also for their supremacy as the centers of intellectual formalism and human assembly.

Hence, the second international conference on mosque architecture will investigate Mosque Architecture's fundamental assets. It will cast light on the demand for revolutionary intellectual paradigms. It is acknowledged that Architecture has survived absolute successive intellectual paradigms in terms of technique, form and function. Hence, Mosque Architecture should not lag behind this framework. It is notable that houses of worship in all religions are nobly conservative. It seems that this is out of sincere piety and strict faith in norms, which safeguard this architectural formative rather than functional validity. This reveals the stagnation of Mosque Form in the late 14th century, but for slight differences that did not touch upon the visual essence of mosques. So, what are the reasons for considering this constancy unjustified? Surely, creating new Mosque Forms according to the times is not the goal of the award. It is all about unshackling Mosque Forms from its historically radical visualization, paving the way for architectural reasoning in urban, formative and technical terms.

The new paradigm promises a sorting out of the historical complex, yet it will not assign a Futuristic Mosque definite speculation. From now on, the





quest is on. Architects around the world in general and from the Arab and Muslim world in particular must spare no effort to contribute to draft the awaited Futuristic Mosque renovation.

It is apparent that the new paradigm entails a number of transformations in the cognition of Mosque Architecture resulting in jurisprudential amendments and urban speculation adjustments on the municipal and residential suburb levels. In addition, technical and scientific attempts must be put into action, led by scientific and professional associations in cooperation with architects believing in the desired noticeable Futuristic Mosque Form. Still, there must be motivated social awareness to realize renewable ideas serving the functionality of mosques.

However, is this new paradigm only concerned with the urban and technical aspects of mosques? Does it include other fundamental aspects to realize this transformation?

As mentioned previously, this transformation should address the jurisprudence issues, which will be discussed later.

These issues are quite controversial, since there are prayer jurisprudence conditions cannot be infringed. The addressed issues right now are those holding to Mosque Forms in certain radical visualizations, despising any innovational attempts to surface. Muslim legislation imposes no sacred context; therefore jurisprudence would embrace these freedoms seeking a new paradigm.

The new paradigm must spread the new Mosque Architecture awareness. This awareness must address four social categories: *decision makers*, who entail all governmental authorities that deal with Mosque Architecture. Then, the *donors*, who come second in this hierarchy; these individuals consider themselves as mosque owners, who are act in negligence of the urban and visual influence, yet pay tribute to having grand mosques no matter what their appropriate design, functional and technical attributes. Worse, they turn a cold shoulder to the formative art of mosques. Thereby, they must be involved in the new paradigm to perceive the aspects of Futuristic Mosque Architecture. Then the third category is: *architects and planners*, who must take the issue seriously, rather than building scattered prayer rooms everywhere. Finally, the fourth category is somewhat important, *technicians, and researchers* must work on developing new techniques for better quality and lower budget.



One of the springboards used to adopt the new paradigm is the notable withdrawal of mosques from their role as the center of visual arts in Muslim civilization. It has been centuries, whereby inscriptions, carvings, geometric forms, *muqarnas*, and structural engineering systems have only developed within this symbolic building. The contribution of Mosque Architecture was substantial to the development of visual arts and techniques. Why did this role come to an end? It is not aspired that the new paradigm will bring this back to life, but artistic visualization and development within mosques are the main stakes of the Futuristic Mosque Architecture.

Mosques are culturally loaded yet not restricted buildings, for they can be allocated to any spot in the world. Thereby, the scientific committee of the second international conference on Mosque Architecture, held by the International Islamic University of Malaysia, has received numerous research and studies from 23 countries all over the world. The submitted papers were of diverse cultural and architectural backgrounds. This asserts the compatibility of the mosque's religious functionality and architectural multiplicity. It is time to select that which is in concordance with the objectives of the award and conforms to the conference topics. May all the approved paper researchers, who participate in the second international conference in the Museum of Islamic Art in Kuala Lumpur in Malaysia, contribute to a fruitful scientific forum in the benefit of Mosque Architecture all over the world. God Willing.

Prof. Mashary A. Al Naim
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مقدمة

يأتي هذا المؤتمر ليؤكد أن هناك "إشكالية" فكرية معمارية وعمرانية تواجه المسجد المعاصر في العالم، وهي إشكالية ذات مستويات متعددة تبدأ من علاقة المسجد بالمحيط الحضري الذي يقع فيه مروراً بالشكل البصري العام والعلاقات الفراغية خصوصاً تلك التي تمس الاستخدامات الخدمائية اليومية مثل أماكن الوضوء وأماكن وضع الأحذية التي تشير إلى الأفعال السلوكية للمصلين وتثير أهمية الاستدامة والحفاظ على موارد الطاقة والمياه. حيث أن المسجد عنصر حضري ومعماري يحظى بالقداسة وله انتشار واسع على مستوى العالم (3.6 مليون مسجد) يستحق أن يصبح أحد الموضوعات المعاصرة في مجال الدراسات العمرانية بشكل عام.

ولعل هذا المؤتمر يحاول أن يشير هذه القضية المتقاطعة التخصصات Interdisciplinary التي تتطلب اجتماع مجموعة من الخبراء في مكان واحد.

و من ناحية أخرى لقد لاحظنا وجود انقطاع لدور المسجد كمركز لتطور الفنون العمارية في الحضارة العربية والإسلامية المعاصرة وكان بادياً أن هذا الإنقطاع بدأ منذ قرنين وبالتحديد خلال النصف الأول من القرن التاسع عشر وأخذ في التصاعد حتى وصلنا إلى حالة من عزلة المسجد عن السياق المعماري العام وأصبحت عمارة المسجد ليست ذات تأثير حقيقي على إنتاج الفنون البصرية والانشائية. و قد نحتاج إلى دراسة تاريخية تفصيلية لتاريخ عمارة المساجد خلال القرنين التاسع عشر والعشرين. إن هذا ما لفتت إليه الإنتباه الندوة التي عقدتها جائزة عبداللطيف الفوزان مع مكتبة الإسكندرية يوم 25 يوليو 2018م، فقد أثارت قضية أنه لا يوجد توثيق حقيقي ومنهجي للمساجد التي بنيت خلال القرنين الأخيرين مع أن أغلب مساجد العالم بنيت في المئتين سنة الأخيرة. و هكذا فإنه أصبح جلياً بأننا نواجه أزمة



معلومة و كذلك أزمة تراجع في التأثير الحضاري المعماري لعمارة المساجد المعاصرة، كما أننا نعاني من تراجع واضح في القيمة المهنية والحرفية و من ثم القيمة الاقتصادية للعمارة المسجدية.

لقد شهدت عمارة المساجد عبر التاريخ الإسلامي تأثيرا مهنيا وحرفيا عميقا وبالتالي كانت هناك مجموعة صناعات قائمة على هذه العمارة وكان لذلك تأثير ثقافي و اقتصادي مهم شجع على تطوير الحرف الفنية البصرية لمئات السنين، أي أنه كان هناك مجتمعا حرفيا موازيا نشأ وتطور وعمل على تطوير الافكار والابتكارات من أجل تطوير عمارة المساجد عبر التاريخ الاسلامي، وكان لوجود هذا المجتمع تأثير في تطوير العلوم الأخرى وتطوير العمارة بشكل عام. لم يتوقف تأثير عمارة المساجد على هذا الجانب المهني والحرفي الذي صنع موجات متلاحقة من الابتكارات في الفنون والنظم الانشائية وأنشئ سوقا اقتصادية ظلت قائمة ومؤثرة لقرون عدة، بل أن التأثير أمتد أفقيا كي يشكل مدارس فنية معمارية شملت نماذج المباني الأخرى.

و هكذا نحن نعتقد أن عمارة المسجد كانت هي مركز العمارة في الحضارة الإسلامية لأنها كانت منبع الابتكار ومحرك للإقتصاد ، وإن المتبع لتطور العمارة في هذه الحضارة سوف يجد أن كثير من العناصر والافكار بدأت من المسجد وانتقلت إلى نماذج العمارة الأخرى.

و هذا الشيء قد يطرح تساؤلا حول أسباب توقف هذا المد من التأثير الابداعي والاقتصادي؟ وكيف و لماذا تم عزل المسجد عن السياق المعماري العام؟ هذه أسئلة نقدية محورية تقتضي إعادة التفكير في نشأة وتركيب العمارة المعاصرة وكيف ساهمت التحولات المهنية "المؤسسية" و "التقنية" في دفع المسجد بعيدا عن تأثيره الابداعي والاقتصادي السابق. في اعتقادنا ان الأزمة هي أزمة حضارية بشكل عام وليست أزمة منحصرة في عمارة المساجد، فالاشكالية تمتد إلى المنتج الحضاري والمعماري العام ودورنا المعاصر في الحضارة الانسانية وتقلص تأثيرنا التقني والفني والاقتصادي على مستوى منتجنا المحلي وبالتالي تراجع تأثيرنا بشدة على مستوى العالم، ونتيجة لذلك فإن أول عنصر سوف يتأثر بهذا التراجع هو العنصر الذي كان له تأثير عميق في توليد الابتكارات والتقنيات وبناء المجتمع الحرفي والاقتصادي وهو المسجد. قد يكون هذا التعليل بحاجة إلى المزيد من الدراسة ورصد الأمثلة وقد يكون هناك أسباب أخرى أدت إلى هذا التراجع لكن بكل تأكيد هناك إشكالية تستحق الدراسة والبحث.

و بناء عليه فإن أحد مبررات تأسيس جائزة عبد اللطيف الفوزان لعمارة المساجد هو إستعادة ذلك الدور الحضاري للمسجد و إعادة رونقه الجمالي كأهم عنصر معماري في الحضارة الإسلامية في توليد الفنون والابتكارات الفنية الإنشائية والبصرية وخلق مجتمع مهني يركز على عمارة المسجد وتطوير الحرف والفنون المرتبطة بعمارته. بالطبع نحن نعلم أن هذا الهدف ليس سهلاً وأنه بحاجة إلى عمل يشمل طبقات عدة تبدأ بالتوثيق وبناء المخزون المعرفي وهذا سيتم من خلال بناء 3 مشاريع معلوماتية رقمية عملاقة هي ”موسكبيديا“ أو الموسوعة الرقيمة للمساجد حول العالم و ”أسفار“ المكتبة الرقيمة العلمية لكل ما نشر حول عمارة المساجد و ”منابر“ قاعدة المعلومات الرقيمة التي تجمع المهتمين بعمارة المساجد من معماريين وحرفيين وتقنيين وأكاديميين وكتاب ومؤسسات حول العالم. كما أن الجائزة تقيم بناء المجتمع المهني من خلال منح جوائز لأفضل الممارسات في عمارة المساجد المعاصرة حول العالم وقيمة مجموع الجوائز يصل إلى مليون دولار تقدم كل ثلاث أعوام. يضاف إلى ذلك أن الجائزة تقيم بناء الجانب الفكري والعلمي من خلال مشاركتها مع مؤسسات مرموقة في البحث العملي والتدريب والتعليم الخاص بعمارة المساجد. هذه الثلاث جوانب الأساسية هي باكورة المشروع الحضاري الذي يهدف إلى إعادة الوصل الحضاري لعمارة المساجد في السياق المعماري العام حول العالم.

إذا هذه الجائزة تسعى لتكون مؤسسة علمية و مهنية معمارية شاملة متخصصة في عمارة المساجد، و لهذا السبب لم تتوقف الجائزة عند نشاطها في منح الجوائز لأفضل التجارب المعمارية لتصميم المساجد، بل تعدى عملها ليتسع و يشمل الأبحاث و الدراسات المعمارية المتخصصة بتوجيه كريم من صاحب السمو الملكي الأمير سلطان بن سلمان بن عبد العزيز رئيس مجلس الأمناء وبدعم سخّي من مؤسس الجائزة الشيخ عبد اللطيف الفوزان و مستندة بذلك الى زخم المعلومات التي يتم جمعها في كل دورة من دورات الجائزة نتيجة لعمليات ترشيح الأعمال، حيث أعدت الجائزة قواعد متعددة للبيانات يستفيد منها كل متخصص و معماري مهتم بعمارة بيوت الله في كافة أنحاء العالم.

و من الأنشطة الأساسية التي تنظمها جائزة عبد اللطيف الفوزان لعمارة المساجد هو تنظيم المؤتمر العالمي لعمارة المساجد ليكون منتدى متخصص يجتمع فيه الباحثون و المعمارون المتخصصون في عمارة المساجد لبحث موضوع علمي معين على علاقة بعمارة المساجد. و كانت باكورة هذه المؤتمرات في جامعة الإمام عبد الرحمن بن فيصل في الدمام بالمملكة العربية

السعودية حيث شهد المؤتمر في حينه (5-7 ديسمبر 2016م) إقبالا محليا و إقليميا أسهم في وضع مبادئ للعمل البحثي المؤسسي في عمارة و فنون المساجد. و ينعقد المؤتمر العالمي الثاني لعمارة المساجد في رحاب متحف الفن الإسلامي بالعاصمة الماليزية كوالالمبور ليكون أول عمل دولي تخصصي يتناول مسائل هادفة.

كان أحد أهم قضايا عمارة المسجد المعاصرة هو شكل مسجد المستقبل، و مسجد المستقبل هو قضية مركبة، تجمع أفكارا بين الفلسفة المعمارية التقليدية للمسجد و أفكارا مستقبلية معقدة و ستكون علاقة المسجد بنسيجه العمراني هي أهم الجدليات سيما مع انتقال المجتمعات الإنسانية من الواقع الفيزيائي الملموس الى الواقع الافتراضي الرقمي، كما يتناول مسجد المستقبل قضية مهمة أخرى و هي إدماج التقنيات الحديثة سواء في العمارة أو في الخدمات و أيضا معايير الإستعمال الرشيد للمياه و الطاقة. ولعل العنصر الفلسفي و الاجتماعي لعمارة المسجد في المستقبل يكاد يكون الموضوع الأبرز، مقارنة بدور المساجد التاريخي في المجتمع و المدينة، حيث كان المسجد مكوناً بارزاً و عنصراً هاماً في النسيج العمراني للمدن بالإضافة إلى دوره الاجتماعي الحيوي لكونه مركزاً اجتماعياً و ثقافياً يخلق حراكا إنسانيا مستمرا خمس مرات في اليوم و على مدار السنة، و يأتي المؤتمر و محاور أبحاثه لتسليط الأضواء على هذه الجوانب، و مدى إمكانية استمرار مسجد المستقبل في لعب هذا الدور الأساسي التنموي و التنويري في المدينة الإسلامية و في المجتمع الإسلامي.

هذا الكتاب هو خلاصة لبعض الأفكار المعمارية في تصور مسجد المستقبل، حيث يطرح في طياته أبحاث و دراسات تناول باحثيها مضامين مختلفة عن المساجد من شتى أنحاء العالم. و بصفتنا منظمي هذا المؤتمر و محرري هذا الكتاب نشير الى أن طرح عمارة المساجد كي يكون موضوعا ”معماريا“ و ”عمرانيا“ و ”علميا“ و ”اجتماعيا“ و ”ثقافيا“ و ”حضاريا“ في هذه الحقبة الزمنية أثار إهتماما دوليا و حراكا فكريا، و ما أثار الإنتباه هو ذلك الإقبال المتعدد الثقافات للمشاركة و للتفاعل مع أنشطة جائزة عبد اللطيف الفوزان لعمارة المساجد، ليس لأن المسجد كان حاضنا للجمال و عنوانا للحضارة الإنسانية بل نظرا لأهمية هذا المكان كونه منطلقا للعديد من المنظومات الفكرية و التجمعات الإنسانية.

ولهذا فإن المؤتمر العالمي الثاني لعمارة المساجد والمؤتمرات القادمة ستثير تساؤلات جوهرية عن أهمية الحاجة الى مدارات فكرية جديدة لعمارة المساجد، حيث أن مفهوم العمارة



بشكل عام في حقيقة الأمر هو مفهوم متجدد وعبر التاريخ كان هناك مدارات فكرية paradigms متعاقبة طورت العمارة ونقلتها نقالات كبيرة، سواء على مستوى الشكل والوظيفة أو على مستويات التقنية وبالتالي فإننا نعتقد أن عمارة المسجد يفترض أن لا تخرج عن هذا السياق. من الملاحظ أن عمارة المباني الدينية (في جميع الأديان) تتسم بالمحافظة الشديدة، ويبدو أن الروح الدينية المتشعبة بالحفاظ على الثوابت هي التي تدعم مثل هذا التشدد المعماري، الذي يحرص على "الشكلانية" لا على الوظائف الحقيقية وبالتالي فإن عمارة المسجد ظلت محافظة على لغة بصرية متقاربة خلال الاربعة عشر القرن الأخيرة مع تغيرات طفيفة غالبا ما تمس التفاصيل دون الجوهر البصري للمسجد. فلماذا نعتقد أن هذا الثبات وهذا التشدد المعماري غير مبرر؟ بالطبع ليس المطلوب أن نبحث كل مرة عن شكل جديد، فهذا ليس هدف بحد ذاته لكن ما نهدف إليه هو تحرير المسجد من الصورة الذهنية التاريخية وفتح الباب للإجتهد في تطوير عمارة المساجد على المستوى الحضري والشكلي والتقني.

إن المدار الفكري الجديد Paradigm the New الذي يسعى له المؤتمر يحاول أن يفكك "العقدة" التاريخية لعمارة المساجد لكنه لا يحدد ملامح محددة لعمارة المستقبل، وبالتالي نحن أمام تحد كبير يجعل من تصور مسجد المستقبل يمثل حالة فكرية خاصة يفترض أن يساهم في صياغتها معماريو العالم بشكل عام والمعماريين في المنطقة العربية/الإسلامية بشكل خاص. ولعلنا الآن نبين ماذا نقصد بالمدار الفكري الجديد الذي هو مجموعة من التحولات في عملية التفكير في عمارة المسجد تصاحبها تغيرات في التشريعات وفي التصور الحضري لموقع المسجد على مستوى المدينة والحي السكني، إضافة إلى تشكل تجارب تقنية وعلمية جادة تقودها مؤسسات علمية ومهنية ومعماريين أفراد يؤمنون بالحالة الجديدة التي يجب أن تكون عليها عمارة المساجد في المستقبل. كما أنه حالة من الوعي المجتمعي الذي يدفع إلى الوصول إلى أفكار متجددة تخدم الوظائف التي يقوم بها المسجد.

ولكن هل المدار الفكري فقط يختص بالمكون العمراني/التقني أو أن هناك جوانب مهمة وأساسية من أجل تحقيق هذا التحول الفكري. لقد ذكرنا أن التحول يجب أن يشمل المجال التشريعي وهذه مسألة يمكن أن نناقشها في المستقبل، فماذا نقصد بالجوانب التشريعية، لأنه يوجد أركان وثوابت في الصلاة لا يمكن الخروج عنها لذلك ما نقصده بالاحتوى التشريعي هو تلك الاجراءات التي عززت من الصورة البصرية المتشددة للمسجد وحبتها فيها وجعلت



من صعبت الخروج عنها. الضوابط الشرعية للمسجد لا تدعم شكل معماري محدد وبالتالي يفترض أن المحتوى التشريعي يعزز من المدار الفكري الجديد المرن لعمارة المسجد لأنه لا يوجد ما يمنع ذلك.

كما يجب أن يكون المدار الفكري منبعا لوعي جديد حول المسجد وعمارته، وهذا الوعي يجب أن يشمل أربع فئات مجتمعية أساسية هي: متخذي القرار ونقصد جميع المؤسسات الحكومية التي تتقاطع مع عمارة المساجد وقد تطرقنا للجوانب الشرعية ويفترض أن المدار الفكري الجديد يعزز من الجوانب المعمارية، و أما الفئة الثانية فهي "المتبرعون" الذين يعتبرون أنفسهم ملاكاً للمساجد، وكثير من هؤلاء لا تهمهم عمارة المسجد وتأثيره الحضري والبصري بقدر ما يهتمهم بناء مساجد كبيرة حتى لو كانت ليست ذات كفاءة وظيفية وتقنية فضلا عن المسألة الجمالية، وهؤلاء يجب أن ينخرطوا في المدار الفكري الجديد ويفهموا أبعاد عمارة المسجد في المستقبل. وأما الفئة الثالثة فهي المعمارين والمصممون الذين عليهم مهمة إستيعاب عمارة المسجد بجديّة لا أن يتعاملوا مع المسجد على أنه صندوق تقام فيه الصلاة. وأخيرا التقنيون والباحثون الذين تقع عليهم مسؤولية تطوير تقنيات تجعل المسجد أكثر كفاءة وأقل كلفة تشغيلية.

أحد المنطلقات التي تجعلنا نفكر في تبني مدار فكري جديد لعمارة المساجد هو إنحسار دور المسجد كبيت لنشأة وتطور الفنون البصرية في الحضارة الإسلامية فبعد القرون لم تتطور النقوش والمقرنصات والتشكيلات الجيومترية والأنظمة الهندسية الانشائية إلا داخل هذا المبنى الرمزي. إسهامات عمارة المساجد كانت أساسية في تطور الفنون البصرية وتقنياتها فلماذا أختفى هذا الدور؟ لن نقول أن المدار الفكري الذي نطمح له هو من أجل استرجاع هذا الدور لكن بكل تأكيد عودة الفنون البصرية وتطورها داخل المسجد هي أحد الأهداف الكبيرة لمسجد المستقبل. و حيث أن المسجد من أنماط المباني القليلة و الذي يعتبر عابرا للثقافات و متموضعا باقتدار في كل المدن و التجمعات، فقد تلقت اللجنة العلمية للمؤتمر العالمي الثاني لعمارة المساجد والتي تديرها الجامعة الإسلامية الدولية المأليزية عددا هائلا من الأبحاث و الدراسات من ثلاث و عشرين دولة في كافة أنحاء العالم للمشاركة في المؤتمر العالمي الثاني لعمارة المساجد حيث تستعرض أوراق العمل هذه تجارب معمارية ثرية متعددة الثقافات جاءت كي تؤكد على توافق الوظيفة الدينية للمسجد و تعددية الأنماط المعمارية له، ليتم إنتقاء ما تماشى من هذه الأبحاث مع أهداف الجائزة و المؤتمر، حيث ستم مشاركة



INTRODUCTION

كافة الباحثين المقبولة أوراقهم ليكون المؤتمر العالمي الثاني لعمارة المساجد و الذي سيحتضنه متحف الفن الإسلامي في كوالالمبور منتديا علميا يعود نفعه باذن الله على عمارة بيوت الله في كافة أنحاء العالم.

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FUTURE MOSQUE ARCHITECTURE DESIGN AND FUNCTION REGIONAL DESIGN OF MOSQUE





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**MOSQUE AS THE INTEGRAL PART
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THE MOSQUE OF TOMORROW

Rafee Hakky, Ph.D







THE RELEVANCY OF MOSQUE ARCHITECTURE IN A MULTI-FAITH COUNTRY: CHINA AS A CASE

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INTRODUCTION

ACCORDING to the survey by Pew Research Center for the level of religious diversity in 2010, China was defined as one of the most multi-faith countries all over the world. At present, data shows that some 20 to 40 million Muslims live in China for which the actual numbers are still difficult to obtain. They acknowledged that due to the different origins of Islam in China and the complexity of China's modern national policy, various official and unofficial national identities^{1, 2}. Interestingly, Chinese mosque architecture, whether historical or modern, reflects this diversity. This paper investigates the development history of mosque buildings in China³. The discussion on historical mosques continues to contemporary times, which presents diversified architectural styles for mosques in China. Especially, unlike the olden days, in the 21st century, modern architectural technology allows clients to choose from a variety of styles and materials when designing mosques to reflect specific versions of Islamic identity.

HISTORY OF ISLAMIC ARCHITECTURE IN CHINA

In his book, *Chinese Islamic Architecture*, Liu Zhiping divides Chinese Islamic architecture into three periods – the first period: the transplantation period of Islamic architecture, from Tang Dynasty to the end of Yuan





Dynasty, about 700 years; the second period: the climax period of Islamic architecture development, about 500 years from the beginning of Ming Dynasty to the pre-Opium War; and the third period: more than 100 years from the Opium War to the founding of New China. He further divides Chinese Islamic architecture into two systems: one is “*Gongbei*”. *Gongbei* – meaning “dome”, is a term used by the Hui people in Northwest China for an Islamic shrine complex centered on a grave of a Sufi master. The other system is the mosques of Uyghur and other nationalities in Xinjiang⁴. Wang Zhengming divides the process of *Sinicization* of Islam into three stages: the transplantation period of early Islam, which corresponds to the three dynasties of Tang, Song, and Yuan; the change period of Islamic architectural style in the late Yuan and early Ming dynasties; and the third period is the Ming and Qing dynasties⁵. Based on the above ideas, this paper divides Chinese Islamic architecture into the following four historical periods.

Transplantation Period from the Tang Dynasty to the Yuan Dynasty

Although Muslims have entered China since the Tang Dynasty, and have formed settlements and built mosques in Guangzhou, Quanzhou, Hangzhou, Yangzhou, Chang'an, and other cities, the material remains of the Tang and Song Dynasties are very rare. At present, the earliest relics of Chinese Islam are Arabic stone carvings in the Song and Yuan Dynasties. They are mainly distributed in Beijing, Guangzhou, Quanzhou, Hangzhou, and Yangzhou, especially in Quanzhou⁶.

The only buildings left in the Tang Dynasty may be the *Guangta* (minaret) of Huaisheng Mosque in Guangzhou (Figure 1). The mosque is one of the oldest in the world built over 1,300 years ago. It is known for its unusual minaret, the *Guangta* which means lighthouse in ancient Chinese⁷.



**FIGURE 1**

Huaisheng Mosque in Guangzhou.

(Source: <http://catalogue.wellcomelibrary.org/record=b1187734>)

Quanzhou Ashab Mosque was built in 400 years (1009 – 1010) of the Islamic calendar, that is, the second year of the Emperor of Song Dynasty (Figure 2). The mosque is a typical representative of the period when Islam has not yet been localized. Its shape and layout are quite different from traditional Chinese architecture, all of which are made of granite. The existing Mosque was rebuilt in 1310. It has a history of more than 700 years. There are no Chinese characters on the stone carvings of this Yuan Dynasty building, rather all of them are in Arabic⁸.

**FIGURE 2**

Qingjing Mosque Entry.

(Source: https://commons.wikimedia.org/wiki/File:Qingjing_Mosque_-_entry_-_DSCF8665.JPG)





In the Yuan Dynasty, the earliest examples of the combination of Islamic brick and stone architecture from Central Asia and West Asia with Chinese-style architecture emerged, such as the arch of the Phoenix Mosque in Hangzhou, and the arch of the mosque in Dingzhou, Hebei, all adopted the architectural style of the Islamic brick arch in the interior and Han-style pavilion at exterior. Chang Qing, an architectural expert of Tongji University, clearly put forward in his article titled “Evolution of Chinese Brick and Stone Vault Architecture in Yuan and Ming Dynasties” that structural and qualitative changes have taken place in Chinese brick and stone vault architecture since Han and Tang Dynasties at the turn of Song and Yuan Dynasties. He mentioned that it originated from the influence of the shape and style of Islamic architecture in Western Regions. It can be seen that the transplantation of Islamic architecture is not only the emergence of mosques with Islamic architectural style in China but also the further promotion of a transformation of brick vaults in China in the Yuan and Ming Dynasties⁸.

The *Sinicization* Period in Ming and Qing Dynasties

In the early Ming Dynasty, a series of policies prohibiting “Hu clothes, Hu language, and Hu surname” promoted the localization of Muslim immigrants. In Muslim architecture, mosques generally adopt the large roof style of traditional Chinese wood structure as well as a large number of Chinese-style plaque couplets, inscriptions, paintings, and other forms⁹.

Liu Zhiping has discussed the changes in this period in detail in “Chinese Islamic Architecture”. He listed examples of Ming Dynasty, such as Xi’an Huajuexiang Mosque (Figure 3), Hangzhou Zhenjiao Mosque, Beijing Dongsì Mosque, Yunnan Dali Mosque, Shanghai Songjiang Mosque, Gansu Tianshuihou Street Mosque, and so on. For example, Huajuexiang Mosque has no brick hall. The magnificence and solemnity of the courtyard and hall architecture are the rare essences of ancient Chinese architecture. He cited examples of Qing Dynasty architecture, including East Grand Mosque of Jining, Bozhen Mosque of Hebei, Gulou Mosque of Chengdu, Qiaomen Street Mosque of Lanzhou, Zhuxianzhen Mosque of Henan, and so on. It has completely formed a unique Chinese system, and its overall layout is mostly quadrangular courtyard style. It occupies a special position in the history of Chinese architecture, greatly enriching the tradition of ancient Chinese architecture, and has a long history. It is not comparable to the





common types of Buddhist architecture that can be seen in their temples and palaces. Liu Zhiping gave such a high appraisal, mainly because Chinese Islamic architecture not only inherited the shape and style of traditional Chinese architecture but also had many creative applications and developments, such as the collocation of collocated roofs, front curtain and back kiln hall, unconventional plane type and architectural combination, etc⁴. Its innovation and complexity are amazing. It also shows the two-way influence in cultural exchange expressed above, that is, the *Sinicization* of Islamic architecture is not a one-way and passive acceptance process, but a creative and positive adaptation process. The acceptance and development of Chinese Islamic architecture to the form, technique, and form of traditional Chinese architecture is still going on today. The Mingtang Architecture in Lanzhou is one of the best examples.

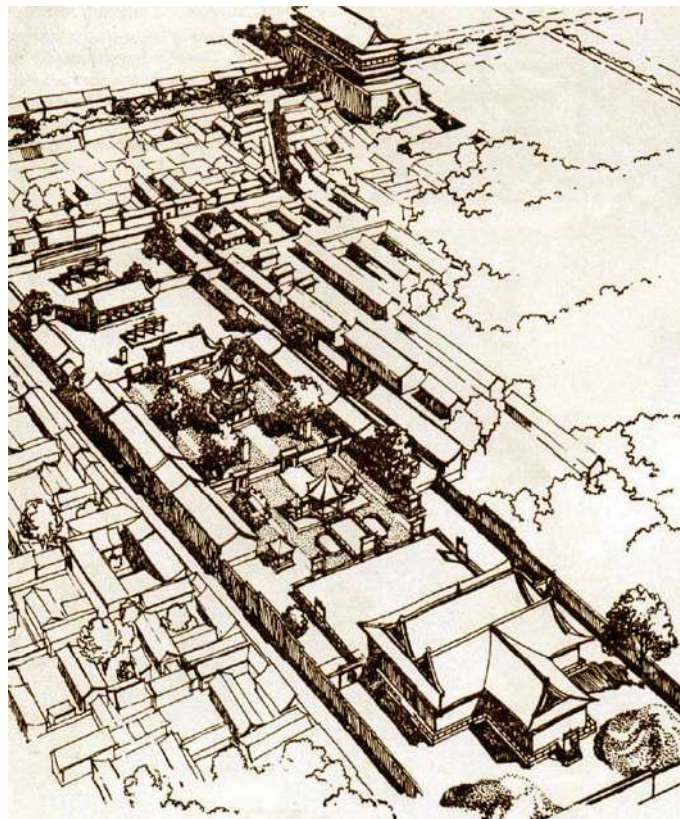


FIGURE 3

Huajuexiang Mosque.

(Source: https://archnet.org/sites/3973/media_contents/1795)





The Declining Period of the Republic of China

Since the late Qing Dynasty, on the one hand, the scale, quality, and artistic level of new mosques have declined due to war and social decline; on the other hand, due to the introduction of Western architectural technology, Chinese mosque buildings have also appeared to adapt reinforced concrete structure. The mosques built in this period are representative of Shanghai Xiaotaoyuan Mosque, Huhhot Mosque, Dongguan Mosque in Xining, Taizi Mosque in Lingwu County, Ningxia, etc.

Shanghai Xiaotaoyuan Mosque, built-in 1930, is the pioneer of modern mosque depicting reinforced concrete buildings. The Hohhot Mosque and Dongguan Mosque in Xining have become a combination of Chinese and Western architectural styles.



FIGURE 4

Xiaotaoyuan Mosque.

(Source: https://id.wikipedia.org/wiki/Berkas:Xiaotaoyuan_Mosque.JPG)

During the 30 years from the founding of New China to the Cultural Revolution, mosque buildings in China went from decline to destruction due to the overflow of “extreme left” thoughts. Many mosques included in Liu Zhiping’s “Chinese Islamic Architecture” have not survived, such as Jining West Mosque in Shandong Province, Nanda Mosque in Tianjin, Shizuishan Mosque in Ningxia, Weizhou Mosque, Lanzhou, and Linxia Mosques. As the “Cultural Revolution” hard-hit areas of Gansu, Ningxia, and Qinghai Hui communities, there are only a few mosque buildings left. There are no mosque buildings in Lanzhou and Linxia, only the small-scale mosques in





Yinchuan and Dongguan Mosque in Xining. The Lanzhou Qiaomen Street Mosque, which Professor Liu Zhiping calls “a rare and precious heritage in Chinese architecture”, has “a huge and magnificent scroll shed rarely seen in ancient Chinese architecture”, and “the spirit of connecting the scroll shed with the hall is even rarer”. Now we can only recall it in his book¹⁰.

The understanding of the period of the overall destruction of this mosque building is very crucial because it is this comprehensive destruction that brings about the style transformation of the mosque building in the next period.

THE MODERNIZATION OF MOSQUE IN CHINA SINCE THE 1980s

With the end of the Cultural Revolution, religious activities in China have gradually tended to normalize. In the 1980s, the mosques that survived were gradually reopened, and the destroyed mosques were gradually restored and rebuilt, forming the first climax of mosque reconstruction. Limited to the social and economic conditions at that time, most of the rebuilt mosque buildings were relatively simple, not only the construction technology could not be compared with the Ming and Qing Dynasties, but also the construction quality was not up to the mark. As a result, the rebuilt mosques servers for only about 10 to 20 years and then faced re-construction^{8, 11}.

After entering the 21st century, with the further promotion of reform and opening up the market economy, the economic life of the vast majority of Muslims in Northwest China has been greatly improved, and a new round of mosque reconstruction climax appears again. This wave of rebuilding climax is not the “religious fanaticism” seen in some people’s eyes, but the inevitable result of the above historical logic. In the current wave of reconstruction, the crude buildings built in the 1980s are facing gradual replacement by new reinforced concrete buildings, and their architectural styles will show a more diversified orientation; and this trend of development is consistent with the trend of urbanization and modernization in China at that time.

MOSQUE AND THE LIFE AND MOBILITY OF MUSLIMS IN CITIES

Mosque is the center of Muslim community. It is the place to perform prayers, carry out education, inherit culture, inherit traditions, and gather





people to discuss, settle disputes, help the poor, exchange, and cater for the community. It plays both communal and religious functions and plays an irreplaceable position in the Muslim community. Therefore, in history and reality, where Muslims live together, there will be mosques the serve their communities. Mosques in China are usually integrated with Arab-Islamic culture and Chinese culture¹². At the same time, they combine regional culture. They are not only the most magnificent and solemn buildings in the community but also the material landmark. They are also spiritual landmarks in the cognitive and classification system of the surrounding Muslims. Mosque creates a homelike environment for the Muslims to experience the love and warmth of their beliefs, and feel the significance and value of life.

According to the trend of population migration, Muslims in China have the characteristics of migration from village to town, town to county, county to central city, central city to metropolis. From the perspective of occupational status of migrants, it is mainly the migration of some regional industrial groups from rural areas or cities to big cities, such as Qinghai Hui, Sala, and Xinjiang Uygur into coastal cities to open restaurants; Henan Mengzhou, Changge and other places Hui migrated to Quanzhou, Guangzhou to operate leather based industry. From the regional analysis of migration, it has the characteristics of migration from inland areas to coastal cities, from western areas to central and eastern areas. Particularly noteworthy is that in recent years, there has been a trend of migration to cities where Muslim activities have existed in history, although the early Muslims communities had generally declined in the planned economy era¹¹.

There are two reasons for the migration mentioned above characteristics: one is the attraction of Mosque cities to Muslims; the other is the prosperity of urban commerce in developed areas, the developed market, and the humanization of policies, which have a “pull” effect. Traditionally, there are mosques and after the arrival of new immigrants, they will quickly construct their social network through mosques, share the social capital formed with mosques as the center, and provide the basic network support for immigrants to enter the city. And cities with developed markets, open policies and prosperous commerce can attract Muslim businessmen to enter the industry in a short time, thus rapidly gathering a certain number of people to build a harmonious religious community.





DISCUSSION AND CONCLUSION

Over the past 10 years, the style of newly built mosques has tended to imitate that of the Middle East region. This trend makes the religious symbols of mosques emphasized but severely separated from the connection of geographical and cultural context. The development of Islam in China cannot be understood as “*Sinicization*”. Firstly, the products of the *Sinicization* of Islamic architecture are the two major Islamic architecture systems in the Mainland and Xinjiang. Secondly, Islamic architecture in the interior of China is not passively accepting and imitating traditional Chinese architectural techniques and styles, but creatively inheriting and developing them. Thirdly, the *Sinicization* of Islamic architecture has its distinct characteristics of the times and changes synchronously with the development of Chinese society as a whole. The conclusion is that it is unrealistic to require Chinese Islamic architecture to remain in the era of big roof architecture in the Ming and Qing Dynasties without renewal today when traditional Chinese architecture is declining, and modern architecture is developing towards diversification.

Also, is there an architectural style called “Arab style”? The answer is “No”. Islam is recognized as a world religion, with a variety of localized styles; in the field of Islamic art, the most representative is the art of architecture and calligraphy. Therefore, “Islamic Architectural Art” does not mean “Arab Architectural Art”. In the contemporary Arab countries, there is no unified “Arab architecture”. Therefore, the assertion of “building an Arab-style mosque” is meaningless in itself. If there is a more unified style of Islamic art, it is completely normal for Chinese Islamic architecture to inherit, develop, and transform this style, which adds not only new content to the treasure house of Chinese culture, but also contributes new content to the world Islamic culture.

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MOSQUE AS THE INTEGRAL PART OF THE CONTEXT AND NATURE: CULTURAL MAPPING OF SULTANATE PERIOD IN DELTA BENGAL

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INTRODUCTION AND HISTORICAL BACKGROUND

MEDIEVAL BENGAL Independent Sultans in Bengal started their mission to promote Islam by holding the hands of continuing local cultural phenomenon, blending the traditional matter along with their inherent ritual started a new era in the frazil land of delta. Topographic – fetchers, sometime restrained their development process, however – further “challenge” became the blessings and medieval Bengal received a stylistic appreciation named “provincial style of Bengal” (Dani, 1960). Where brick and terracotta art works became the unique architectural archetype of this region. This very delta region was developed with small and large cities. All these various cities leaved tresses of remarkable settlement patterns – which may call the medieval city and contextual settlement by the Independent Sultan of Bengal.

Now what was the cultural landscape that was unique in this tropical region? This medieval landscape eventually evolved and grew by the strategic situation. The components of this pattern of layout perhaps could be focused with some mechanism, such as mounds, man-made water bodies, community development around the aqua landscape (water, body), microclimate, and the mosque itself.

Having said that these medieval models were efficient and became effective to consume the livelihood and marked as the authentic one. Infrastructures along with medieval structures positioned with innovative construction and structural process happily blended with Bengal’s own-cultural values. Shortly, this paper would like to address the significant part of medieval landscape where the sultanate mosque became the vital





settings and the process how the entire cultural landscape became the part of the community.

Strategy 1: the mainland was excavated to collect earth for the raised platform where the mosque used to settle in;

Strategy 2: the other excavated earths were involved to create primary construction material, such as burnt bricks and terracotta plaques to build the mosque;

Strategy 3: engagement of community-neighborhoods and lastly;

Strategy 4: microclimate generation.

This watery landscape became the unique part at the region to identify the scientific explanation; it is needed to uphold medieval Bengal's historical continuity with social-cultural development.

OBJECTIVE OF THE PAPER

The focused area of this research paper is to explain the process of making a neighborhood cultural landscape and mapping during the Medieval Sultanate state; where further these setting became a historic pattern- it could be termed as the cultural landscape. Notion of the paper is also to realize the environs around the settings, why this kind of process was necessary to build structures in the hinterland? The objective of the paper was also to highlight the climatic factors that used to prevail within the area. Neighborhood – engagement was another page of this research, lastly – space, scale, and proportion in the particular area are needed to revisit along with the other parameters.

METHODOLOGY OF THE PAPER

Methodology of this research would be justified by identifying the historic sites of Bangladesh, especially on the northern and southern part of Bengal, along with the topography as well. The research would also refer the ancient cartographic mapping to understand the trade and riverine networks. On the other hand; present and existing site situation might be the observed phenomenon of the study paper. Historic literature would be focal part to re-identify the proper methodology for the research.





WHAT IS CULTURAL MAPPING? CULTURAL LANDSCAPE OF MEDIEVAL DELTA BENGAL

A cultural landscape, as defined by the World Heritage Committee, is the “cultural properties” represent the combined works of nature and of man.

“Cultural heritage” in the hinterland would be the area or region which is profound since time immemorial, it perhaps significant for topographical situation, it could be noteworthy for the historic movement, possibly it would contain the legacy of an epoch, a cultivating land which is the emblem of a nation or a site near the aqua route could be titled as the cultural landscape. Eventually – a particular site or an area continue with the “values-rituals” of the community it might consider as the cultural landscape as well.

In delta land – diversified political amalgamations occurred in different time period, almost each rulers set their principle in building infrastructures and environment consideration. In this very situation, during the medieval time Bengal was dominant with small and big size congregation mosques where the water body along with a small locality/neighborhood consisted with the whole settings. In due course, this contented landscape became a part of this region and people started living with this components and infrastructures. Consequences; huge water body, cluster of vicinity, mosque, and the microclimate approach are still evident and working in a good shape as serving the part of the locality, this environs as the cultural landscape is appropriate to term in this hinterland. It is often frequent to see in this very watery landscape with green horizon. Medieval cultural landscape is seen here and spread over the country side. However, this cultural pattern of landscape is dilapidating by the encroachment and other vandalism. Proper strategies are needed to secure the environs which are dotted in various region of the country.



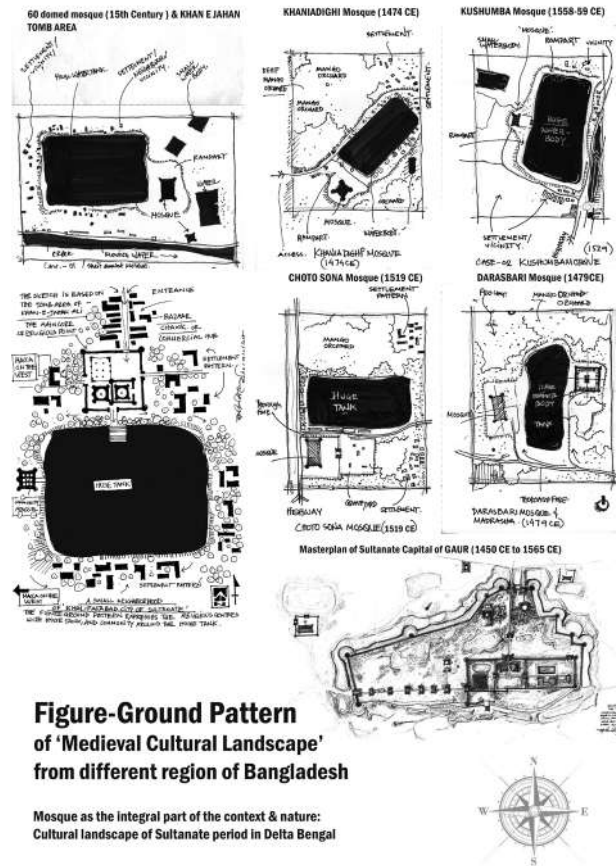


FIGURE 1

Figure-ground pattern showing different situation. However entirely it appears the unity in all patterns.

PROCESS OF MAPPING MOSQUE AS THE INTEGRAL PART OF THE VICINITY AND NATURE

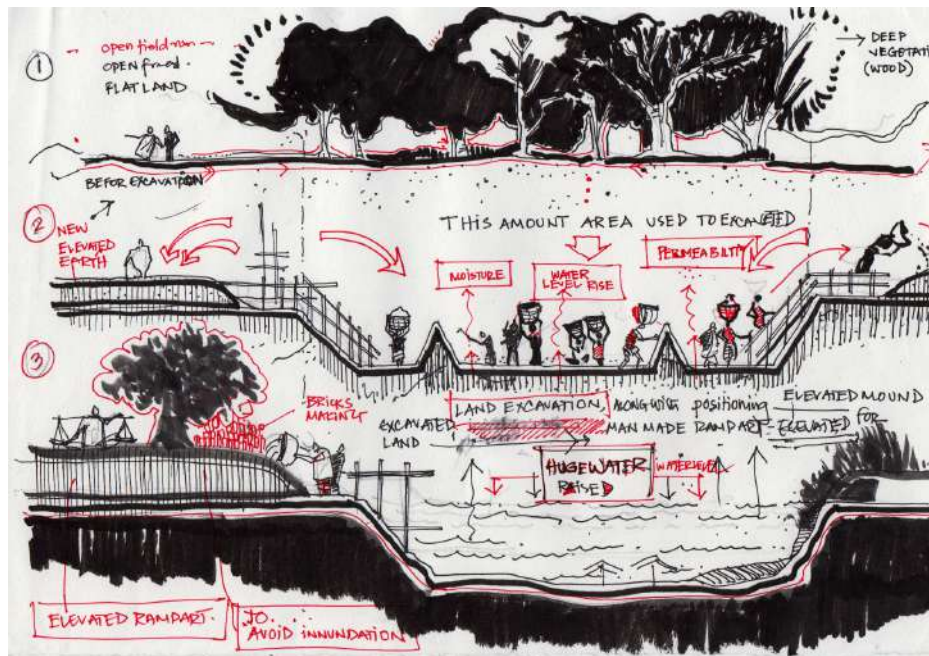
The whole process of medieval cultural landscape is a strategic involvement through participation of various disciplines in one formula. Eventually – the Sultans and the medieval builders combine the entire process through digging or excavating the tank as well as huge artificial water body. As this hinterland was marshy and inundation was a severe constraints on the path of developing superstructures: the builders used to create artificial mound or rampart by mobilizing excavated earth from the huge-tank to resolve the flooding issues, certain height used to maintain to found a mosque structure.



The rulers of the medieval era were comprehensive in participation; as they were friendly with the prevailing society along with continuing cultural values and eventually, they incorporated the direct influences from our vernacular matters and settings in building the mosques and tombs.

By digging the tank sultans contributed “grand sweet water source” to the existing neighbour, moreover this huge tank further acted as the vital “core socio traditional spatial pattern” in the vicinity. At the same time the vast amount of water body creates micro-climate impact within the neighbourhood. So in that sense – broader sequences generated within the spot settlement pattern. Having said that: firstly household intimate area, then the water body as the everyday lifestyle pattern of delta people, further congregation to the bazaar and lastly the submission to the mosque for prayer.

This whole phenomenon is not only a sequence of spatial pattern but also a sense of splendid environment, a picturesque fact and a locality with cultural continuity and inherency. A landscape that remind the ancestor’s livelihood. The root of a greater community a nation as well. In nut shell, cultural landscape of medieval period in the very delta land signed as the definite seat in the horizon of world heritage. This innovative development long way back gives us a way forward to think, solution for upcoming environ.



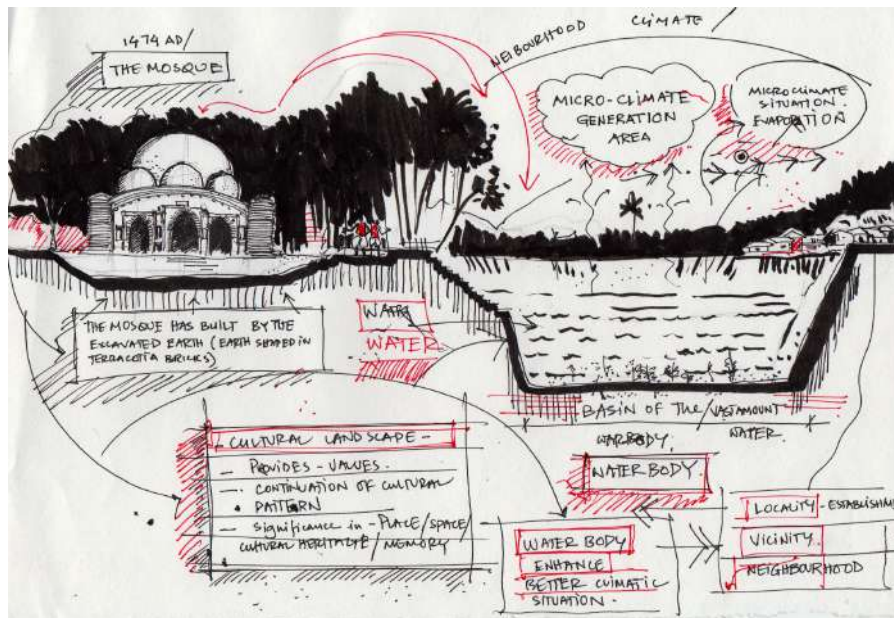


FIGURE 2

A chronological diagram of making the mosque along with the vicinity around the water body. The whole process in an integral part of the cultural mapping.

CONCLUSION

Cultural landscape is known to be a new terminology in south-east Asia. Preservation of this historic landscape is unfamiliar substance in Bangladesh. Proper historic background studies are needed to do research on a cultural landscape. Since Buddhist till Colonial era ancient and medieval Bengal is a treasure land for the cultural landscape. However, there are few structured guidelines are needed to put in the policy diagram to maintain and to promote the medieval historic landscape:

1. understanding the planning organisation of the historic site;
2. understanding the orientation of the area;
3. superstructure location along with the tentative focal point of the organisation;
4. pattern of relevant landscape identify and study with critical analysis;
5. understanding the figure-ground pattern;
6. settings of the area would remain as it was;
7. if excavation is necessary to justify the cultural landscape it would be executed with several phase;



8. documentation would be proper with existing situation;
9. a conjectural view could be good tooling to understand the historic area;
10. sometime permeability would restrict to keep the original situation of the area; and
11. if the site remains water body; it would be properly treated to refilling the water again.

Above all mentioned criteria could be maintained to secure the site, minimum intervention would be preferred instead of heaviness. Cultural landscape of medieval sultanate epoch is focused with water body and the mosque, identically in all situations this form of art are the same and it perhaps became the criteria to generate bigger settlement pattern during the medieval time of Bengal.

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THE DIMINISHING OF INDIGENOUS ARTISTIC TRADITION IN THE DECORATIVE ARTS OF THE MOSQUES IN *DUNIA MELAYU*

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INTRODUCTION

THE mosques in *Dunia Melayu* are valuable historical evidence left by the Islamisation process, as they are indicative of the establishment of Muslim populations in the region, and thus often record the people's socio-economic and political aspirations. Many scholars embarked on the study of mosques; mainly due to the academic fascination of such wide-range architectural vocabularies emerging from mosque design as being the trademark for Islamic architecture. The mosque, says Robert Hillenbrand in the opening paragraph of *The Mosque in the Medieval Islamic World*, "is the Islamic building par excellence, and as such the key to Islamic architecture" (Hillenbrand, 1985).

Unlike their counterparts in the Islamic mainland, the vernacular mosques of *Dunia Melayu* however lacks the "grandeur" in architecture as well as ornamentation. In fact, these mosques are distinguished for their simplicity and lack of decorations (Lombard, 2000a; Pijper, 1985). Compared to the mosques in the mainland Muslim world during the same period, vernacular mosques in *Dunia Melayu* are relatively small in size and humble in appearance. Mosques of gigantic scale only appeared in the region during the post-colonial and pre-independence periods.

The absence of decorative arts in these mosques is seen by some as in line with the concept of "humility" in Islam (Lombard, 2000a); or as an effort by the Muslims to accentuate the religious spirit in the mosque by leaving everything of worldly nature outside of its doors (Pijper, 1985). However, to some sceptics, it is the nature of austere Islamic teachings that "killed" creativity in mosque architecture. Graaf and Pigeaud, while acknowledging





the contributions of the *wali* in reliving certain aspects of performing arts such as *wayang kulit* (shadow play) which was, at one time instrumental in the propagation of Islam, blamed the *wali* as being responsible in the “secularisation of art from religion” (Graaf and Pigeaud, 1985).

A quick survey on contemporary mosques of post-independence *Dunia Melayu* will quickly demonstrate that most decorative arts seen in these mosques are mainly imported from elsewhere. With the exception of woodcarving panels found either as movable partitions or decorative elements of the *mimbar* and *mihrab*, the rest of the decorative schemes are either direct reproductions from popular motifs and materials elsewhere, or locally installed as the product of craftsmanship not inherited from local artisans.

For the last two decades, morphological and typological studies of historic mosques of *Dunia Melayu* have mainly focused on the form, or factors influencing the forms. Very few studies have been done either on the interior qualities of these mosques, the ingenuity of their decorative elements or the construction systems employed. There has been no study performed on the formation or development of Islamic artistic culture in mosque architecture of the region.

RESEARCH OBJECTIVES

The aim of this study is to analyse the changes taking place in the decorative arts of the mosques built between 15th to 20th centuries. This study aspires to understand how the decorative arts of mosques in *Dunia Melayu* evolved. While Hillenbrand considered the birth of Islamic art to have begun with the Umayyad dynasty (661–750), where the outstanding Great Mosque of Damascus (b. 709–715) took its form less than a century after the death of the Prophet (PBUH) (d. 632), this study attempts to find the genesis of Islamic art in the context of *Dunia Melayu*. As the oldest extant mosque known of this region was built in the 15th century (i.e., 8th centuries after the foundation of the Great Mosque of Damascus, and in the same period that witnessed the establishment of the last Islamic dynasty, the Ottomans in Turkey), it is critical to understand why the earliest mosque in *Dunia Melayu* took the form that it had; how this form was later transformed into a completely different model and how the artistic tradition was affected by these changes.





RESEARCH METHODOLOGY

Visual documentation and analyses were conducted on the oldest extant mosques by initially following the routes of Islamisation, that naturally brought the study to the establishment of the most important centres in *Dunia Melayu* between the 15th and the 20th centuries (Figure 1).



FIGURE 1

Map of major urban centres, 16th and 17th centuries.

(Source: Cribbs, 2000)

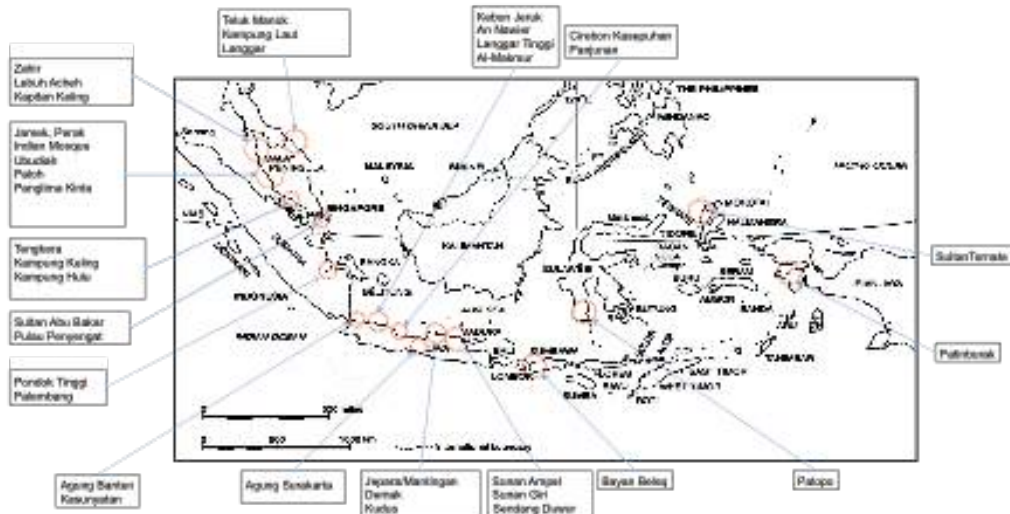


FIGURE 2

Distribution of selected mosques for analyses.





The 15th century was selected as the beginning period for investigation as it recorded the establishment of many Muslim sultanates. In addition, the earliest surviving mosques of the region belong to this period. The 18th century, as many authors have agreed¹, was the watershed in the history of *Dunia Melayu* that marked the beginning of European political interference in regional affairs. As such, it is critical to study the effects of this leap in history on the artistic and architectural vocabulary of this region. The period selected (i.e., the 15th century through the 20th century) is a huge time span in itself, and thus requires samples to be short-listed only after the process of filtering. In addition, it is necessary to define the limits of material under discussion by adopting a suitable methodology. By arranging them in chronological order, the earliest surviving mosques of each city were identified. The 40 mosques finally selected for this study were filtered from a list of more than 100 mosques found either through literary studies or fieldwork.

VISUAL SURVEY OF DECORATIVE ARTS IN MOSQUES OF *DUNIA MELAYU*

The survey looks for decorative elements in mosques, both ornamental and architectural. Two dimensional decorations are often found applied on structural elements such as columns and beams, as well as interior and exterior surfaces such as the walls and floors. They include carvings, ceramic works, paintings or illustrations that utilise techniques and colours that could be studied for their origins and influences.

Three-dimensional decorations are found in the design of gateways, and any 3D figurative or non-figurative artworks. The motifs used are studied based on the types known such as geometric pattern, floral-vegetal, zoomorphic, and cosmos. The survey also looked for decorative schemes in typical mosque elements such as *mimbar* and *mihrab*. Based on the visual survey and archival studies conducted, decorations in Island Southeast Asian mosques were mainly concentrated in structural elements and *mimbars*. As vernacular mosques have non-loadbearing walls, the *qiblah* wall including in it the *mihrab*, were susceptible to being replaced. In many cases, change was necessary, as vernacular materials such as wood tend to rot. The study

¹ See, among others, Barbara and Leonard Andaya in *A History of Malaysia* (1982); Ricklefs in *A History of Modern Indonesia since c. 1200* (2001), *Mystic Synthesis in Java* (2003), and *Polarising Javanese Society* (2007); Steinberg (ed.) in *In search of Southeast Asia* (1987); Khoo Kay Kim in *Malay Society 1874-1920* (1974), *Malay Society: Transformation and Democratisation* (2001); Anthony Reid in *Charting the Shape of Early Modern Southeast Asia* (2000); Roelofs in *Asian Trade and European Influence in the Indonesian Archipelago* (1962).





also found that the majority of the *mimbars* in the mosques selected are made from wood and are movable rather than fixed, with the exceptions of a few mosques such as Masjid Menara Kudus (15c), Al-Mansur (18c), and Kampung Baru (18c). All of these mosques have inbuilt *mimbars*.

Mimbar

An interesting feature in some of the *mimbars* of the 15th and 16th centuries is the *kala* or *padmasana* design, which is found in four of the old mosques. The *mimbar* is designed in the form of a *padmasana* or throne (as it is known in Hindu culture), with four posts supporting a stylised *kala* with curled ends forming an arch to the entrance of the *mimbar*. This design is found in Sendang Duwur, Giri, Demak, Cirebon, and Panjunan. By the 16th century, however, none of the *mimbars* were designed in the same style.



FIGURE 3

Padmasana design in the *mimbar* of Masjid Sunan Giri (left) and Masjid Merah Panjunan (right).



FIGURE 4

The *mimbar* of Masjid Agung Cirebon Kasepuhan.





Mihrab and the Qiblah Wall

There were not many original *mihrab* found in the mosques of the 15th and 16th century period. However, those that survived demonstrated peculiar designs. The *mihrab* of Masjid Agung Cirebon (Figure 5) is made from white marble with intricate detailing and sculptured pilasters topped with lotus buds supporting a curved-form portal with *surya Majapahit* emblem at the centre and curled clouds trimming. Masjid Menara Kudus original *mihrab* was in the form of *Paduraksa* (closed gateway) exhibiting strong influence of Javanese-Hindu artistic tradition.



FIGURE 5

The *mihrab* of Masjid Menara Kudus (left) and Masjid Agung Cirebon (right).

Architectural Decorations

Medallion Wall Tiles

Other than the *mimbar* and *mihrab*, mosque decorations were mainly found in structural or constructional elements such as the wall, beams, and pillars. Unique to the mosques of the 15th and 16th century was the method of installing decorative tiles to the walls like medallions, whereby they are not used as wall covering but spaced out almost evenly forming a continuous pattern. This practice is believed to have been inherited from pre-Islamic traditions of temple decorations (Hall, 2000; Iswahyudi, 2007). Annamese ceramic tiles with various motifs and colours are found in the walls of Masjid Mantingan, Masjid Agung Demak, Masjid Menara Kudus, and Masjid Merah Panjunan (Figures 6 to 8). In Masjid Mantingan, however, instead of ceramic tiles we found coral-carved panels decorating the entry facade of the prayer hall (Figure 8).





FIGURE 6

Annamese ceramic tiles on the wall of Masjid Merah Panjunan.



FIGURE 7

The tiles at Masjid Agung Demak.



FIGURE 8

Masjid Mantingan.





Wood-Carved Structural Elements

Intricate woodcarving patterns are often found on columns and beams of the mosque, in particular the *soko guru* which – to the Javanese people – represents power and strength (Sumintardja, 1989a). The most prominent feature in the mosque design is often the *soko guru* with its roof framing system. The jointing systems which utilised *catokan* (mortise and *tenon*) without the use of nails have resulted in magnificent details in craftsmanship (Figure 9). Such applications echo the ingenuity practices of traditional civilisations whereby ornamentations – in principle – must be attendant to architecture (Jones, 1856); thereby producing a beautiful architecture with structural clarity (Figure 10). Examples of mosques employing these techniques are Masjid Agung Demak, Masjid Agung Cirebon Kasepuhan, and Masjid Merah Panjunan.



FIGURE 9

Soko guru and beam design in Masjid Agung Demak.



FIGURE 10

Structural features in umbrella configuration of Masjid Merah Panjunan.





2D and 3D Ornamentation and Motifs

Floral and Vegetal Motifs

Floral and vegetal motifs composed in the forms of meandering clouds, spiralling tendrils which spring out of a central urn, a flower or a seed are the dominant theme in decorations on wood elements. John Guy in his assessments of Chinese and Vietnamese ceramic wares found in Trowulan as well as in the mosques of 15th century identifies that the design composition of the flowers and meandering leaf motifs find its origin in the decorative repertoire of Yuan and early Ming China; many elements in which are drawn from Middle Eastern Islamic design (Guy, 1989). The possibility of Chinese influence in early mosques' decorative arts is strengthened by the fact that many early Muslim missions and patrons were of Chinese origin; in addition to the existence of Chinese shipbuilding yard in Semarang as well as woodcarving guild in Jepara.

Many floral and vegetal motif decorations however were composed in narrative style, especially those found in tomb mosques. In addition, some of these motifs were those taken from pre-Islamic periods but given new meaning and application.



(a) **Mosque:** Masjid Sendang Duwur
Location: Tomb
Medium: Wood
Motif: Flower, leaves



(b) **Mosque:** Masjid Sendang Duwur
Location: Tomb
Medium: Stone
Motif: Flower, leaves, tendrils





(c) **Mosque:** Masjid Mantingan
Location: Wall
Medium: Coral
Motif: Water lily, lotus



(d) **Mosque:** Masjid Mantingan
Location: Wall
Medium: Coral
Motif: Water lily

FIGURE 11(a)–(d)

Flora and vegetal motif in 2D and 3D decorative arts.

Calligraphy

The earliest employment of the Arabic calligraphy in *Dunia Melayu* is found on the tombstones spread across the archipelago, and in particular in the epitaphs of the group of old graves found in Pasai and Gresik. Coincidentally Gresik, where two of the earliest tombstones were found, was also the site of Masjid Sunan Giri (original building founded in the 15th century), one of the oldest surviving mosques in *Dunia Melayu*. The early discovery of the use of calligraphy in monumental art in both of the tombs may have explained the presence of the Arabic calligraphy in the old mosque of Gresik, which this research found to be the only vernacular mosque to incorporate Arabic calligraphy as part of its decorative scheme.

In Masjid Sunan Giri, the calligraphy incisions were made on the wooden wall panels, main columns and beams at a height just below the ceiling level of the mosque, making it difficult to capture a clear photographic image. Arabic scripts of Allah and 'Ali (Figure 12), and Allah and Muhammad (Figure 13) were arranged in geometric, symmetrical composition. The fact that 'Ali is singled out in the decorative scheme indicates that the influence of *Shi'ite* teaching had penetrated Gresik, perhaps through Persian traders. It is also probable that the patron commissioning the calligraphy work was someone with a Gujarat and Southern Indian connection, as, according to Q.S. Fatimi, during the Muslim period they were integral parts of the





same cultural unit known as *Dakan* (Deccan), which were “the closely-knit, all-India organisation of the *Sufi* orders and the general employment of the Persian language as the lingua franca of Muslim culture” (Fatimi, 1963, pp. 35).



FIGURE 12

Arabic scripts of Allah and 'Ali.

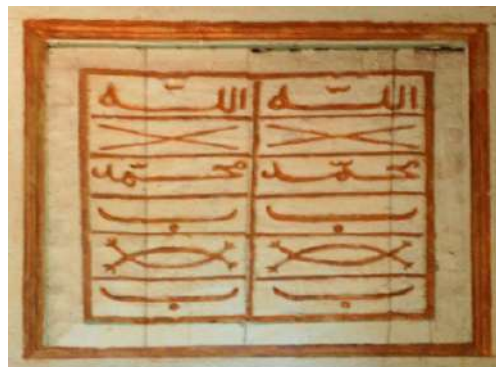


FIGURE 13

Arabic scripts of Allah and Muhammad.

An illustrious narration documented by Raffles in *History of Java* informs us that the mosque of Giri was built by Raden Paku, who was of Arab descent, at a time when the Hindu Majapahit king was still in reign. It also indicates that around the 15th century there was already a group of influential Muslims in Gresik, whose presence was recognised by the Majapahit king, a story that was corroborated by the presence of the old tombs. In addition, the relationship between Sunan Giri and the Majapahit king was evidenced through the existence of the Majapahit regalia, the eight-pointed *surya Majapahit* (Sun of Majapahit) in the mosque decorative scheme.





FIGURE 14

Calligraphy placed at the centre of the eight-pointed *surya Majapahit* regalia.

At the main columns (*soko guru*) where the main beams meet the main central column, small calligraphic writing in medallion design is placed at the centre of the eight-pointed *surya Majapahit*, surrounded by a stylistic arrangement of vegetal in the form of a stylised butterfly and *kalamakara* (Figure 14). The same medallion-like arrangement of the calligraphic design can also be found above the main entrance door (Figure 15). This time the calligraphic writing of the verse of the *Qur'an* placed on the door lintel was more legible, containing the verses from *Surah al-Munafiqun*, (63):9–10.



FIGURE 15

The calligraphy of verses from the *Qur'an* placed on the door lintel.

The calligraphic style found on the door lintel is more angular and closely resembles the monumental *Naskhi* script that replaced the angular *Kufi* after c. 1250 (Begley, 1985, pp. 14). According to B. Moritz in *Encyclopaedia of Islam* (1913, pp. 338–390), the *Kufi* calligraphic style disappeared from practical use by the end of the 13th century, to be replaced by the round script *Ta'liq* (later developed into *Nasta'liq*).





The absence of the *Kufi* calligraphy in this mosque, as opposed to its presence in the previously mentioned tombs, suggests that the mosque artistic style could have belonged to a later period (i.e., after the diminishing of the *Kufi* influence). However, within the same mosque, there is a marked difference between the calligraphy found on the upper wall panels of the interior of the mosque and the one decorating the door frames. While the wall panels exhibited a rigid and almost “immature” calligraphic style in an unique geometric composition that is incomparable to any other samples found by this research, the design of the door frames suggested that they were products that closely resembled the stylistic Deccan (or *Dakan*) monumental calligraphy prevalent after the 13th century.

This difference suggested that the decorative scheme of the mosque may have been executed by different people, probably at different periods. Given that Masjid Sunan Giri (which is present today) is the mosque that was reconstructed by Sunan Prapen in 1544CE, 40 years after the death of Sunan Giri (Moehammad Habib, 2001, pp. 59), the difference in the periods of the mosque construction (and reconstruction) and the dates inscribed on the headstones indicate that there was a progressive change in stylistic preferences across the periods. It is also most likely that the calligraphy found in the Masjid Sunan Giri was probably executed by non-native Muslims who lived or transited in Gresik during that period.

Zoomorphy and Narrative Art

Peculiar to the mosques of 15th and 16th century was the presence of 2D and 3D zoomorphy ornamentation carved in stone or coral. Most of these motifs were found applied in the decorative arts of tomb mosques, such as Masjid Sendang Duwur and Masjid Mantingan. Masjid Sendang Duwur in particular bore evidence of the transition between pre-Islamic concepts and their applications in the Islamic context. The mosque exhibits three dimensional forms in the stone crafts which were original borrowings from the Hindu-Javanese temple arts: such as *candi bentar*, *paduraksa*, and *stupa*. It is also the only surviving mosque of the transition period which employs a range of zoomorphic motifs in its decorative scheme. However despite the consistency with Hindu-Javanese art repertoire, according to Uka Tjandrasasmita (1984) the winged gate is a developed gate archetype which is not found in the old Hindu temples of Java. This signifies an initial attempt by early Muslims to develop an old repertoire into a new form and meaning.





FIGURE 16

Winged gate of Masjid Sendang Duwur.



FIGURE 17

The concept of resting place in Jannah, depicted here with Geroda wings guarding the entrance with the Eternal Tree, Kala Makara, clouds, hills, and plants motifs.



FIGURE 18

Wings carved into pedestals near entry to the tomb.





DISCUSSION ON FINDINGS

In general, the study found that the most artistic period was the 15th and 16th centuries, when mosques exhibited a variety of motifs and techniques of execution (Chart 1). During this period, most decorative applications were concentrated on structural items such as the beams and columns, as well as the *mimbar*. The 15th to the 16th centuries also witnessed the widespread use of ancient motifs such as scenery, narrative, zoomorphic, cosmos, crown-stupa-nanas, and cloud. However, this pattern gradually decreased in the 17th and 18th centuries (Chart 2). By the end of the 19th century, basically all ancient artistic traditions had diminished, only to be replaced by more Islamic motifs such as calligraphy, floral-vegetal, and geometric pattern (Chart 3).

CHART 1

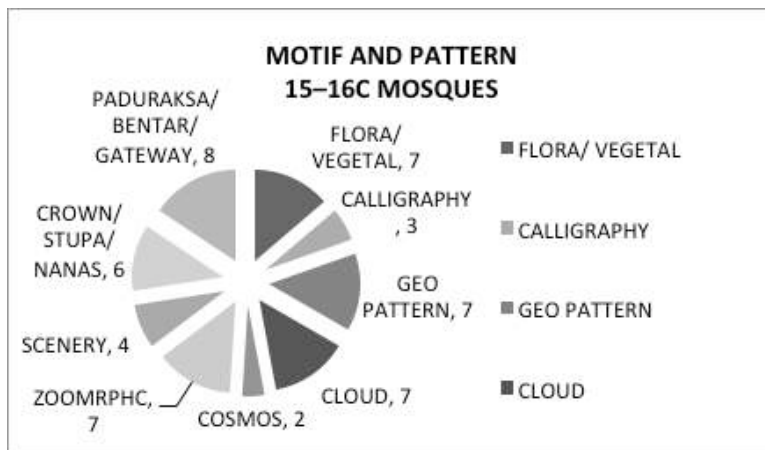


CHART 2

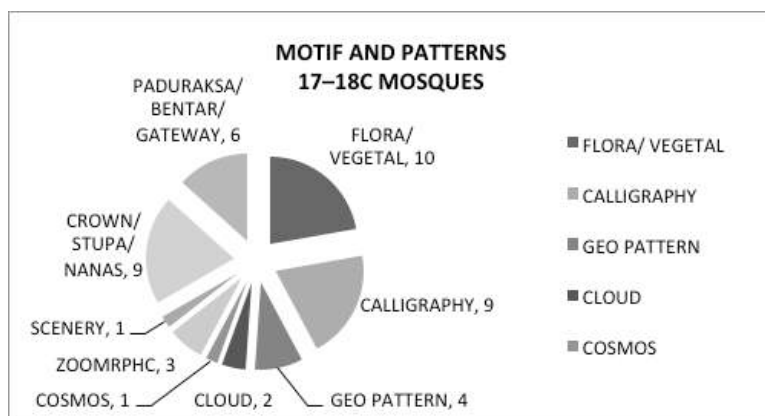
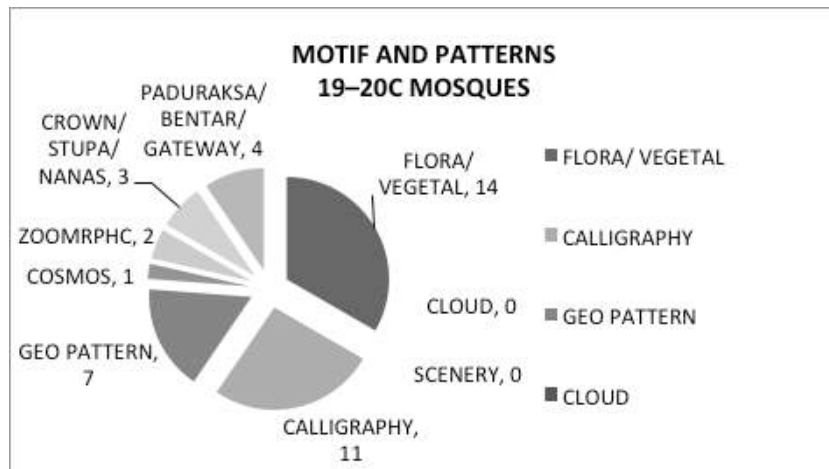


CHART 3



The mosques of the 15th and 16th century marked some distinguished vocabularies in the mosques' decorative elements. These mosques displayed a range of ornamentation motifs, styles, and applications which in themselves were evidence of fine craftsmanship. Despite the fact that the mosque's art of this period was considered as a continuity of pre-existing building tradition exhibited in the borrowings of architectural grammar and adoption of motifs with symbolic meanings; it is also undeniable that they were courageous attempts in defining new languages of Islamic tradition by adopting, reappropriating and inventing new meanings to pre-Islamic applications.

The initial endeavour however was never met with constructive efforts that could have enabled the development or flourishing of distinctive local Islamic idioms. Islam, underlines Hasan Ambary, only adopted the pre-Islamic building tradition both in techniques and in its aesthetics and did not introduce a new cultural tradition (Ambary, 2001). The mosques of the post 16th century period were notable for their plainness and lack of decorative elements. Apart from the sharp diminishing of decorative elements associated to Hindu-Buddhist tradition, the mosques of this period were in fact stripped of any kind of meaningful embellishment.

The detachment of decorations from the mosques persisted for a considerable period of time, only to be replaced by mosques of gigantic sizes and alien architecture in the 19th and 20th century period. Based on the analysis done, it could be ascertained that after the 16th century, there has been no developments on any of the traditional building techniques,



materials, designs, or didactic functions; in fact what is evident in the mosques of the nineteenth and twentieth century is a copied version of pre-16th century tradition without any inventiveness and in some cases; a complete replacement of architectural vocabulary with total disregard of local cultural tradition.

“ISLAMIC ART” IN THE *DUNIA MELAYU*

When Islam arrived at the shores of the *Dunia Melayu* in the 16th century (and even earlier), the western part of the Islamic world has already achieved building technology advancement in their mosque architecture and decorations. The congregation mosque Masjid-I Jami' of Isfahan (built 1310 during the Saljuqi rule) was an example of the elegance in the application of dynamic geometries which Oleg Grabar proposed as being the product of a particularly inventive designer in Isfahan during that period (Grabar, 1990). Based on his knowledge that the poet and mathematician Omar Khayyam had identified the properties of pentagon; Grabar anticipated that he could have well been the one who designed the mosque. When Islam sets its foot in the coastal regions of the Malay Archipelagos, the well-proportioned structures and aesthetically pleasing spatial and structural innovations have become the trademark to major Islamic centres (Holod, 1988).

Records kept in the Topkapi Sarayi Museum Library in Istanbul entitled *Risale-I Mi'mariyye* (Treatise on Architecture) inform us on the frequent meetings and discussions (*majalis*) held between artisans and builders (architects); whereby artisans were known to consult mathematicians and mathematicians were known to have written guidelines on the principles of forms and structures. A 16th century Ottoman geometer was recorded as teaching his apprentice artisans from a book written by Abu'l-Wafa' al-Buzajani (940–998AD) the famous mathematician-astronomer; dedicated especially for artisans entitled *Kitab fima yahtaju ilayhi al-sani' min a'mal al-handasa* (The book on what the artisan requires of geometric constructions) (Ozdural, 1998).

The advancement of building sciences in the era of the Ottoman rule in Turkey is evident in the works of Sinan (1489–1588), the chief architect of the Ottoman Caliphate, who had built more than 70 mosques in his lifetime. In a rare autobiography written by an architect, he underlined the critical relationship between piety and creativity when he said:





There is no art more difficult than architecture, and whosoever is engaged in this estimable calling must, to begin with, be righteous and pious. He should not begin to lay the foundations if the building site is not firm, and when he sets out to lay the foundations he should take great care that his work be free from defect and he reach the firm ground. And, in proportion to the abundance or paucity of piers, columns and buttresses, he should close up the domes and half domes that are on top of them, and bind the arches together in an agreeable manner, without carelessness. And he should not hurry in important matters but should endure in accord with the import of the saying “Patience brings one victory!” in order that, with God’s help, he finds divine guidance for the immortality of his work. And in this there is no doubt.

(Gulru Necipoglu (ed.), 2006)

It is unfortunate that there has been no evidence linking the advancement of technologies in Isfahan or Istanbul to the building developments of the *Dunia Melayu*. Even with the assumptions of some scholars that Islam came to this region from India, the architectural developments depicted in the Delhi-Imperial Style (12th–16th century) or the Mughal style (post 16th century) (Hasan, 1994) has not in any way impacted the building traditions of the Muslims in this part of the world. Despite the initial contacts of the *Dunia Melayu* with the material cultures of the western part of the Muslim world, as indicated in the presence of Gujarati marble stone designs and the calligraphy works in Masjid Sunan Giri, there was literally no cultural interactions whatsoever after the 16th century – either from the west or from the east.

It is difficult to disentangle European’s pursuits for economic monopoly in the 16th century from its military and political encroachments onto the existing population. Through warfare, fortifications and trade monopoly, by 1650 the Europeans had gained control of the region’s vital ports and products (Reid, 2000). For the first time, the Europeans had managed to secure the commercial posts from their traditional rivals – the Moors or Saracens – and effectively isolated the ISEA from the rest of the world (Day, 1904).

In many cases recorded in the history, the Europeans aggressions were not confined only to commercial rivals. In the face of local oppositions they resorted into destroying often the finest material culture which was symbolic of the people’s civilisational achievements. When the armies of Albuquerque attacked Malacca in 1511, they destroyed the palace, the





mosque, and massacred the Malays to the extent that “the city looked like a cemetery” after the assault (Teixeira, 1961). For more than a century, there were no religious houses in Malacca, except those belonging to the Portuguese.

Similarly, when Jan Pieterszoon Coen destroyed Jayakarta in 1619, he burned the *kraton* and the mosque inside its walls; to the extent that during the V.O.C. era (1619–1799) there was no mosque in the old city of Batavia; nor were there any Chinese temples or Catholic Churches (Heuken, 1983). The Dutch aggressions towards the Muslim communities in the trading ports were recorded when in 1628 and 1629, under Coen’s order, two assaults were launched on Japara burning all ships, killing all Gujerati merchants who could be found, destroying the English lodge and carrying off the Chinese by force to Batavia (Meilink-Roelofs, 1969).

In Banten, the Dutch assault was recorded in the destruction of the Banten royal Palace Sebakingsing in the 17th century, which ruins are left intact until today (Ambary 1977; Guillot *et al.*, 1990). In Aceh, in the wake of Sultan Iskandar Muda’s rebellion, the Masjid Baitur-Rahman was attacked in 1873–1874 to ruins. There is no archaeological evidence left of the original mosque except in the drawings of Francois Valentijn (1724–1726) which suggested that its architecture was similar to the surviving mosque in Indrapuri. However, the remnants of the royal pleasure gardens could be traced in the form of an elevated, walled enclosure square opening onto gardens dominated by the *gunungan* (mountain-like structures) (O’Neill 1994). In Malay Peninsula, the Malay leaders were well informed of the nature of British actions against any kind of rebellion. In the aftermath of the killing of J.W.W. Birch in 1875, the British Resident of Perak, Maharaja Lela entered his house – “the best house in Perak” – in tears for the last time as he knew it would be burnt down by the British (Gullick, 1987).

These intrusions, in addition to pre-existing internal dissensions among the Malay traditional rulers, have in large imposed a political and economical restraints on the population of *Dunia Melayu*. With the exception of Mataram rulers who were sponsored by the V.O.C., other regional rulers lived in relatively poor and humble conditions. As agreements were negotiated and imposed upon them, the Muslims were left without legitimate or powerful Muslim leaders overseeing neither cultural nor religious developments. The armed confrontation, economical restraints and political unrest effectively precluded the initiation of major building programmes among the Muslim communities (O’Neill, 1994); and consequently affected the formation of sustained Islamic building culture.





CONCLUSION: THE EROSION AND TRUNCATION OF TRADITIONAL ARTISTIC CULTURE

The findings of this study suggest that the detachment of decorative arts from the mosques of Dunia Melayu beginning of the 17th century was parallel to the absence of any major building activities or architectural developments; as well as the vacuum in legitimate Islamic leadership foreseeing the affairs of the Muslim community. In addition, the 17th century also marked the severed cultural network in effective transmission of Islamic teaching via maritime activities due to the European's commercial and political policies imposed on the region. These factors consequentially brought about the critical importance of the role of patronage in the design, function, and development of a mosque.

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SACRED COMMUNITY ASSETS: PLANNING FAITH SPACES FOR FUNCTIONAL, UNIVERSAL, AND FUTURE-READY MOSQUES IN SINGAPORE

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INTRODUCTION: MOSQUES AS COMMUNITY ASSETS

As a multi-racial and multi-religious nation, Singapore's Muslim community prides itself with the 70 mosques built to-date, located across 722 square kilometers, each unique in its identity and serving a specific demographic of the community.

Mosques in Singapore are governed by a statutory board, an Islamic authority, MUIS¹ (the Islamic Religious Council of Singapore or Majlis Ugama Islam Singapura). With a centralised approach to policymaking and long-term planning by MUIS, the development expertise overseeing execution of upgrading and developing mosques is undertaken by real estate professionals by its wholly owned property subsidiary, Warees². Each development is fully funded by the community where these mosques are built solely upon the contributions and resources of the Muslim community efficiently pooled via the Mosque Building & Mendaki Fund (MBMF)³ scheme and community-organized fundraising drives.

From faith spaces built out of religious necessity, our mosques have also developed diversified identities to become valuable community assets,

- ¹ The Majlis Ugama Islam Singapore (MUIS), or Islamic Religious Council of Singapore, was established as a statutory board in 1968 to advise the President of Singapore on all matters relating to Islam in Singapore.
- ² Warees Investments Pte. Ltd. is an endowment asset management company wholly owned by Muis and is responsible for the development of prime commercial and residential properties as well as the conservation of culture and heritage.
- ³ The Mosque Building & Mendaki Fund (MBMF) was established in August 1984 as a community fund collecting contributions from working Muslims in Singapore through the Central Provident Fund (CPF) Board's collection system for the building and upgrading of mosques. The MBMF supports the building of new mosques and upgrading of the older mosques, religious education initiatives, while Mendaki's educational and social programmes are to strengthen and uplift the Malay/Muslim families.





gazetted as National Monuments such as Sultan Mosque, Abdul Gafoor Mosque, and Hajjah Fatimah Mosque; conserved buildings such as Malabar Mosque and Khadijah Mosque, to being integrated as part of metropolitan Commercial and Mixed Developments such as Bencoolen Mosque and Al-Falah Mosque in Orchard. Satellite neighborhood mosques have also grown to become icons and landmarks of the surrounding estates – the old mosques are historical emblems while the new mosques espouse the vision and lifestyle of the future town.



FIGURE 1

Sultan Mosque: Gazetted as a National Monument in 1975.



FIGURE 2

Khadijah Mosque: Gazetted for conservation in 1991.



FIGURE 3

Al-Falah Mosque: Part of a large mixed development, The Cairnhill, in the CBD area (Orchard Road).



FIGURE 4

Al-Ansar Mosque: Located in the public housing heartland of Bedok.

Over the years, these sacred community assets undergo rigorous upgrading and intensification of prayer space, implemented alongside a universal and compact model of strategically designed spatial optimization which





allows for the mosques to serve a wider spectrum of socio-religious needs of the community, especially the need for Islamic education for the younger generation.

At the point of completion of Muhajirin Mosque, which was the first satellite mosque built in 1977 funded by MBMF, the prayer space was only designed for a 1,800-capacity congregant size. Fast forward a mere 40 years later, the most recent Maarof Mosque and Yusof Ishak Mosque completed in 2018 has seen a prayer space area percentage increase of 250% with prayer space designed for 4,500 congregants. Within the mosques, spaces are designed with multi-functional uses in complementary clusters offering a wide range of additional functions, services and Islamic learning programmes catering to the needs of individuals from all walks of life, beyond simply the Muslim community (Green, 2007).



FIGURE 5

Maarof Mosque: Terraced prayer hall combining main prayer with ladies' prayer and extended prayer hall at upper levels.



FIGURE 6

Yusof Ishak Mosque: Naturally-ventilated prayer hall connecting other ancillary spaces allowing seamless *saff* lines facing the *mimbar*.

PLANNING FAITH SPACES: FORM AND FUNCTION

Historically, mosques in the region served as social hubs for the community, even in the traditional set-ups (such as in the villages or kampong mosques and *suraus*⁴). Mosques remain the sites on which village communities meet and discuss ways to improve their welfare. Even as the village set-up made way to high-rise apartments, the social mission remained (Markasan, 2005).

⁴ A small prayer space or a small building used for prayer.





Growing faith, limited in space – that has been the situation faced by the Singapore Muslim community since the early years of independence in 1965. In the throes of urban development and establishment of new HDB towns post-independence, there was a need for the planning and development of the Mosques in Singapore (thereafter “MosqueSG”) to be helmed by MUIS with a centralized planning approach. MUIS was tasked to work with relevant agencies and volunteers within and beyond the Muslim community to ensure the sustainability of MosqueSG during those early years (Saat, 2018). Alongside the government’s efforts to make land available in every HDB town, the community struggled and toiled to continually raise funds to finance the new MosqueSG (Green, 2007).

Today, MosqueSG continues to be an active platform for the Muslim community to spur its social mission (Saat, 2018). A gradual paradigm shift fueled by state and community-driven initiatives has seen MosqueSG increasingly become a future-ready model embodying a balance of the top-down and ground-up approaches.

Centralized Planning Approach: A Multi-Functional Mosque

Every building in Singapore is regulated by Development Control (DC) guidelines set out by the Urban Redevelopment Authority (URA)⁵ of Singapore – Places-of-Worship such as mosques are not exempted. These guidelines provide the parameters namely land size restrictions (limited to 2,500 square meters), allowable build-up area and use quantum of religious and ancillary spaces within the mosque, which are pivotal in shaping the mosques to become as user centric as they are today.

The DC Use Quantum dictates that 50% of the proposed total Gross Floor Area (GFA) shall be prayer areas while the remaining 50% shall be religious-ancillary spaces, within which only 10% is allowed for non-religious uses. This parameter alone greatly differentiates MosqueSG from those in Muslim-majority countries because not every corner of the building shall be declared as sacred prayer areas (*iktikaf* areas).

Although this Use Quantum may sound imposing, these central development parameters have inadvertently created opportunities for the MosqueSG to play host to many useful supporting functions extending beyond prayer activities. An effective strategy employed which is still being adopted in

⁵ The Urban Redevelopment Authority (URA) is the national urban planning authority of Singapore, and a statutory board under the Ministry of National Development of the Singapore Government.





our newer mosques today is to create ancillary spaces which are multi-functional in nature. Classroom clusters with operable walls located beside ladies' prayer halls are a prime example: these classrooms host small to large scale functions and double-up as extended ladies' prayer areas.

Among other ancillary spaces are offices, auditoriums, youth hubs, and kindergartens which lend an adaptable and inclusive nature to the mosque building over and above its principal function for prayers. With the space constraints of our rapidly density-intensifying city, MosqueSG needed to transform itself into an institution that is sufficiently flexible to provide multi-platform uses addressing various facets of the community within a single spatial footprint.

As a reaction to conforming with state-imposed controls, form and function come together to create a cohesive yet malleable identity encompassing an institution of Islamic learning, a hearth of Islamic and cultural functions such as weddings, a hub for youth development and activities, an accessible socio-religious center for the elderly and an open platform for collaborative social work with non-Muslims.

Community-level Approach: “Total Optimization”

One of the key critical functions of the mosques in Singapore which continues to propel the development of the form, architecture and dynamics of spaces within our mosques today is the Friday prayers.

Once a week, the overwhelming demand for prayer space can be witnessed as congregants flock to the mosques to perform their religious obligations, overflowing into every available space within and sometimes even beyond the boundaries of the mosque compound. The root of the problem is entrenched in the rapid intensification and decentralization of the business districts and the burgeoning of housing estates to cater to an expanding population in a land-scarce city. The increasing Muslim population, including the presence of migrant-workers, also poses an impending challenge for the community to swiftly develop a multi-prong approach to how future MosqueSG are developed.

In the current heartlands of HDB⁶ neighborhood estates, the older mosques are being expediently upgraded to cater to the growing needs

⁶ The Housing & Development Board (HDB) is the statutory board of the Ministry of National Development responsible for public housing in Singapore.





of the community for more prayer space and accessibility for the ageing population. Adopting the community-level approach of “Total Optimization”, designing with multi-functional spatial optimization allows for MosqueSG to address a wider range of socio-religious needs of the community within the same limited land areas. Classrooms and multi-purpose rooms dedicated to Islamic learning can easily be converted into extended prayer spaces, catering to the Friday congregation.



FIGURE 7

Al-Ansar Mosque: An urban scheme connecting external public circulation to a covered civic plaza within the mosque which easily converts into an extended prayer area for large congregations such as Friday and *Eid* Prayers.

As excellent example is the Al-Ansar Mosque which increased its prayer capacity by 28%, an increase from 3,500 to 4,500 prayer capacity within the same site area after undergoing the Mosque Upgrading Programme 1 in 2009. The design approach of “Total Optimization” has resulted in more spaces created within this limited development. Temporary use of utility spaces and extended areas outside of the prayer halls brings the total prayer capacity to 5,500.

On the other hand, on the forefront of new heartland developments, the building of new mosques needs to be strategized to ensure that the projected population capacity can be efficiently served with seamless integration into the new communities.

For mosques located within the bustling business districts, spaces within the mosque are designed to be flexible and interchangeable in order to allow for the prayer spaces to be maximized on Fridays, yet still serve multiple functions on other days for other ancillary uses. Al-Falah Mosque is a good example of a mosque located within the Central Business District





(CBD) and a popular shopping belt in Orchard road, which shares its premises as part of CapitaLand⁷'s large mixed development complex, The Cairnhill. With upgrading works completed in 2016 as part of the Mosque Upgrading Programme 2, the prayer capacity increased by 33% from 1,500 to 2000 capacity, much to the satisfaction of the Muslim workers working in the city.

User-Centric Approach: Behavioral Architecture

The task of architecture is the creation of human environments. It is both an expression of human values and a context for human activity. Through the design process, architecture addresses the interrelated environmental, behavioral, and current issues that underlie the organization of built form.

(Stern and Stamp, 2016).

This user-centric approach to design is the underlying current of the development of MosqueSG, a built form constructed based upon the behavioral patterns and Islamic lifestyle of the local Muslim community; in this situation, form follows function. In his book "Behavioral Architecture: Toward an Accountable Design Process", Clovis Heimsath presents a design methodology with an emphasis on accountability. At the very fundamental level of behavioral architecture, the creation of architectural spaces and forms begins with the needs of the user within specific building typologies, an alternative to the top down methods of design (Heimsath, 1977).

In the design of our mosques, through the design brief prepared by Warees, architects employ the principles of behavioral architecture in addressing the specific needs of our unique local Muslim community. With the large number of congregants frequenting each mosque, especially during Fridays and mosque events, designated shoe-off areas have become an important design feature at entrances to mitigate the problem of too many foot wears being left at entrances, overcrowding and obstructing movement of congregants. In the newer mosques, designated points of entry have incorporated waiting areas, creating a sense of welcoming

⁷ CapitaLand Limited (CapitaLand) is one of Asia's largest diversified real estate groups with a portfolio spanning across diversified real estate classes which includes commercial, retail; business park, industrial and logistics; integrated development, urban development; as well as lodging and residential.





and comfort for visitors and congregants to leave foot wears behind in thoughtfully designed shoe racks.



FIGURE 8

Maarof Mosque: Point of entry designed with integrated footwear-off ablution areas before entering prayer areas.

Behavioral architecture of MosqueSG addressing the pertinent issue of overcrowding and need for space have also led to many ablution areas to be designed at the immediate entrances to the mosques to effectively manage the congestion and flow of congregants into the mosque. A strong way-finding concept and design is also fundamental to MosqueSG to guide the vertical and horizontal circulation flow of congregants through the mosque. With the Customer Service/Reception Counter usually near the entrance and symbiotically located near the lift, unobstructed access is designed for the handicap and elderly and acts as a point of orientation to further direct and guide congregants to spaces on the upper levels of the mosque. Dedicated ladies' entrances have also been designed in some of the newer mosques to ensure efficiency in wayfinding and movement of female congregants.



**FIGURE 9**

Maarof Mosque (Level 1): Ablution areas and toilets are designed as part of the circulation route to ease congregants' experience entering the mosque for self-cleansing before approaching the prayer spaces. This is a deliberate design attempt which brings the user through the natural flow of actions from the point of entering the mosque leading up to the prayer.

With MosqueSG hosting more family and community-centric activities and services now than before, an example of the multi-functional nature of mosque spaces can also be seen in the care and consideration given to catering to the parent (mother)-children demographic. The introduction of gender-sensitive design such as nursing rooms and larger female washrooms with ample space allowing mothers to comfortably tend to their children.

Spaces are also designed in complementary clusters with a focus on flexibility of function and efficiency of circulation. Classrooms are also located in close proximity to these amenities to allow for the flexibility of being transformed into play areas and children-minding spaces during Ramadan's *taraweeh* prayers, providing convenience to congregants with children. Maarof Mosque, one of the newest mosques completed in 2016, is a glowing demonstration of the features mentioned.



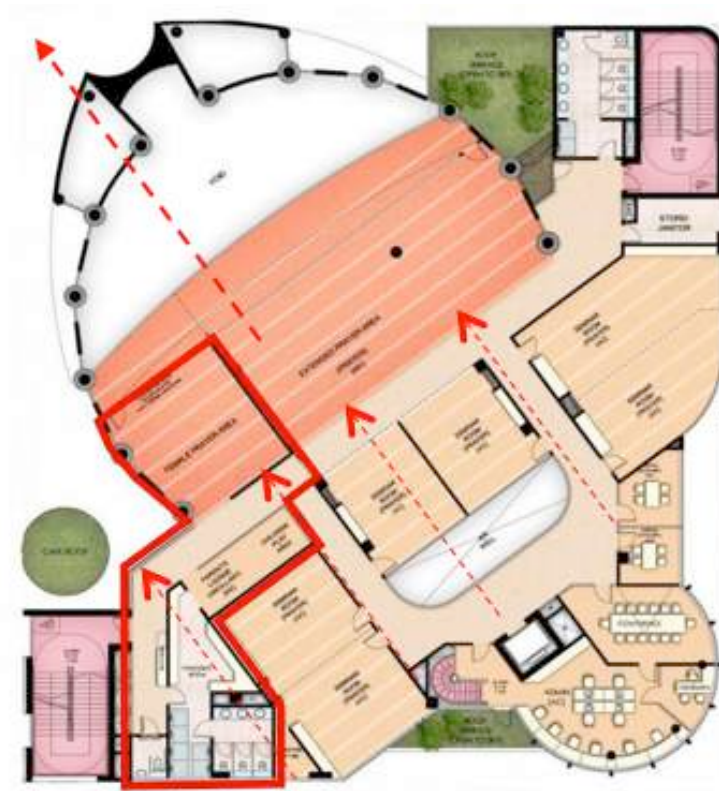


FIGURE 10

Maarof Mosque (Level 2): Ancillary spaces such as seminar rooms are openable and orientated to face the *qiblah* (*saff* lines) to serve as extended prayer areas.

The area outlined in red shows dedicated spaces for the ladies' prayer, nursing/changing room and children play areas in a complementary cluster.

BEYOND COMMUNITY ASSETS: A COLLABORATIVE EFFORT

Where the development of MosqueSG takes a significant leap is in 2013, when a ground-breaking collaborative strategy of at a national scale was proposed – a convergence approach with multi-stakeholders – to bridge the gap between the centralized planning, owners, architects, and community. This collaborative effort is crucial in ensuring that our mosques continue to evolve and transform according to the needs of the community and defining a fresh identity of MosqueSG. Pitching the Singapore Muslim community's needs and vision through rigorous exploration of concepts, ideas and reinterpretations of the mosque institution through the fresh lens of local architects and designers, the future of the mosques in Singapore is anything but traditional. This method of molding and shaping the forms



and function of MosqueSG allows for inclusivity in our mosques which not only translates through its physical built spaces but resonates in its radical conceptions and identity.

Methodology: Through Design Thinking

Directly addressing the issue, the methodology adopted goes back to how mosques were built and designed in the native village context – by engaging the community in informing the expectations, functions, and creating an image for the mosque representative unique identity of the community. Despite the centralized approach to MosqueSG policy position by MUIS and development undertaken by Warees, being fully funded by the Muslim community imbibes a collective bottom-up ownership and engagement with our mosques.

The methodology employed, the first to be adopted for MosqueSG, was an open-to-all Mosque Design Competition for the proposed Al-Islah Mosque. Breaking away from the normative mold of a controlled tender process, the creative competitive platform invited an unprecedented volume of proposals from a variety of architects and designers, each proposal challenging the preconceptions of what a mosque in Singapore should be in this millennium.

The design brief for Al-Islah Mosque had only three main requirements: (1) a mosque which complements and embodies the new Punggol⁸ estate vision of an “Eco-town”; (2) to demystify the mosque – creating an “Open Mosque” reflective of contemporary Islamic aspirations in Singapore (Architects, 2015); and (3) to design a dedicated Ladies’ entrance.

Out of the 49 anonymous design proposals submitted, a panel of jury comprising of MUIS officials, Singapore Institute of Architects (SIA)⁹ Council members and Warees development professionals shortlisted the top few candidates to present their schemes with physical models. The winning design was then further developed with the jury team to ensure that the Muslim user requirements and behaviors are well-addressed and incorporated.

⁸ Punggol, alternatively spelled as Ponggol, is a planning area and new town situated on the Tanjong Punggol peninsula in the North-East Region of Singapore. The “Punggol 21” plan was conceived as a new model for housing, which would feature a new concept in housing as a model for new towns in the 21st century. The newer “Punggol 21-plus” plan was later introduced to redevelop the area into a waterfront town.

⁹ The Singapore Institute of Architects (SIA) is the national organisation representing architects in Singapore.





Methodology: Through Functional Planning

Going a step further in the collaborative multi-stakeholder effort, a public roadshow was subsequently held to showcase the design proposal for the new mosque to the community. Beyond the typical considerations for which Islamic architectural features and styles to be adopted, the focus of designing a mosque is shifted to capitalize on and center around the functional requirements for the mosque in serving its community. The intention is to actively involve the community in the design and decision-making process; a chance for the designers and architects to find out what the visions, aspirations and expectations the community has for the mosque.

Among the countless feedback received was the request for more classes and programmes to be held in the English language instead of the cultural norm of being conducted in the Malay language. The incorporation of bilingual signages is a live example of how MosqueSG is evolving with the needs of the highly globalized Muslim population.

Another recurring feedback was the community's concern with regards to the design strategy of allowing ample natural lighting via the use of large glass panels in the main prayer hall. The community raised critical concerns, despite acknowledging the aesthetic merits of natural lighting, of the possibility of heat build-up and high costs of air-conditioning and mechanical ventilation. At the end of the day, the function of the mosque as a comfortable prayer space and a sustainable faith space far precedes mere aesthetic values of the architectural design.



FIGURE 11

Al-Islah Mosque: The main prayer hall on the ground floor is designed with a higher ceiling height to allow for natural lighting and espousing the “Open Mosque” concept. All other ancillary facilities have been elevated to the second floor onwards to free up the ground level for continuous *saff* lines.





Completed in 2015 with a congregant capacity of 4,000, Al-Islah Mosque's "Open Mosque" design with its visual porosity, spatial accessibility, terraced landscaping and green design elements is a purposeful reaction to the surrounding Punggol heartlands.

While it is relatively easy for a new mosque like Al-Islah to adopt such principles, for older mosques undergoing reconstruction such as Al-Ansar Mosque and Darul Ghufuran Mosque, the culturally and historically rich existing building and site conditions pose a different set of challenges. A fine balance needs to be achieved between developing these old mosques to reflect the new-age modern Islamic identity and at the same time keeping firm to its cultural roots and local heritage.

In Al-Ansar Mosque, the minaret of the mosque was preserved during the upgrading and reconstruction works because it has become such a prominent local landmark for Muslims and non-Muslims alike in the heartland community.



FIGURE 12

Al-Ansar Mosque: Preservation and retaining of the minaret in the reconstructed design of the mosque – minaret remains a prominent icon in the surrounding heartland (Top left: after reconstruction; Top right: before reconstruction).





This iconic structure is then seamlessly integrated into the new concept and design of the new mosque – it was transformed into a key functional element of the new mosque as a lift shaft for the new lift which promises a mosque that allows for universal accessibility and mobility for the elderly, handicap and parents with strollers.

DESIGN SUCCESS

Innovation, Integration, and Sustainability. Amidst all the planning and physical constraints faced, mosques in Singapore have managed to achieve critical design success factors of Innovation, Integration and Sustainability. Most notable of which is the strategic design of spaces centered around the flow of congregants through the mosque – ablution areas are located near entrances, toilets are located along the path of congregants leading to the prayer hall, and well-organized, complementary sacred and ancillary spaces which address the key issue of insufficient prayer spaces during Friday prayers and large congregations. In almost all our mosques, vertical accessible routes via lifts are also designed to efficiently ease the congestion of congregants and disperse the crowd vertically into the upper floors especially during Friday prayers.

Another key design success factor is the spatial optimization of our mosques. Despite being located in irregular-shaped sites, the orientation of the mosque building is optimized to face the *qiblah* – any residual ancillary spaces are designed to also be used for Friday prayers.

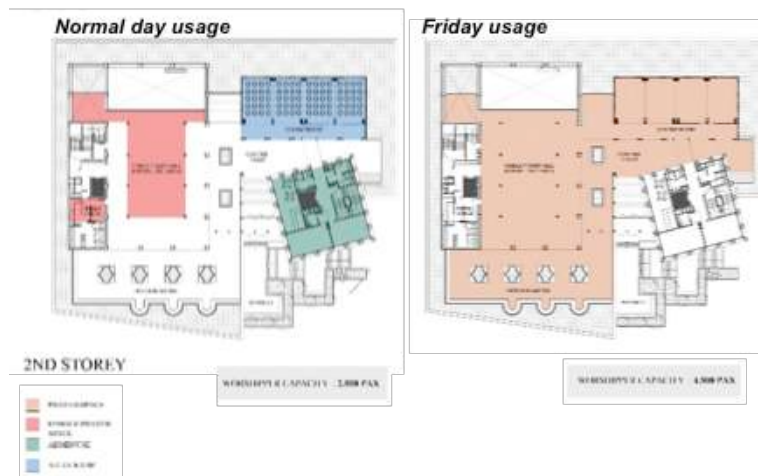


FIGURE 13

Al-Islah Mosque: Ancillary spaces such as seminar rooms and community spaces are designed to be efficiently used for multiple functions, e.g. as extended prayer space.





Our mosques also incorporate gender-sensitive design with dedicated ladies' entrances, which eases wayfinding through the mosque for the female congregants, and amenities such as nursing rooms and classrooms for dual-use as child-minding spaces. These ancillary spaces such as classrooms and function rooms are designed to be efficiently used for multiple functions serving the male congregants on Fridays, female congregants during normal prayers and Ramadan and the larger demographic on normal days as classrooms and event spaces.

Other notable design success factors of our mosque is its ability to closely integrate and incorporate government initiatives as part of a larger planning and design framework. Our mosques are readily-designed to adopt principles of Universal Design, Barrier-free Design, sustainable movements such as The National Cycling plan¹⁰ to encourage cycling and bicycle use, adopting green practices to achieve Green Mark¹¹ accreditation while at the same time achieving Cultural and Heritage awards and National Monument statuses. These achievements are testament to the successful ground-up approach we have adopted for the development of our mosques as part of the larger built environment in Singapore.

UNIVERSAL: POINT OF COMMUNITY CONVERGENCE

The inclusive, open and flexible mosque model birthed from the unique medley of state-imposed parameters and community influences and behaviors serves as a bedrock and thriving platform for a multitude of functions to co-exist and serve every demographic of the Muslim and Singapore community.

As integrated hubs of Islamic learning, some of the key educational programmes are the aL.I.V.E. (Learning Islamic Values Every day) programmes¹², which cater to specific children age groups through Kids aLIVE (5–8 year olds), Tweens aLIVE (9–12 year olds), Teens aLIVE (13–16 year olds) and Youth aLIVE (17–20 year olds), and ADIL¹³ (Adult Islamic

¹⁰ The National Cycling Plan is a governmental multi-agency collaborative effort to make cycling a safe, healthy and convenient transport option for Singaporeans.

¹¹ The BCA Green Mark Scheme is an initiative to drive Singapore's construction industry towards more environment-friendly buildings. It promotes sustainability in the built environment and raises environmental awareness in the project conceptualisation and design, as well as during construction.

¹² The aLIVE programmes aim to develop pious children who are nurtured with *taqwa* (God-consciousness) and good *akhlaq* (character), knowledgeable in Islam, become practising Muslims, and show care and concern towards others. The programmes aim to inspire students to continue Learning Islamic Values Every day.

¹³ ADIL is an acronym for Adult Islamic Learning and is an Islamic learning programme specially tailored for adult Muslim learners in Singapore.





Learning) programme, which cater to adults of all age groups. Weekly madrasah programmes and ad-hoc classes and courses for holistic Islamic education from Quran classes, religious advisory and counselling, *Hajj* and *'Umrah* classes and even *jenazah* management courses are also main functions held in our mosques.

However, not all of these programmes are organized by the mosque itself. For many of the ad-hoc classes, courses, seminars and talks, the classrooms and function rooms within the mosque become platforms for other voluntary Muslim organizations to engage the community in their Islamic (and at times community bonding) programmes through the mosque, making it a central point of convergence for socio-religious exchange of ideas and learning.



FIGURE 14

Kampung Siglap Mosque: Darul Quran Singapore (building on the right of photo), a specialized Islamic learning centre dedicated for memorization of Al-Quran, is an Annexe building to Kampung Siglap mosque (building on the left of photo).

In addition to a hub of education and learning, mosques have also been instrumental in assuming a key role in the social development of the community. Many of our mosques are authorized collection centers for *Zakah* and are key points of engagement with the community to direct them to relevant self-help channels such as Ministry of Social and Family Development (MSF). MosqueSG also provide substantial support in providing marriage and pre-marriage counselling and even in non-religious functions such as legal clinics, health check-ups and interfaith collaborations.





Mosques are also host to many Islamic events for the community such as the annual *Eidul Adha Qurban*, *Maulid*, and even cultural events such as Muslim weddings and *tahnik*.

CONCLUSION: FUTURE-READY MOSQUES

Moving forward, in the next phase of development, there is great potential for Singapore mosques to leverage upon digital and smart technological advancements to innovate and enhance the utilization of our mosques and to better manage pertinent issues such as overcrowding. The overarching vision is to achieve a mosque model that is future-ready, sensitive to global trends, responsive in assimilating into our increasingly “smart towns” and lifestyles, more environmentally sustainable and energy efficient while maintaining its sanctity as a place of worship.

Faced with the increasingly urgent demand for even more prayer spaces, longer period of construction and upgrading of mosques means lesser prayer spaces available for use. Concepts such as Design for Manufacturing & Assembly¹⁴ (DfMA), Design for Safety (DfS), and Design for Maintainability¹⁵ (DfM) are gradually being introduced and implemented by the building and construction industry. Adopting these concepts would mean increased productivity, reduced construction time and reduced resources (such as non-skilled labor) via off-site fabrication.

Other initiatives include utilization of lightweight and sustainable materials such as Exterior Insulation Finishing System (EIFS) which provide substantial energy savings and reduced environmental impact over the life of the structure on top of flexibility of design. The impact on our mosques could mean lower development costs and subsequently lower cost of operations which benefits the Muslim Community as further contributions to achieving greater sustainability in the lifecycle of our mosques while playing a significant role in nation building.

¹⁴ In construction, Design for Manufacturing & Assembly (DfMA) is a process whereby buildings are designed for ease of off-site manufacturing and efficiency of on-site assembly.

¹⁵ Design for Maintainability (DfM) is the practice of integrating operations and maintenance considerations into project planning and design to achieve effectiveness, safety, and economy of maintenance tasks during the lifespan of a facility.





FIGURE 15

Al-Islah Mosque (above) and Al-Ansar Mosque (below): These are the first two mosques in Singapore to employ the use of EIFS – the lightweight facade can be extruded into 3D designs unique to each mosque.

In Al-Islah Mosque, the facade expresses three different interpretations of the Arabesque for each of the different blocks – Prayer, Admin, and Education blocks. In Al-Ansar mosque, the facade mimics the traditional batik motif, representative of the Malay culture of the residential heartland of Bedok.

The blue theme also reminisces the color of the original mosque.

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THE MOSQUE OF TOMORROW

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INTRODUCTION

THE mosque throughout history acted as a representation of the culture where it was built in addition to its function as a place of worship. This is the case of all religious buildings in all civilizations. Although mosque's basic principles and elements were repeated all over the Islamic World, they were executed in a variety of forms and detailing that was closely tied to every locale's cultural, environmental, artistic, and social perspectives. This genius adaptation to conditions and backgrounds brought about distinguished manifestations of Muslims' place of worship.

These different manifestations of the mosque's form were a logical result of the work of builders and/or architects rooted in their particular cultures at both social and artistic levels. They were also masters of the techniques of construction known to them. Moreover, they did not suffer from any kind of inferiority complex when it came to matters of identity and adaptation from others. All these qualities guaranteed the production of architecture that was true to its place and time.

Jumping to our present time to observe the architecture of mosque is a dangerous endeavor, while predicting its future is perhaps illogical. This is because those who claim knowledge of Islamic architecture have not yet reached a definite conclusion on whether there is indeed an Islamic architecture. Thus, one seriously questions if it is at all possible to reach any understanding of this era's future architecturally, especially the future of the mosque because of its distinguished importance as the religious and spiritual center per excellence.

As the mosque is, arguably, the best representation of the religion and its followers, this paper attempts to tackle this complex topic examining three





related issues central to any discussion about the future of the mosque. The first issue is the mosque as a representation of identity, followed by the mosque's form and contemporary architectural trends, and finally, the mosque as a socio-cultural center. The three issues are definitely not the only crucial ones that contribute to the formation of mosques, but can be considered the most crucial. This is because any religious piece of architecture should first and foremost be able to project an image that is candidly related to the identity of its people and their culture, can speak to its surrounding with an appropriate and contemporary architectural language, and can go beyond its walls to serve its congregation.

MOSQUE AND IDENTITY

A Historical View

It is not the paper's intention to discuss the issue of identity per se because of its complexity and perhaps its lack of objectivity as a concept. Rather, the point to be made here is that architectural identity is supposed to be a reflection of its culture's identity. Simply put, American architecture, as an example has a distinguished identity that matches and reflects the American culture. And so is the case when considering German or Japanese architecture. Can our architectural identity, exemplified in the mosque, project our cultural identity?

Historically, it was capable of doing so; the Ottoman *Küllüye* can serve as a very convincing example. The *küllüye* was a complex of facilities around a mosque; the facilities were geared to serve a number of social and educational purposes. The urban as well as the architectural composition of *küllüyes* went through a line of development that reflected the social, cultural, and engineering progress of the Ottoman society.

In its complete formation, the *küllüye* was a superb witness to the Ottoman culture and was capable of acting as a manifestation of its identity. This was because it itself had established a very strong architectural identity. The *küllüye* represented power and majesty, it exhibited mastery of stone construction that was beyond its age, it also enjoyed highly sophisticated ornamentation compositions which were rooted in the Ottoman artistry, and, from a different perspective, the *küllüye* acted as a model of a socio-cultural institution serving all sorts of needs for its surrounding community. In other words, the *küllüye* projected its society's life style and values in its unique physical formation. This is architectural identity reflecting cultural identity.





FIGURE 1
Külliye Süleymaniye.

The same argument can be introduced in connection with Moghul architecture and it is also applicable when looking at Muslim architecture in Spain. In both cases, as well as in other Islamic epochs, one can see very powerful architectural identity telling the story of strong cultural identity. Naturally, this is true in all other cultures in the West and the East including Indian, Chinese, Japanese, Egyptian, Mesopotamian, Greek, Roman, Gothic, Renaissance, and Baroque cultures.

Architecture and Culture

Thus, “(a)n architecture that has its own identity acts like an identity certificate for its homeland and reveals the thoughts of its people”¹. If this is the case, one interesting question arises: What does a particular architecture relay to the observer about the culture of that architecture? For example, what does Old Egyptian architecture convey to us about the identity of the Egyptians of the time? What do the pyramids tell about their culture? Do they tell more about the superb ingenuity of the Egyptian

¹ Torabi, Z. and Brahman, S., 2013. “Effective Factors in Shaping the Identity of Architecture” in the *Middle-East Journal of Scientific Research*, Vol. 15, Issue 1, pp. 106–113.





engineers? Or do they speak more about the level of oppression and injustice that that society held? They perhaps tell both. Similarly, what does the great plan of Sixtus V for Rome say about the Catholic Church then? And what does the great scheme of railways across America speak about planning at the time?



FIGURE 2
Sixtus V's plan for Rome.



FIGURE 3
The pyramids.





It requires very careful analysis in order to tie all ends of any story related to the relationship between any architecture and its culture. This is true in the case of cultures that are complex by nature such as when they are in their development stages. At such a time, influences from a number of other cultures intertwine together forming this new one. A case in point may be the Umayyad era when Byzantine and local Syrian traditions influenced the then newly established state in many aspects among which were art and architecture. Contemporary Islamic societies are also of this type of cultures; they are not pure, they are an interesting mixture of West and East forming, one can claim, a chaotic hybrid of “things.” Therefore, in these societies, it is not easy, and perhaps even not possible, to establish a logical relationship between architecture and culture.

Cultural Identity

Because of this amalgam of possibly not homogeneous or connected factors, it is not easy to delineate a clear identity for Islamic societies. Contemplating the idea of Islamic societies brings up many questions including:

1. What is our social structure?
2. What are our economic aspirations?
3. What are our political directions?
4. What is our contribution to the advancement of our artistic heritage?
5. What is our position in connection with the environment and its sustainability?
6. In essence, what are our cultural perspectives and our contributions?

Simply put, how much have Muslims actually participated in the formation of their present culture considering the massive and direct and indirect infiltration of other cultures into their societies? And, accordingly, how much of us is actually “us”?

These questions are related to the earlier questions of what we can read from the pyramids and Sixtus V plan of Rome. “If architecture can have a meaning, we should recognize that what it says is not independent of what it is”². What does the new urban landscape in any city of the Islamic regions

² Szynalska, K., 2012. “Architectural Identity: Architecture Meaning” in *e-architect*. Retrieved from <https://www.e-architect.co.uk/articles/architectural-identity> on October 20, 2019.





communicate as an architectural identity and, thereafter, cultural identity of that place? What kind of architectural identity have our societies acquired during the last 50 years? Is the identity that of affluence, structural advancement, unique aesthetic language, or is it of special environmental or social distinction? Or is it, on the other hand, an indication of socio-economic dependency and subordination, a complete surrender to foreign aesthetics and values, or an utter absence of understanding of the cultural, environmental, and social realities?



FIGURE 4
Al Fateh Mosque, Bahrain.



FIGURE 5
Sheikh Zayed Mosque, UAE.





The Architecture of the Mosque

This confused view regarding cultural identity and its relation to architectural identity can easily be projected onto the architecture of mosques. Major contemporary monumental and/or iconic mosques are questionable entities in the landscape of religious architecture when it comes to the issue of identity. One can think of Al Fateh Mosque in Manama, Bahrain; Sheikh Zayed Mosque in Abu Dhabi, UAE; Imam Turki bin Abdullah Mosque in Riyadh, Saudi Arabia; Hassan II Mosque in Casablanca, Morocco; and the list goes on. Do these “iconic” mosques reflect their respective society’s levels of technological, engineering, maintenance, and operational achievements or capabilities? Is the society of any of these mosques comparable with the Umayyad society when its mosque was built in Damascus in terms of power and presence, in terms of achievement and aspirations?



FIGURE 6
Imam Turki bin Abdullah Mosque, Saudi Arabia.





FIGURE 7
Hassan II Mosque, Morocco.

Present Identity of Muslim Cultures

Zaheer Allam and Zarrim Allam wrote in 2013 a manifesto which they called: “Invasive Aesthetics: A Manifesto for Reviving Architectural Identity in Developing Nations”. In their charged manifesto, they pointed out a number of crucial points, not the least of which was this statement:

We must recognize that any architectural piece is fundamentally related to its emergent locality and so should be endowed in its spirit and symbolism. We must take inspiration from a community’s identity to shape our designs, and in so doing, bring back glory to our cities and their people³.

The question is very simple: does the contemporary mosque relate to its community’s identity? The questioned identity is the true one of the community; the identity which may not be clear to all involved, architects, planners, economists, or sociologists.

This confusion is evident if one visits any city of the Muslim countries, one would be totally confused, the music is foreign, the food is foreign, all products are foreign, in some countries, most of the working force is

³ Retrieved from <https://www.archdaily.com/385904/invasive-aesthetics-a-manifesto-for-reviving-architectural-identity-in-developing-nations> on October 20, 2019.





foreign, and of course buildings are foreign. One has to agree that in some countries, “(i)t is only the dress code that still reminds us that we are in fact in an Arab country”⁴. While in some other countries, not even the dress code is present anymore. This is not meant to level judgment; merely to state a fact. The point is, however, what is the identity of these places? Do these places have their own identity? Can a society adopt a foreign identity? And for the sake of argument, if it actually can, is it acceptable to adopt a foreign identity so fully and completely that it would totally erase and replace the original identity? After all, “(b)y embracing foreign cultures, we too often deny our own roots”⁵.

What would be the relationship between mosque’s identity and the cultural identity of its locale? Should it continue to reflect the old identity that does not reflect today’s beat, or should it embrace the foreign amalgamation of identities that is strongly pushing to wipe out any local identity?

MOSQUE’S FORM AND CONTEMPORARY ARCHITECTURAL TRENDS

The Cultural Issue

The form of a mosque can swing between two opposing possibilities: a complete adherence to classical language of mosque design which has its local variations on one hand, to a full liberation from any historical references on the other. Any combination of the two extremes is possible and can be found. The first extreme is easy to understand; returning to the past because of its aesthetics and symbolism has been always the choice of many patrons and designers. In a way, it is an easy and guaranteed recipe for acceptance if not complete success. Most state mosques were designed according to this option which apparently can better facilitate the performance of the mosque in order to carry out its responsibilities as a reflection of the state.

Variations on the classical language can result in a baroque kind of formation as it abides by the general rules but allows itself to stretch these rules a bit, or sometimes a lot. Eclecticism is also an approach to generate a different type of variation. The design combines elements and forms from different Islamic epochs in order to generate a new form. All these options seem to be easy to accept for they are variations on a strongly accepted theme.

⁴ *Ibid.*

⁵ *Ibid.*





To create something truly different, it is essential to free the design completely from any particular architectural heritage and to search instead for sources of inspiration from different architectural backgrounds. Of course, the sources in this day and age are Western for the most part. How much of the West can architects adopt while maintaining a connection with local heritage and history is a very crucial question. Jehan Latief wrote: “There is also the quandary of sacrificing national identity to modernity”⁶. Latief continues in the same article quoting Diebedo Francis Kere who lectured at the Design Indaba Conference in 2011: “The problem is, we’re copying the Western model, but we don’t know the story of it and we don’t own the means to make it happen in an appropriate way”⁷.

This is one basic concern about borrowing, or copying, from the West, or from any other source for that matter. The copied element, concept, or form is a result of a set of experiences unique to a particular society; using it in a different setting does not make any sense. Social and cultural differences typically result in differences in behavior⁸. Behavior is supposed to be reflected on the physical environment since it envelops it and provides the appropriate environment for it. Studies in housing as an example have shown time and again how importing a particular housing type to a different society will result in most probabilities in rejection. Such rejection comes from the inability of the new society to accept alien patterns of behavior forced on them via the design of their homes. One has to remember that:

Architecture is part of the identity of each community and carries the message, concept and characteristics attributed to the community where it was born. Therefore, it depends on the geography, traditions, manners, insights and knowledge of the community as well as its history⁹.

6 Latief, J., 2018. “How Architecture Shapes National Identity and Helps Us Understand History” in *Design Indaba*. Retrieved from <https://www.designindaba.com/articles/creative-work/how-architecture-shapes-national-identity-and-helps-us-understand-history> on October 23, 2019.

7 *Ibid*.

8 This is a point of concern in many fields; results of research indicate that differences in culture result in differences in behavior. See for example: Cox, T.H., Lobel, S.A., and McLeod, P.L., 1991. “Effects of Ethnic Group Cultural Differences on Cooperative and Competitive Behavior on a Group Task” in *Academy of Management Journal*, Vol. 34, No. 4, pp. 827–847. Retrieved from <https://doi.org/10.5465/256391> on October 19, 2019 (also available at <https://pdfs.semanticscholar.org/289a/18dca104c2f6a676f3dc5cace9876ccd6c1e.pdf>); or Alicia Chon, 2014. “Asia and America: How Cultural Differences Create Behavioral in *Social Impact Research Experience (SIRE)*. Retrieved from <http://repository.upenn.edu/sire/26> on October 19, 2019.

9 Torabi, Z. and Brahman, S., 2013. “Effective Factors in Shaping the Identity of Architecture” in the *Middle-East Journal of Scientific Research*, Vol. 15, Issue 1, pp. 106–113.





Islamic Religious Concepts and Western Architecture

The relation between architecture and identity is all the more crucial when it comes to the design of mosques. The mosque is a religious building which is unique on a number of levels, not the least of which is its specificity to the religion of Islam. Borrowing from architecture that is based on a non-Islamic background is definitely a dilemma. Issues of symbolism, functionality, atmosphere, and ambiance are all to be carefully addressed. Using Greek architecture for mosques is an obvious lack of judgment; this is easy to see because it is common knowledge that Greek architecture is considered an atheist one. Perhaps Modernism, Post-Modernism, or Deconstructivism are not as clear of a contrast with Islamic beliefs, but they could be. One can argue that Post-Modernism is rooted in Classical architecture which is an atheist one, and that Deconstructivism is based in principle on fragmentation, a principle that opposes Islamic beliefs which constantly calls for unification and equality. Does this argument suffer from exaggeration? Not really, because carrying a message is one of the most celebrated qualities of architecture, and in particular, religious architecture. Therefore, it is imperative that messages transmitted through mosques are carefully addressed.

Local Architectural Heritage

Moreover, accepting, adopting, and celebrating foreign architecture means in one way or another denying and rejecting local architectural heritage. Societies all over the world are getting increasingly more sensitive and celebratory of their own artistic and architectural heritage. A very strong worldwide movement, admittedly perhaps not as much in the Muslim part of the globe, calls for connecting each society with its own heritage and building on it. Globalization is not as welcomed as it used to be in the past, if it truly ever was. People now are more aware of, and concerned about the danger of rejecting their own heritage for an alien one. As John Walsh puts it: "Over the past hundred years, Arab countries first had vernacular buildings, then colonial buildings, then imported modernism, then local adaptations of modernism"¹⁰. Where does this line of progression lead to is a pressing question. Do local adaptations of modernism provide a promise or a hope? Is it an early stage of consciousness that could lead to a more intellectual adaptation from the West? Or will it continue to be

¹⁰ "Architecture and National Identity" in *New Zealand Institute of Architects*. Retrieved from <https://www.nzia.co.nz/explore/comment/architecture-and-national-identity> on October 18, 2019.





an empty and formalistic interpretation that lacks any depth, meaning, or value?

In the same manifesto mentioned earlier, the authors wrote: “Surely, mimicking the formula of technologically advanced countries will project us into the public eye. Well it certainly does, but not necessarily in a positive way. It is creating a global architectural uniformity as designs promoted by Western ‘architectural gurus’ are being replicated around the world”¹¹. There is a level of awareness of the danger of globalization and the downfalls of a simplistic process of borrowing and copying foreign architectural forms. Perhaps this realization has only occurred on a theoretical level this far because, practically, we continue to see buildings in every single city of the Muslim world mimicking empty shells of Western architecture.

Western Trends and Technologies

It goes without saying that contemporary Western architecture is highly advanced technologically. Therefore, Muslim societies will have to use these technologies when they decide to borrow Western architecture. It also goes without saying that most Muslim societies are not equipped to produce the needed technologies; thus, they are bound to import them. This scenario puts Muslim societies in absolute dependency on the sources of these technologies. A position they were not in when producing masterpieces of “classic” Islamic architecture.

When building materials and construction technologies are imported for a particular project, all future maintenance contracts will have to be given to the original provider. In many countries such contracts can be seen as a sort of absolute dependency. Even an electrical bulb cannot be bought but from the original provider. Such dependency destroys any possible local development or enhancement. As if architecture becomes alien shipments dropped from the sky, forced on an environment, and dictating the future of the place from afar.

This absolute dependency on foreign technologies means that the sound system in the mosque, its lighting system, air conditioning, and security system are all manufactured, installed, and more often than not, operated and maintained by foreign entities. In addition to the fact that such situation

¹¹ Retrieved from <https://www.archdaily.com/385904/invasive-aesthetics-a-manifesto-for-reviving-architectural-identity-in-developing-nations> on October 20, 2019.





is impractical for day to day operation of the mosque, it is humiliating. Due to a lack of clear cultural identity, an architectural language to reflect the fragmented self and a lack of technological artistry, Muslims find themselves after fourteen centuries of Islamic civilization unable to build their own places of worship!

SOCIAL ROLE OF THE MOSQUE

The Early Mosque

This is perhaps an unnecessary reminder, but needed for the following discussion. Early mosque was always a hub for all religious, educational, social, and even political activities of the community. It was the court of law and it was the free lodging place for the poor. It was the center of knowledge and the place for full religious devotion. With time all activities except worship moved out of the haram of the mosque to other structures surrounding it. A complex of sort was born. This complex included a number of buildings which were nested within the fabric of the city serving the community and all its needs.

The Ottoman Külliye

Ottomans developed these naturally growing service centers into one whole, functionally and formally, under what was named a “*külliye*”. The *külliye* provided the community with all the needed educational and social services in addition to the main religious one. Residents found in these *külliyes* all their needs including shopping. The *külliye*, thus, brought the community together and unified it. One cannot tell what kind of unplanned social activities took place in the *külliye*, but the beautiful gardens and open spaces which occupy a sizable area of it allow the observer to assume that all usual activities observed in contemporary public open spaces may have been practiced there too.

Later Mosques

A tendency to build individual structures as mosques without the supporting activities became the norm while the process of building *külliyes* started to slowly phase out. One major reason for this change was the weakness of the state apparent as early as the 19th Century. The Ottoman Empire at the time was not as strong and as rich as it once was. Those who attempted to build for the community were not as rich as their





predecessors; therefore, they reduced the size of their projects to include only a mosque. Services became less and the mosque lost its role as a socio-cultural hub. A second reason was that community services became the duty of the government and not the religious institutions.

The Church

If one looks at mosques built during the last 50 years in Damascus, Syria for instance, one can see how most of them are single structures dedicated for the conventional worshipping activities. While, on the other hand, churches in Damascus became actual social centers for the congregation to meet and enjoy a variety of activities geared to serve in particular the youth. Young people meet there to worship perhaps, but more so to socialize, and to participate in a number of sport, outdoor, or cultural activities. The church succeeded in bringing the young back to it and away from the streets.

The Mosque in the West

Early mosques in the West were single structures simply because the Muslim community in any city was relatively small and not very wealthy. The layout of the mosques followed the traditional mosque layout. In cases where an existing building was purchased to be used as a mosque, its interior was adapted as much as possible to accommodate the needs of the prayer. Activities other than religious ones were also hosted in the same structure.

Later mosques became centers with a number of activities, social, educational, sports, and health related. These activities absorbed large numbers of the community and provided them with much needed places to meet and lead a healthy social life. The accumulated experiences administering and using these centers resulted in more development and new ideas. The need to attract youngsters continues to be the most pressing item on any list of priorities. The life style led by the new generations, or at least they are exposed to, is very different from that promoted in typical mosques. Community leaders abroad have realized the danger and have been attempting to face the pressure of the surrounding society. To what extent have they succeeded is questionable, but their sincere efforts to tackle the danger is not. How the design of mosques or Islamic centers should be in order to support the efforts of the community to keep the new generation under their umbrella is another difficult question. In fact, it is perhaps the most critical question.





Contemporary Mosque and Its Social Role

The challenge which faces Muslim communities abroad has reached home. The surrounding society has all types of attractions that are difficult to ignore. If any society aims to bring the young generation to the mosque in order to teach them how to lead an honorable life style out in the society, it has to think of the mosque as a socio-cultural center where a devoted youngster can learn about and participate in a comprehensive experience. The mosque was never only for prayers; it was always a school.

THE MOSQUE OF TOMORROW, A FINAL NOTE

“We tend to forget that our cultural identity is a matter of being as well as becoming, and thus it belongs to our future as much as our past”¹². Three crucial factors will always be influential in the formation of mosques: the issue of identity, foreign influences, and the social role of the mosque. The mosque does not only project a formal identity, but also a cultural one. The identity of the mosque stems from the culture and in return redefines it. Identity does not come from heritage only. As Latief puts it, it takes “climate, region, religion, city, neighborhood, history, and creator”¹³ to put together a meaningful identity.

In doing so, foreign interference will not exist. Foreign experiences would be welcomed to benefit from but not to imitate. The form of the mosque should be secondary to its role, in particular its communal role. The mosque cannot afford to be a place for performing rituals only; in fact, it was never intended to be so. The mosque of the future should be a social institution geared towards serving the community in all needed regards: it is to provide all kinds of social and cultural activities including sports, it should be a service center for all daily needs, and it should be an educational hub.

How can we make this possible? If architecture is to ever go beyond its historical role as a subordinate to the rich and powerful, and realize its responsibilities as a servant to all humans and the environment, only then it will assume the role of educator and advisor for the betterment of all. Only then the process of building becomes architecture. And only then can we think of a mosque for tomorrow.

¹² *Ibid.*

¹³ Latief, J., 2018. “How Architecture Shapes National Identity and Helps Us Understand History” in *Design Indaba*. Retrieved from <https://www.designindaba.com/articles/creative-work/how-architecture-shapes-national-identity-and-helps-us-understand-history> on October 23, 2019.





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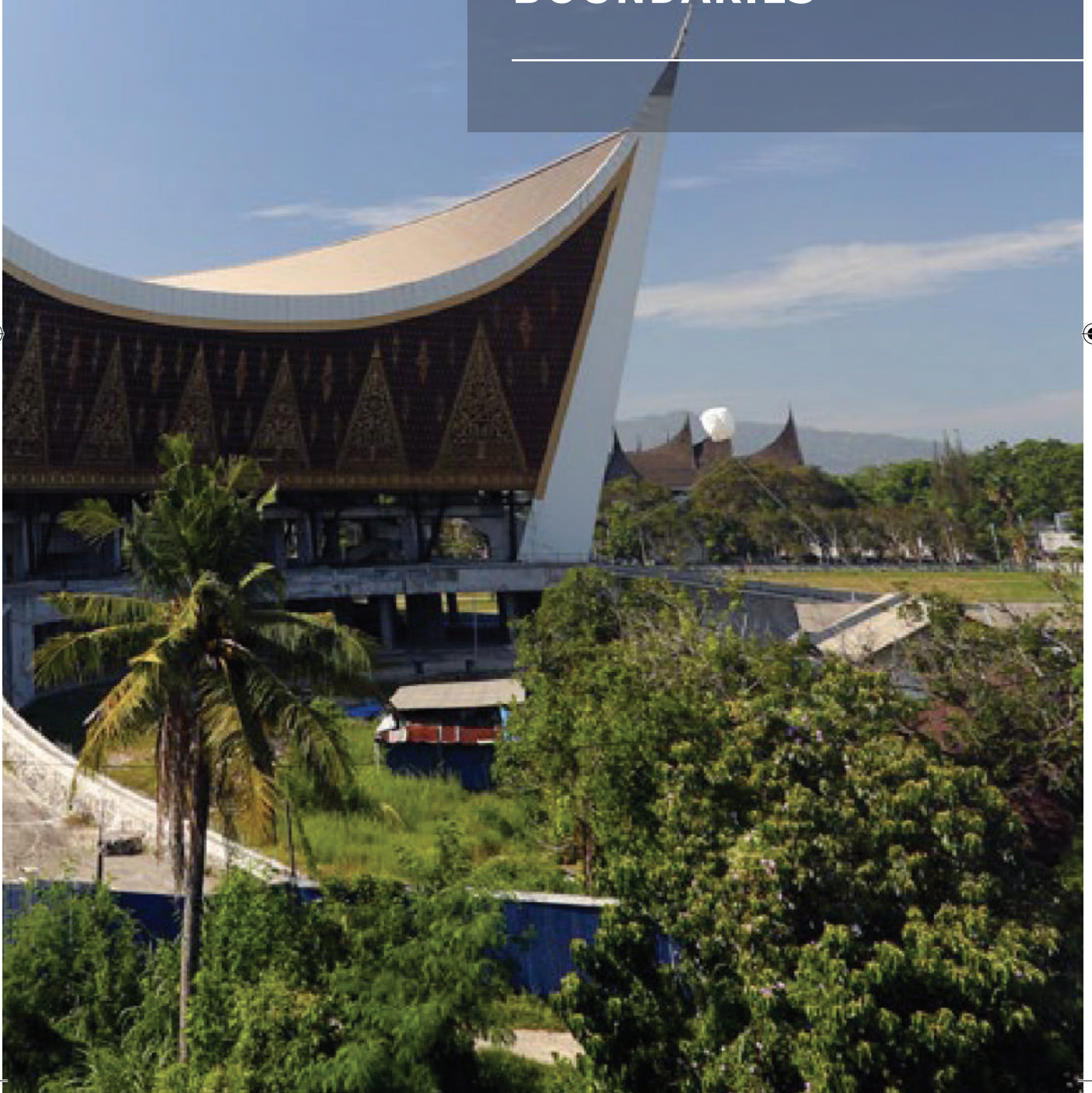
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MOSQUE ARCHITECTURAL SPACE AND BOUNDARIES







THE REVIVAL OF COURTYARD CONSOLIDATION IN MOSQUE ARCHITECTURE

**Islam Elghonaimy
Dalia Eldardiry**

THE RAY OF LIGHT MOSQUE DESIGN OF A MOSQUE FOR MEN AND WOMEN

Co Govers

AN EVALUATION OF PRAYING SPACES IN SHOPPING MALLS: THREE CASE STUDIES FROM RIYADH, SAUDI ARABIA

Mayman Almayman

HAS MOSQUE DESIGN REALLY DEVELOPED? NOTES ON THE HIDDEN COMPLEXITIES OF MOSQUES' ARCHITECTURAL BRIEF

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HOW CHILDREN USE SPACES IN THE *MASJID*?

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PHYSICAL DIMENSION OF *MASJID* – TOWARDS CHILDREN FRIENDLY *MASJID*

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THE CLEANLINESS AND PURITY OF ABLUTION AND TOILET AREA IN *MASJID*: AN ANALYSIS OF USERS' UNDERSTANDING AND BEHAVIOUR

**Siti Hanisah Abdullah
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THE REVIVAL OF COURTYARD CONSOLIDATION IN MOSQUE ARCHITECTURE

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INTRODUCTION

THE BUILDING of a mosque has not been confined to be a dedicated place for ritual prayers. This curfew has sentenced mosques to be desolate urban, to serve merely religious ends. Mosques have been ripped off its essence; as the core of various activities that sustains the well-being of the community. In the golden eras of Islam, mosques have been of social, economic and environmental command. These buildings have witnessed the moderate integration of faith virtuosity and daily vivacity¹.

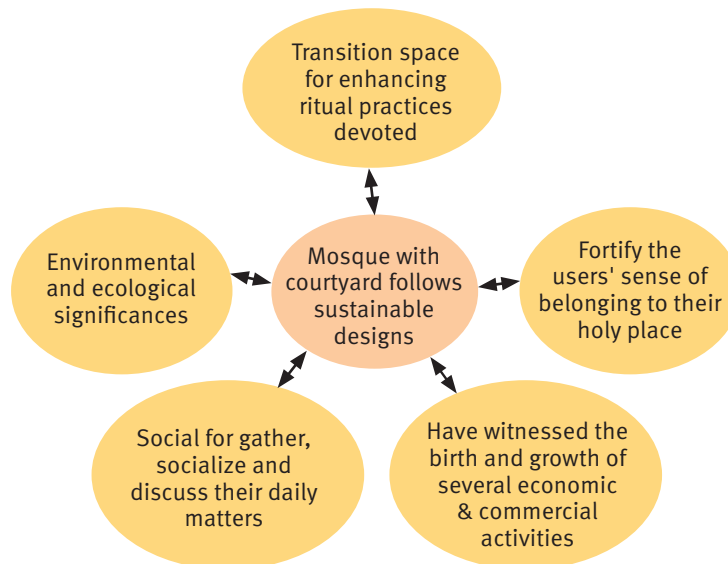


FIGURE 1

Sustainable designs for mosque by the use of Courtyard.



Courtyards as a concept are designated to meet the hosting humane needs, seeking definite purpose in the first place. Thus, it should not part with its originality, to be of a void intentional necessity. Alfred Frazer, as stated by M.A.J. Beg, about the basics of Islamic architecture: “*The architecture of Islam is the expression of religion and its view of the world rather than that of a particular people or political or economic system*”².

As aforementioned, mosque courtyards are born for the pursuit of melding religious theology with the daily life activity, for Muslims are ordained to practice what they preach. Since Islam is not only a religious scripture but eternal culture, then it is propagated and transferred by example. These courtyards are semi-public places for younger generations can observe their elderly Muslim fellows’ daily life practices and ethical convenience within their community³.

PROBLEM OF THE RESEARCH

Mosque courtyards are assigned to bridge the gap between lecturing religion by text, and creating productive true citizens in their urban context. Therefore, obliterating the role of mosque courtyards out of its thematic misconception have erupted in social segregation, economic inflation, and civic affliction. The current mosque functional embargo have deprived it of its former authority and by turn the wellbeing of its surrounding community.

However, the use of the courtyard as gated space has slowly begun to diminish, which affected some of the functions and the role of the mosque in social activities, and further changes in the scope of use of the existing courtyard. Accordingly, significant adverse changes in lifestyle, working conditions, the advancement in technology, lifestyles, in the socio-economic status of the population were resulted⁴.

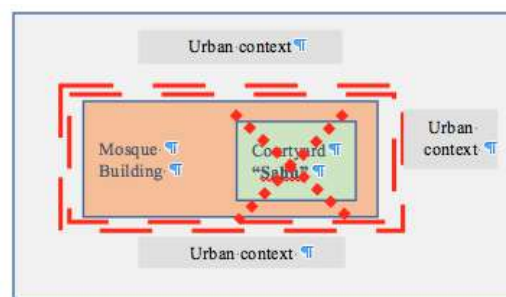


FIGURE 2

Courtyard as transition space for practicing daily life activities in relation to mosque building.



Therefore, the research problem that the missing courtyards in mosque design led, to losing some of the roles of mosques as a substantial factor in creating an ideal humane life in their homing cities. Mosque courtyards have been conveniently perfect spaces for religious rituals and public works to be performed. Unfortunately, the courtyards “Iconic Element” is about to vanish and thusly the sheltered activities within.

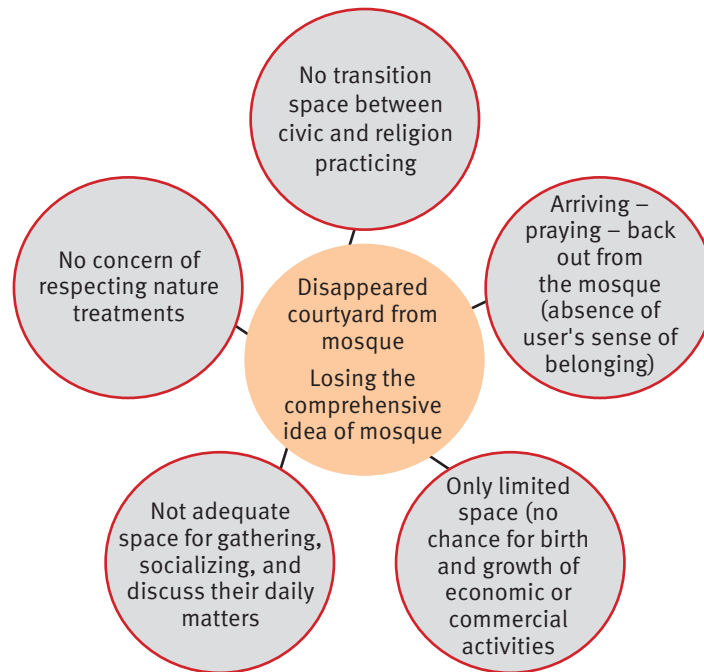


FIGURE 3

The impacts of disappearance of the courtyard from mosque.

Consequently, the main power of mosques and the spiritual obligations within communities will be deteriorated. Moreover, this would be of grave consequences and loathed deviations from the essence of the holy message, which by turn stabs the core of the Muslim faith that Islam is not only practicing religion but also for practicing life and for the world.

GOAL OF THE RESEARCH

The goal of the research is to explain the significance of courtyards in resolving the social, economic, and environmental issues in the mosques. Moreover, the research aspires to revive the use of courtyards in mosques and direct the various courtyard effects as well as methods that would provide a better life quality and thermal comfort that benefits the mosques



designed with a courtyard as well as returning many of lost functions of mosques.

Besides, it demonstrates the methods that would provide a better social, environmental, and economic quality via the use of courtyards in mosques' design^{3, 5}.

HISTORICAL MOSQUES AND COURTYARD

Most historical mosques are not of isolated circumferences, but incorporated with several civic services and activities like institutions, kitchens, hospitals, schools, etc. Consequently, mosques courtyards have been the artery of these surrounding activities. The central void has been a mutual volume among the floor spaces with visual, audio, and physical link maintaining a rapport with vertically segregated levels.

In that case, courtyards provide privacy for users in a healthy space. Prayers and visitors' activities can spill out, yet remain intimate spaces.

COURTYARD AND “ARCHITECTURE OF THE VEIL”

The courtyard in the mosque is one of the most durable architectural outdoor spaces. It is of a supreme architectural balance for its functionality as a community councilor providing effective solutions to social and filial problems abiding by the Islamic legislation. Attributing mosque courtyards to socio-cultural roots this architectural realm has been termed as, “architecture of the veil” because it focuses on the interior spaces (courtyards and social spaces) assuring there seclusion from the outsiders. Mosque courtyards became an apt, socio-cultural congruent for allotting ground spaces for its users, especially women to carry out daily religion chores and festive celebrations away from men⁶.

These courtyards provide multi-environmental, social, and economic fruitions. Most importantly, they are hailed for showing the true essence of Islam; as a moderate faith of genuine regular ethics, where civic activities take place side by side of the ritual practices, proving that both parallel paths are united in Islam. Courtyard impacts extend to the urban context of the mosque. Moreover, mosques can host these multitasking courtyards, which facilitates practicing social, economic, and environmental activities, which presents the transparency the Muslim faith; as a divine religion that has once founded glorious civilizations.





MOSQUE AND THE RECENT CHANGING OF THE CITY URBAN FABRIC

Amid the recent significant change within the city urban fabric, both urban and architecture design characteristics of mosques have been modified, distorting their interior components. For instance, mosque courtyards have been either changed in form and design or even demolished, which by turn adversely affected their civic role within their respective community.

As aforementioned, mosque courtyard had been a mere attachment within the mosque parameters, but it had been an exact incarnation of the Muslim faith where religious practices and civic ones must go hand in hand, to verify the true meaning of Islam.

SIGNIFICANCE OF THE COURTYARD ON ISLAMIC PERIOD

The birth of Islam necessitated that of mosques for their authorization as:

1. key community control factor;
2. gathering space and social counseling center; and
3. trading and commercial activities founder and auditor.

DEFINING FOR THE TERM OF THE COURTYARD

The definition of courtyard conception would facilitate the idea of the research perception. It is a clear area enclosed by walls or surrounded by buildings, such as a space left for the admission of light and air, an area around a castle. A courtyard is an area that is outside but yet almost inside. It is where space is kept open to the sky but surrounded by rooms (enclosed by a building). Both of the words “court” and “yard” are derived from the same root, which means an enclosed space.

Reynolds (2002) states that “courtyard” is a loaned concept from the Western civilization, denying the fact of the modern adaptation of its original and traditional ideas that have been once spread from East to West in the bygone eras⁷. Explicitly, concerning public buildings, El-Ghonaimy (2018) explained that in the Arab region, courtyards had been indicators for the building typology and functionality abiding by its design stipulations and environmental considerations.

Moreover, it was used for multi-function space. Accordingly, the design variables of the courtyard have been designed and improved by the





integration of social, cultural, and environmental factors. Also, the design adjustments – area, number of floors, orientation, exposure, wall types, etc – were introduced, to achieve successfully oriented courtyard that responds to human needs⁸.

It should be noted that according to the courtyards allocation typology, there are several types and categories of courtyards design, yet only a few do realize a precedent success. Hereunder, the most prominent one.

1. Elevated courtyard: The area with walkways and plants in the middle is separated from the street by a set of stairs. The change of levelling gives the courtyard spaces a sense of seclusion from the road even though it is only enclosed on two sides.
2. Mostly enclosed courtyard: The bilateral enclosure assures secrecy, leaving the third side open side for the openness of courtyards.
3. Enclosed with a fenced courtyard: It is applied in a busy neighborhood, yet using plants and fences, they effectively make this courtyard feel secluded and private.
4. Fully enclosed by a building: It is a fully enclosed courtyard and is surrounded on all four sides by mosque components buildings.
5. Moreover, the merits of the encompassed courtyards within the urban fabric of mosques are beyond estimation. Yet, the researcher hereby mentions a few.
6. Introducing courtyards to public buildings is primarily considered: To create a convenient open place for the social assemblage of purposes. The core of the concept lies in the coinage of its Latin root words. Both court and yard are of mutual philological origin, meaning an enclosed space.
7. Ensuring secrecy and privacy, even if it is allocated in the center of a building: Courtyard or courtyard patio is directly adjacent to the building. It can also be an intimate enclosure situated within a more massive yard or garden. Some courtyards serve as enclosed entryways to a building⁹.
8. Making advantage of functional courtyard as a common architectural feature that had been adopted for thousands of years in many parts of the world; particularly houses: Courtyards had been primary meeting places for specific purposes, including gardening, cooking, working, playing, sleeping, or even in some cases as places to keep animals¹⁰.
9. Assuring what Taylor said: “*Space you walk through just might be a courtyard*”⁹.





10. Getting the goal of courtyard: As a building element that had been originated out of tough environmental conditions; heat and drought within their native regions¹⁰.
11. Grasping the courtyard diversity: It can be defined as an enclosed area surrounded by a building or wall and open to the sky. The use of inappropriate courtyard forms of some regions – applying the default form of a courtyard in the center of the plot – does not function in areas of harsh climate conditions¹¹.
12. Understanding courtyard in its physical aspect: It is an open or close space, surrounded by 2, 3, or 4 walls, homing trees and bounded greenery, where residents gather and perform some activities. It can include a reservoir. It is usually located in the entrance or the middle of the building.
13. Apprehending that courtyards are enclosed outdoor spaces but are generally open to the elements at their top. Courtyards do not signify a named historical era, but of persistent existence.

BASIC FUNCTIONS OF MOSQUES

The religion of Islam had been sent to spread reverence and knowledge; therefore, open spaces within mosques had been a fertile ground for this juxtaposition. Scrutinizing the plan of Muslim cities, it is easily detected that mosques had been at the central point of the city and the nucleus of the Muslim community. They had been the most frequently visited spot in these cities daily. Thence, the disjunction of the mutual bond between religion and knowledge is but a sheer dissection to the Islamic doctrine. That is why mosques had once appropriated some of its buildings to educational sessions and theological lessons. Some did go to an advanced level; for instance, those universities and institutions attached to Al-Azhar Mosque, Mosque – Madrassa of Sultan Hassan, and Ibn Qalawun Mosque in Egypt and Konya Aziziye Mosque in Turkey.

This triadic functional bond had asserted the social worth of mosques, for they had become the springboard of spreading the Islamic civilization and redemption for Muslim laborers seeking earnings and salvation. Linguistically speaking the English term “mosque” is of two equivalents in the Arabic lexis – *masjid* and *jame'*. The latter is a qualifier for the former – since it is a literal connotation of an assemblage within a forum. The term *jame'* is usually used to indicate major mosques. Muslim cities have been naturally and physically designed in radial projection to mosques;





as in Cairo, Medina, Ancient Jerusalem, and Al Kairouan. Mosques had been only prayer halls but lord bearers of the Islamic enlightenment societal conformity and spiritual atonement.

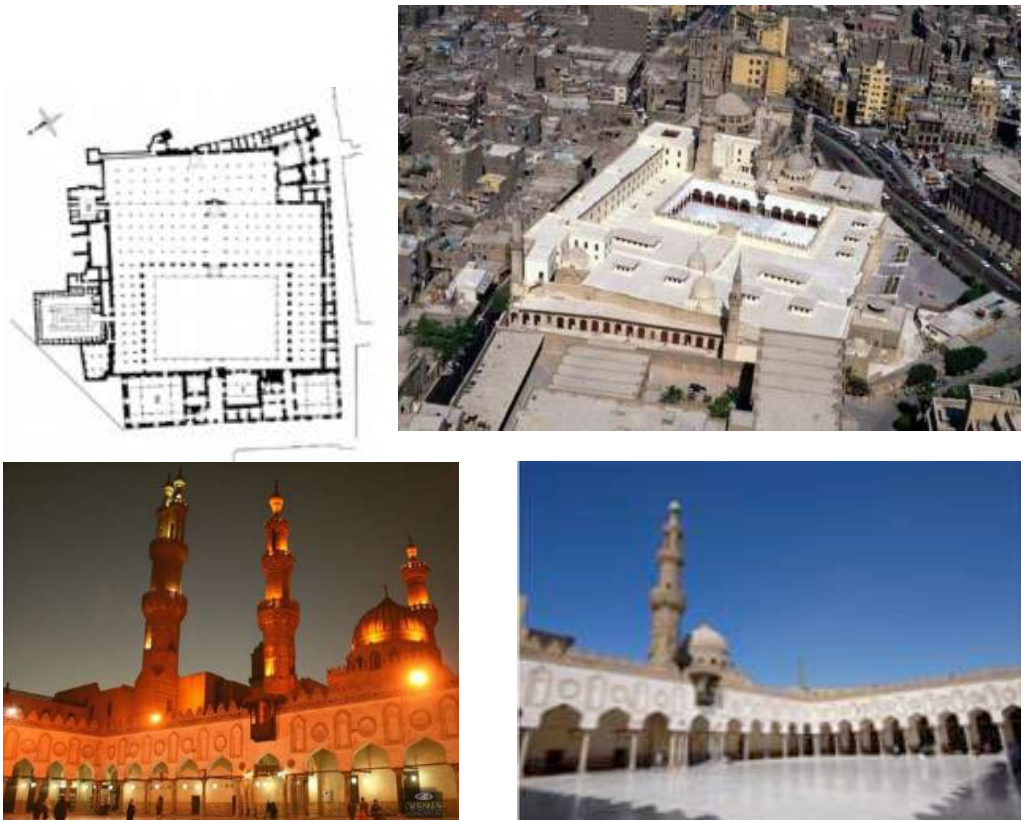
Amidst the early Muslim reign, the significant zones of a mosque had been arranged around the central courtyard satisfying all the needed civilian activities¹². Mosques had rapidly abandoned their limitation – as a desolate place, for worship and practicing religious rituals, and extended to be supreme civic bodies serving the needs of their neighborhood and community. For example, each mosque had a clinic, media center and educational institution (*kuttab*-school-university), social center, and markets in different levels and types¹³.

The “*kuttab*” was initially attached to a mosque and was used as a school. The main function was to teach children and the new converts to be true believers of Islam. In the daily base in the morning of the *kuttab*, students would recite and memorize passages from the Qu’ran. In the afternoon, they would teach children to write and study Islamic prayers and rituals.

The vast expansion of the Islamic empire has enriched the conception of courtyards as a significant element in mosque architecture, fruiting in poignant landmarked mosques till the being. In that time, mosques received multi types of visitors and included varies activities and different events that matched with multi-cultures for Muslims in that time. To name a few, Al-Azhar Mosque, which was built in 975AD, to host religious rituals, civic activities, and inaugurate one of the most prominent universities in the Muslim world from the age of the Fatimid dynasty till now. The university has never been confined to theological studies, but it does include many disciplines to study in its respective faculties – law, languages, science, jurisprudence, etc.

Moreover, it always arranges workshops, social, and economic activities, further to the municipal administrative and managerial positions granted to their heads, enabling them to be audible among men of the regime¹⁴. Initially, the design of Al-Azhar is sophisticated. It is based on a huge central courtyard – as a prayer hall with five aisles and a modest central courtyard, the mosque has since been expanded multiple times with additional installations surrounding the original structure¹⁵.



**FIGURE 4**

The rectangular courtyard is 275 by 112 feet. All these activities surrounded this huge courtyard¹⁶.

The Great Mosque of Kairouan (AD 836) in Tunisia had the same performance, using the interactive courtyard. It is a similar example of the courtyard style in the Great Mosque of Susa in Tunisia. It is built on a rectangular plan 125m long by 75m wide; the edifice consists of a courtyard and a pillared hall 137m x 37m divided into seventeen naves and eight bays. The courtyard of the mosque has a high number of columns and ancient capitals in the prayer hall and in the galleries around the courtyard. The courtyard is surrounded by galleries and has a fluted dome at the center of the narthex¹⁷ (Mami, 2018).



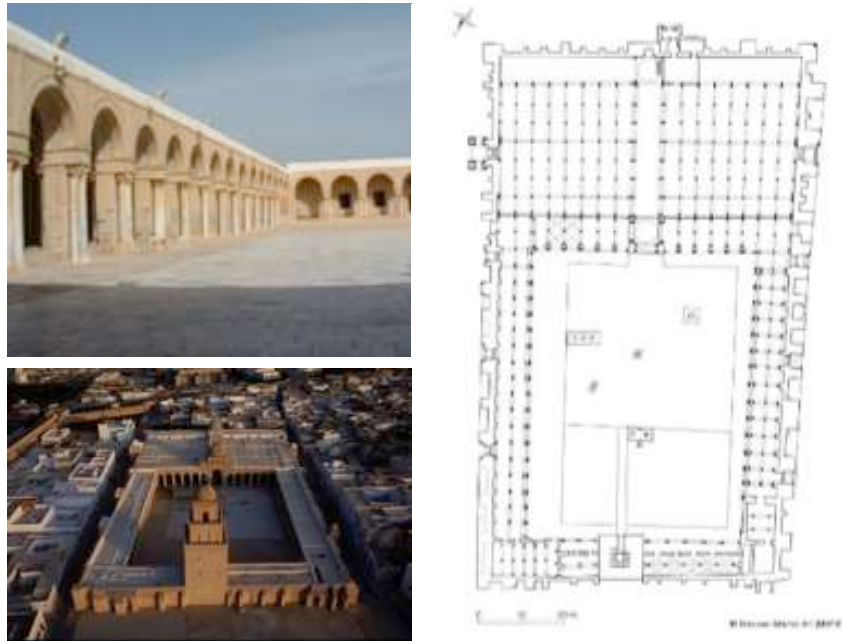


FIGURE 5

Wide courtyard surrounded by arched porticoes in the Great Mosque of Kairouan in Tunisia AD 836¹⁷.

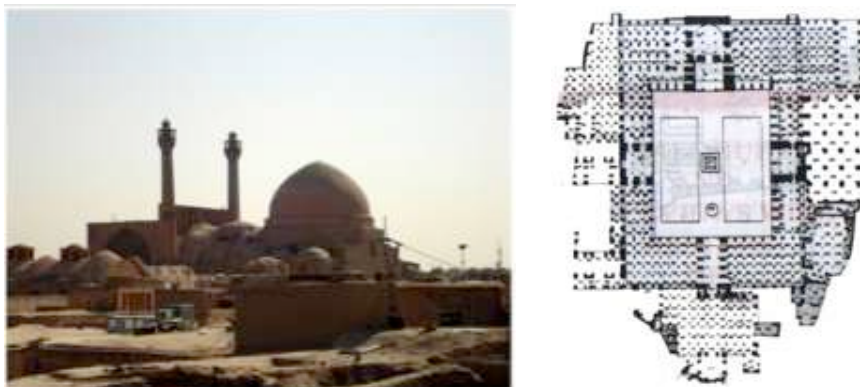


FIGURE 6

Esfahan Mosque AD 11 to 17: main purposes are religion, educational, artisan center, market, and social activities¹⁸.

It could be concluded that the mosque had been the heart of the Muslim community, recruiting its students in the most prestigious positions in the empire. Consequently, the courtyard precisely is essential for mosques to keep his performance as:





1. civic centers and worship halls;
2. educational institutions and knowledge minarets; and
3. social events hosting courts.

DESIGNING PRINCIPALS FOR COURTYARDS IN ISLAMIC ARCHITECTURE

Using courtyard for the mosque has to respect the concept of the Islamic architecture, which promotes unity in diversity, where unity implies that of the message and purpose, and diversity connotes the variety of styles, methods, and solutions. It is acknowledged that the religion of Islam does not stand in isolation from its society. To that, end congregational mosques must have a large prayer hall as well as spaces for civic activities. In many mosques, prayer halls are adjoined to an open courtyard, called “*sahn*”. The courtyard “*sahn*” is a common element in religious buildings. Within the courtyard, one often finds a fountain, acting as both a welcome respite in hot lands and ablutions accessory (ritual cleansing done before prayer).

Indeed, this renders that courtyard design for mosques is so relevant dynamic, consistent, and adaptable. It is such a fascinating subject to translate the Islamic principles into sustainable buildings.

The most fundamental necessity of congregational mosque architecture is that it is able to hold the entire prayers of a particular zone of a city or town. Moreover, the various activities in mosque courtyards unravels the secret glory of Islam. It is more than that: it is about beholding the Islamic ideology and creed at work. It is about witnessing a microcosm of Islamic society, civilization, and culture within the courtyards in mosques.

Absence of Courtyards in Mosques

Unfortunately, mosque courtyards have been gradually absented, continuing mosques to their religious role, to be void of its former social dominance. Adding insult to injury, the existent courtyards have been of altered usages than their late counterparts. Consequently, this turnover has resulted in significant changes regarding the lifestyle and working conditions, thanks to the poignant rise of the technological advancements, which have ultimately shown on the socio-economic setup of the populaces of these communities. Therefore, the impacts of the absence of courtyard are variable between the missing social spaces and prayers activities in





addition to the absent of environmental control. No wonder these spaces are but cardinal environmental control elements within the parameters of their respective mosques^{19, 20}.

The Identity and Vocabulary of Using the Courtyards in Mosque

Showing the identity was the reason of having the courtyards as a means for the fulfilment of the concerns of Muslim societies in the mosque as an element of the Islamic architecture evolved. The social reasons for the Islamic culture and civilization were the main reason for having a courtyard in the mosque. It is never to be the other way round, that is to say, that architecture should change into an interest or an exploration in the process striking itself on culture while neglecting, or taking lightly, people's identities, principles, and the demands of their daily struggles²¹.

Consideration for Designing Courtyard in Mosque

Recently; fining courtyard in mosque sustainability purposes.

Recently, mosque courtyards reformation has been widely called out for achieving a Muslim sustainable community. Architects are to investigate the methodology, where courtyards can play a role in the development of mosques. Courtyards fulfil various functions in terms of social, economic, and environmental function towards treating the microclimate ones. The central location of these spaces within a building gives it the substance of landscaped with water bodies, various plants, shade and light, played an essential role in our social and working life²². Designing courtyards, mosque architects must devote their efforts, to maintain the sustainability of their design as follows.

Social Aspects

1. Performing common activities that modernize mosque courtyards to ensure the users' intimacy and privacy.
2. Ensuring High-Security Procedures for the prayers' gathering. Moreover, architects should provide outdoor gathering spaces for communication purposes and social interaction.
3. Introducing other subsidiary factors to serve the same end; hot tubs or small pools – like fountains or *Wudhu*' ablution elements that offer convenient access and privacy.





4. Sustaining circulation for courtyards are quite patent by its central location amongst the mosque urban fabric, where users feel it a privacy savior and an additive spiritual zone as well.
5. Creating a transition zone between the prayer hall; spiritual zone; and urban context; social zone; safeguarding the users from the escalating danger of the vehicles.

Economic Aspects

1. The mosque is part and parcel of an entire community and its urban context. It is a constructional embodiment, where practices of Islam take place. Since the birth of the holy message, Islam has not been confined to spiritual rituals, so does the mosque, catering for the civic interaction among the citizens of its community. In the Golden reign of Islam, courtyards were divided into several sections; each serves a definite purpose. That is to say; there have been allotted rooms for lecturing the teachings of Islam, while others have been a sort of jurisprudence book stores. Besides, mosques have been a delegate mouthpiece, where daily announcements, religious alerts have been declared to the mob. From spiritual rituals to social routine, courtyards lie in between.
2. Courtyards may include several niches for pillar religious ordnances – alms giving (*zakat*), and preparing for pilgrimage to Mecca; (hajj) or the non-mandatory lesser pilgrimage (*umrah*). It may enclose open-air entertainment spaces, lecture, and meeting halls. Additionally, some spaces may be leased to sell clothes that do comply with the Islamic dressing code, etc. Without having such suitable places. Negligence of such merits would infringe the functional aspect of a mosque and defraud its financial profit used, to serve the cause of mosques.
3. Courtyard would facilitate cutting down costs of running cooling, lighting, and ventilation services, which is a positive point as well.

Environmental Aspects

1. Enforcing nature into mosque designs is a microclimate modifier to the environment, for it sustains climatic and acoustic protection. Furthermore, it can be utilized as an appropriate place for taking advantage of nature and environmental amelioration²³.
2. Assuring that mosque courtyards geometrical and material settings should be related to the design function to provide the highest level of acoustic and thermal comfort possible²².





3. Applying the typical rectangular courtyard form in hot or temperate climate to soothe the effect of the weather conditions within its ambience and among its users. Surface protection is recommended to avoid the intense reflection of solar radiation and hot dusty wind flow as well, to assert the ventilation concept, which has a sound impact on thermal comfort²⁴.
4. According to Rust (2010)²⁵, architects could add the ameliorating components of nature in courtyards within the building footprint, along with voids at the end of corridors or arcades, to allow natural light for the spaces (internal or external), semipublic, semiprivate, shading devices, water elements, softscape (trees and flowers), wind captures, pavement. Moreover, selecting the colors could induce positive effects on the five senses of the prayers human body¹¹.

FINDINGS AND DISCUSSION

Amid the urban and social challenges, there are several difficulties facing the enhancing of the social condition of Muslim communities²⁶. Preserving mosque courtyards will revive the original socio-economic and environmental tasks of mosques upon the community. The courtyard is significant to host civic activities and is very suitable; as transition space that connect the daily life in the neighborhood and spirit activities inside the mosque. The key to solving different neighborhoods' issues will start from and use of mosque courtyards. Moreover, having a courtyard in the mosque is a substantial factor in achieving sustainability, where they can gather, socialize, and discuss their daily matters as well as practicing economic and other activities that many socialists call for calls for reviving the role of mosques in the community as intimate and scoured spaces.

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THE RAY OF LIGHT MOSQUE

DESIGN OF A MOSQUE FOR MEN AND WOMEN

Co Govers

Ir. MA Arch, Director of ZEST Architecture, Barcelona

INTRODUCTION

AT the start of 2010, a Dubai based art gallery named Traffic organized a competition that invited designers and architects from all over the world to reflect on new concepts for mosque design. The title of the competition was “A Mosque through Architecture”. The requirements were to develop an architectural approach to a contemporary mosque that could hold up to 1,000 people in an area of 5,000m², which had to include a woman’s prayer room, an ablution area, parking and a library. “Applicants will be judged on their inventive re-interpretation of tradition as well as the responsibility with which the structure will be built and used”¹.

Although one could suspect the location would be the city which is home to the Traffic gallery, in the instructions the locus of the mosque remained formally undeclared, thereby robbing the architects of a specific context and a congregation. In other words, the project could be understood to be for a universal mosque that could function anywhere.

So how do we shape a place of prayer without a specific Muslim community in mind?

After all, as Louisa Hemaissia once said: “... *it is not the place of prayer that shapes the Muslim, but rather it is the Muslim who shapes the place of prayer*”².

And how do we as architects approach this project, for a building type so steeped in history and so charged with symbolism, without giving in to “the temptation to randomly borrow a priori ideas, arbitrary precedents, or eidetic representational forms from the corpus of examples that exist throughout the Muslim world”?³





We felt the only road would be to go right back to the beginning, studying the very few instructions that all scholars and teachings seem to agree on, and from this research develop a design approach that consciously attempts NOT to cite from examples but rather brings the essence of the instructions together within the framework of our own background and training as modern architects.

DESIGN APPROACH

*“What makes a mosque a mosque? The answer is forbiddingly simple: a wall that is correctly oriented towards the qiblah, namely the Black Stone within the Ka’bah in Mecca”*⁴. This description by Professor Emeritus of Islamic Art Robert Hillenbrand is often quoted, because there may be lots of instructions with regards to the rites and times of prayer in Islam, but indeed “there is no rigidly prescribed architectural vocabulary”⁵ and the only instruction that has a spatial implication for mosque design that we find in the text of the holy Qur’an is that believers should face Mecca during prayer^{6–7}.

Faced with such a lack of prescriptive rules, we found an interesting focus for our design research the original version of Al-Masjid an-Nabawi, the Prophet’s Mosque, built in Medina in 622AD. This open-air building served as a mosque, community center, religious school, and even a court. The courtyard functioned as prayer space and there was no minaret, so the muezzin called to prayer from the rooftop. A small platform from which the Prophet could address the congregation effectively served as the first *mimbar* (pulpit). Men and women both prayed in this mosque at the same time, with the women aligned in rows behind the men⁸.

Akel Kahera, architect and writer of various books on mosque design, has referred to the essence of the Prophet’s Mosque as the “spatial *Sunnah*”, and has in fact recommended designers of diaspora mosques study this “spatial *Sunnah*” in order to develop their architectural approach⁹.

Apart from the direction of prayer, 14 centuries of mosque building have yielded several other aspects that have become customary features of many mosques, through custom, tradition or interpretation and differing per region. Of these the most universally found are:

1. *qiblah* wall with a *mihrab*;
2. minaret(s);



3. a pool or fountain, or an entire (closed) ablutions space;
4. gender separation;
5. portal.

In the following I'll be discussing on how the design of the Ray of Light Mosque addresses a number of the above in an innovative manner, which respects the liturgical instructions but does not rely upon tradition.

THE PRAYER HALL

Primarily a mosque is a “spiritual sanctuary”¹⁰. During 14 centuries of mosque building, there have been many beautiful and impressive examples of how to create prayer spaces that lift the spirit and impress the divine on the believer. From the building of the Great Mosque of Damascus (8th century AD) it became customary to cover the prayer space with a cupola¹¹, in later centuries not just one but sometimes many. These were partly developed in order to create a space where columns would not interfere with the line of sight of the believers to *mihrab*, but their added bonus was that the impressive height and the shape of the cupola created a prayer hall that made a deep impression on the believers.

Most mosque designs develop the prayer hall floor plan using the principles of geometry and symmetry. However, such a method strives to create perfection and harmony, whereas in nature we see another element at work. Creation is perfect, however, it's never uniform and when contemplating nature, we understand that harmony in nature is not always about visual perfection. Or better said, the perfection lies in things being exactly as they should be. When we contemplate the fruits below, we understand that they are as they should be and yet their appearance is unique and not visually uniform to the greatest detail.



FIGURE 1
Three perfect strawberries.



With our design approach we searched for a way to express this aspect of creation. We sought ways in which to create a prayer hall space that would be as impressive as a cupola, installing faith, uplifting and yet as impossible to grasp as creation itself, never fully revealing all of its secrets. We experimented with how flat materials could be folded to form dome like shapes. And we decided that the dome should be in two halves, in order to reflect the two parts of the congregation, the male and the female (more about this later).

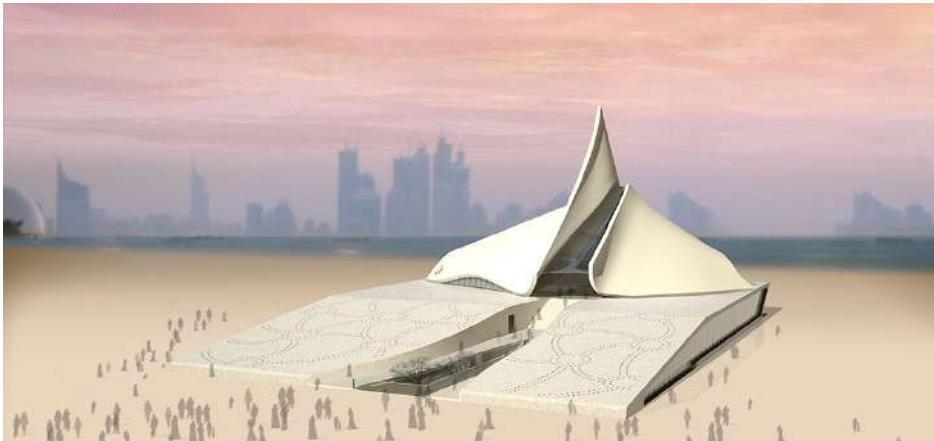


FIGURE 2

Overview Ray of Light Mosque.

In the end the following shape resulted, evocative of a dome, but also of a sea shell or a sand dune in the desert. The two halves are slightly different in size and shape, and also curve up at the bottom to let in natural light. The main natural light, however, comes in through the separation between the two halves at the top. This is the phenomenon that gives this mosque its name, the Ray of Light. As Adel Kameshki pointed out in his recent article on mosques and natural light on the website of the Abdullatif Al Fozan award for mosque architecture, the impressive quality of natural light is sometimes underused as a design feature in mosque design¹². In this case, a strong curtain of light falls in the middle of the sanctuary, creating a metaphorical separation in the space between the two halves, the function of which we will come back to later.

PRAYER DIRECTION

The instruction, mentioned before, that a believer should face Mecca when performing the ritual prayer led to the tradition of creating a so-called



qiblah-wall, a wall that is oriented perpendicularly to the direction of prayer (*qiblah*), and contains the *mihrab* niche that indicated the exact direction. The idea being that if all believers face this wall and the *mihrab* in it, they will automatically face in the direction of the Ka'bah.

No matter how correct is this, as designers, we feel there must be other ways to correctly suggest the axis of prayer. When suggesting a direction, human beings normally use their stretched out arm, or their index finger. In road signals worldwide, we find the use of the arrow sign. In many forms of communication, a simple triangle is used to express the idea that the direction in which we are suggested to move is indicated by the point of the triangle.



FIGURE 3

Traffic signs indicating direction.

In the design of the Ray of Light Mosque, we turned the entire floor plan in the direction of Mecca, so that instead of a wall perpendicular to the prayer direction, there would be a space that flows together and focuses on the *mihrab*, which is expressed as a circular opening with decorated glass. As a result, the entire volume of the mosque serves to indicate the *qiblah* and therefore can also serve as a focal point for prayer outside the mosque.

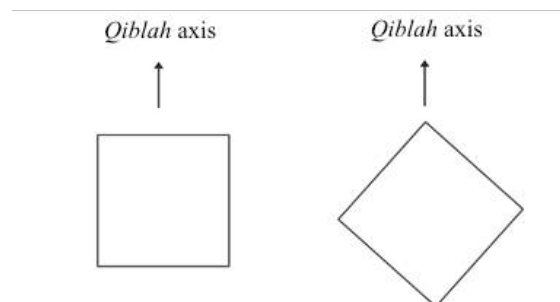


FIGURE 4

Turning the floor plan toward the *qiblah* axis.

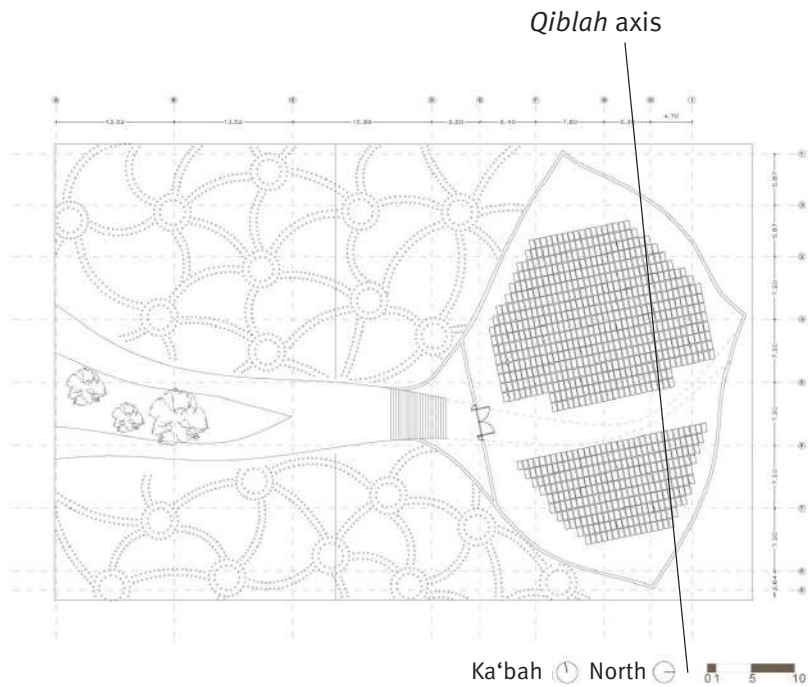


FIGURE 5
Direction of the floor plan toward *qiblah* axis.

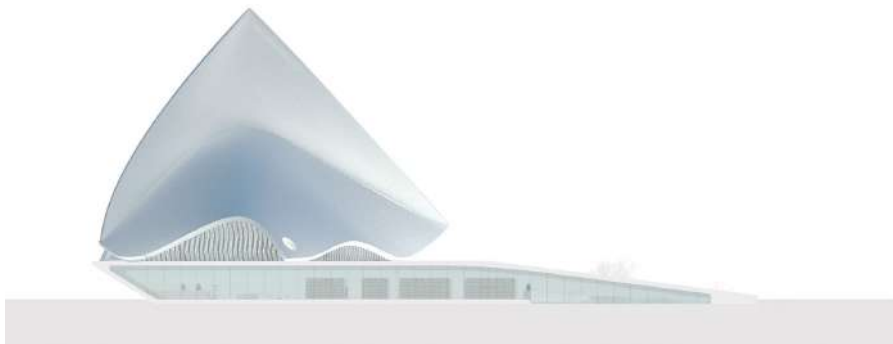


FIGURE 6
Elevation showing the *qiblah* window.

GENDER SEPARATION

One of the most important aspects of the Ray of Light Mosque is the way it is open to both men and women believers. As pointed out by Dr. Salwa Cherif, professor at the University of Tunis, “*In the earliest version of Islam, there*

was no gender segregation such as we see now in the modern, conservative, fundamentalist societies"¹³. The custom of segregating women believers in a separate space, or barring them from visiting the mosque altogether has grown from different interpretations of religious texts.

Dr. Faiza Alí, assistant professor at Suleman Dawood School of Business, who has done extensive research on the position of women in the workplace in Muslim countries, has highlighted that although the Qur'an verses 24:30–31 on modesty are equally applicable to Muslim men and women, most interpretations that have used these verses have been products of the discourse of male scholars, yielding readings that dilute the egalitarianism that was associated with Islam at the time of Revelation¹⁴. As we were a team of female architects, we felt that it was important to research a way to design an inclusive mosque.

We felt that we needed to find a conceptual solution that would give women full access to the prayer hall, its beauty and all that happens there, while simultaneously preventing possible complaints about this from the male part of the congregation. Once again our point of departure was the Prophet's Mosque in Medina, where during prayer, women were instructed to form lines behind the men. This was to avoid uncomfortable situations where women could sense their physique being scrutinized by the eyes of male believers who were not family.

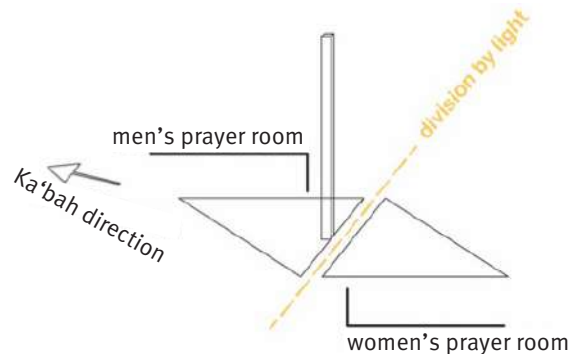


FIGURE 7

Gender separation concept.

In the Ray of Light Mosque, male and female believers pray together in the same sanctuary. In our layout, we placed the female believers behind the male believers, with the curtain of natural light that comes from the Ray of Light being the metaphorical separation between the two.

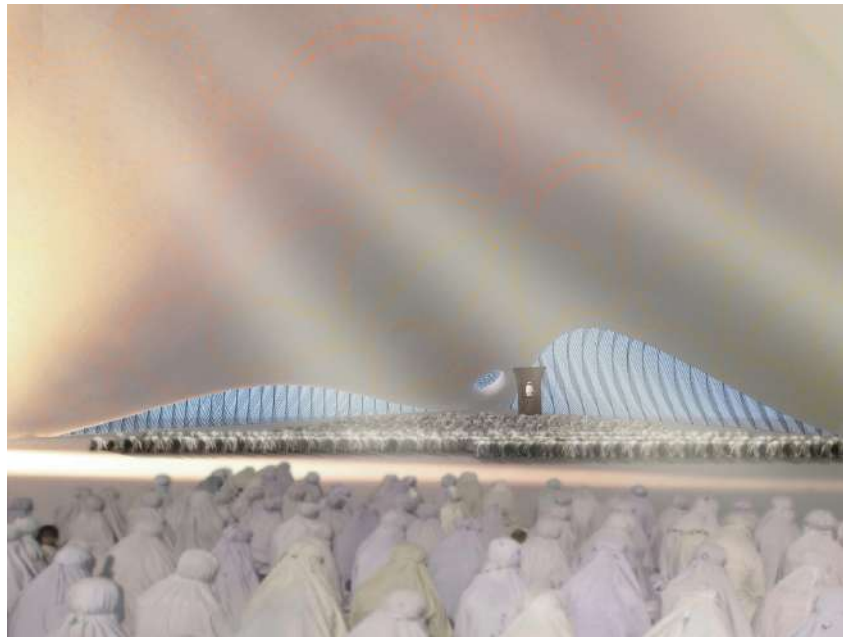


FIGURE 8

View of prayer hall interior from women's half.

THOUGHTS ON MINARETS

Originally the role of the minaret was to be a high place from which the call for prayer could be broadcast as far as possible. Over time, the minaret has acquired much importance as an identifying feature of a mosque and even a symbol of Islam¹⁵. At times, the minarets are a separate construction from the main architectural volume of the mosque.

It struck us that while the original use of the minaret has fallen away with the invention of the loud speaker, the symbolic importance of a high point that can be seen from afar remains. However, the tower shape is very restrictive from a design perspective and although in very great designs the towers may enhance the whole, we also find many examples where the tower(s) and the main sanctuary are not a unity, but become almost like strangers taking part in a dance.

For this mosque, we worked from the idea of a flowing dome shape and made one half fold upwards to form a high point. This is the minaret, but it is also an integral part of the sanctuary shape, making it an indivisible unity.



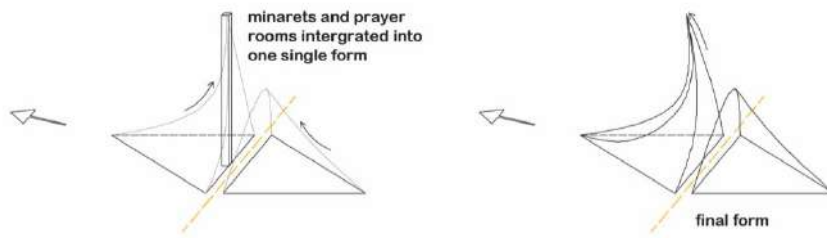


FIGURE 9

The minaret becomes an indivisible part of the whole volume.

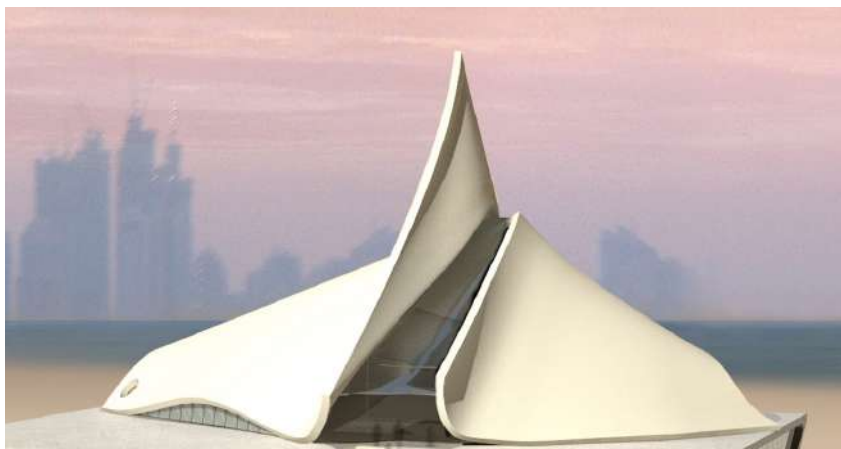


FIGURE 10

Detail of the prayer hall volume showing the “minaret”.

A “ROUTE ARCHITECTURAL” AS PORTAL

The portal is a formal architectural element that Kuwaiti professor of architecture Omar Khattab has described beautifully as “the threshold between hasty earthly life and the tranquil atmosphere inside the mosque”¹⁶. We felt very strongly about creating a formal entrance to the mosque that would serve as a “route to enlightenment”. However, the Dubai design competition stipulated that the mosque should include functions such as a library, ablution area and parking. To which we decided to add a community center as well.

In order not to distract from the spiritual function of the mosque, we worked very carefully on the placement of all the different functions of the mosque and created a sort of landscape which houses all the functions except





the sanctuary itself. This allows us to place the entrances to all the other functions away from the entrance route to the sanctuary, on the outside of the “landscape building” (Figure 11).

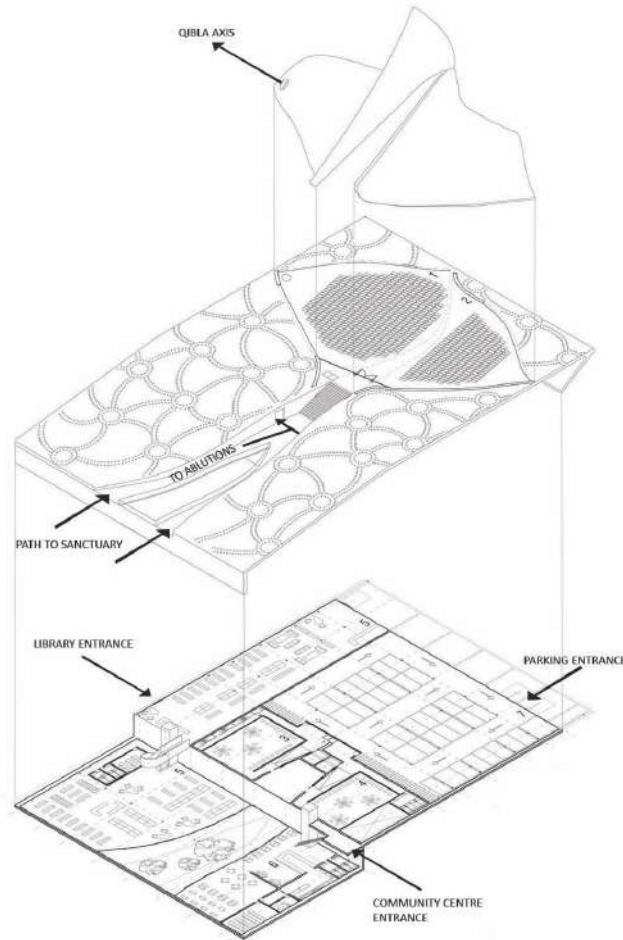


FIGURE 11

Exploded view of the mosque complex with its functions.

Because we wanted to continue our innovation, we did not want to create a formal entrance as much as a “path to enlightenment”. This is a gently sloping and slightly meandering ramp which leads from the street level to the entrance of the prayer hall, with underway entrances on both sides to the male and female ablutions areas. Enroute, the believers can look down into the sunken patio to which the library and community center open, and yet they are removed from this busy everyday life, able to concentrate on the prayers that lie ahead.





SUSTAINABILITY

Because my firm is specialized in sustainable design, we felt it was important to include this aspect in our proposal as well. The advantage of the dome shape is to reduce the surface area for a given volume, therefore reducing the build-up of heat; the dome's exterior insulation and white finish will reflect the heat further. Part of the program is placed underground to stay cool, and opens up to a sunken patio, from where hot air can rise during the day, while cool air will be drawn in at night.

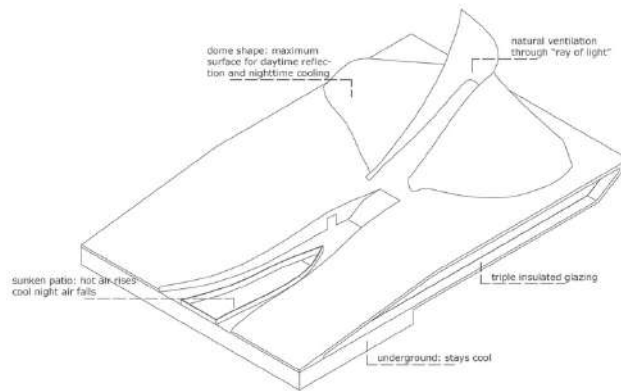


FIGURE 12

Overview of climatic aspects of mosque complex.

The dome itself is made with the technique of Ferro cement, made famous by architectural masters such as Antoni Gaudí and Paolo Nervi. It is a type of concrete construction that uses relatively more reinforcement steel, and sand rather than coarse aggregate in its mix, leading to thinner slabs that can have interesting shapes. It is very suitable for the construction of domes. Because the slab is thinner, it has a smaller ecological footprint than concrete, and is earthquake resistant. Exterior insulation and a white reflective plaster will keep the heat out of the prayer hall. The Ray of Light glass contains sections of openable glazing, which allow for natural ventilation of the hot air rising up in the space.

In order to bring light in the underground spaces, we designed a pattern of small round roof lights which at night light up the roof of the landscape building that carries the prayer hall, and during the day allow for natural light to enter the spaces underneath, such as the library and the ablutions spaces.





This pattern, just like the dome shape itself, is not entirely regular and therefore harder to grasp, again referencing the imperfect perfection of nature (Figure 13).



FIGURE 13
Ray of Light Mosque by night.



FIGURE 14
View of library reading room and sunken patio.



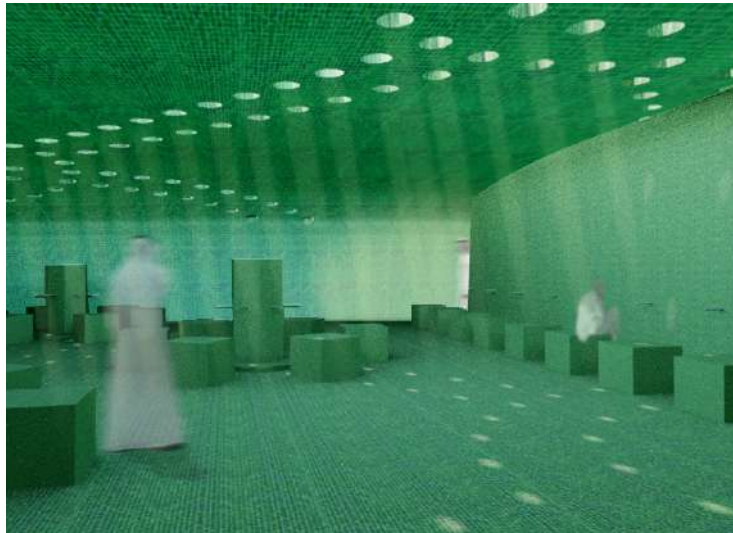


FIGURE 15

View of men's ablution area, with natural light through roof lights.

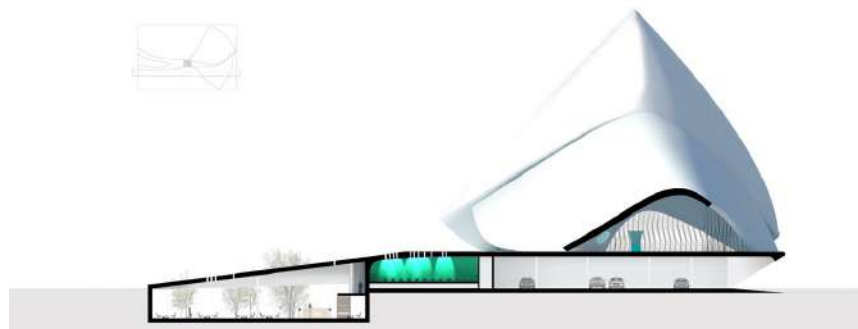


FIGURE 16

Section over sanctuary, parking, ablution area and community center.

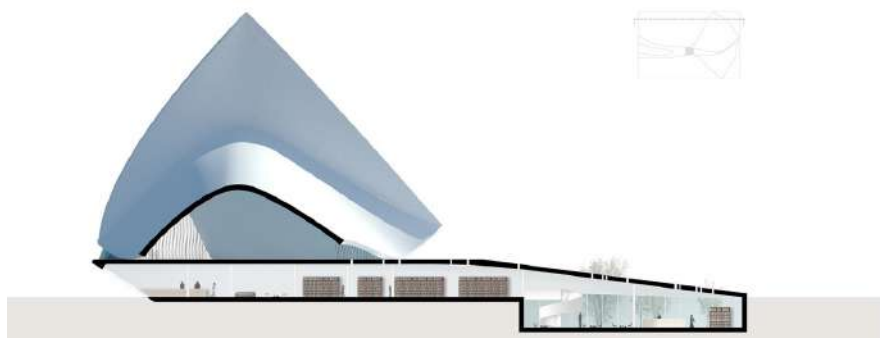


FIGURE 17

Section over sanctuary, and library on street and underground level.



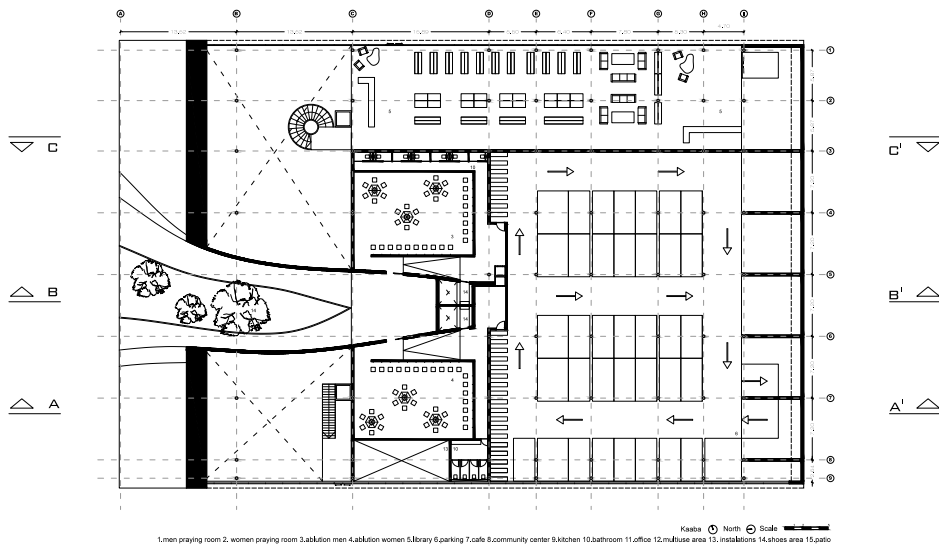


FIGURE 18

Floor plan street level: parking, ablutions, library, entrance community center.

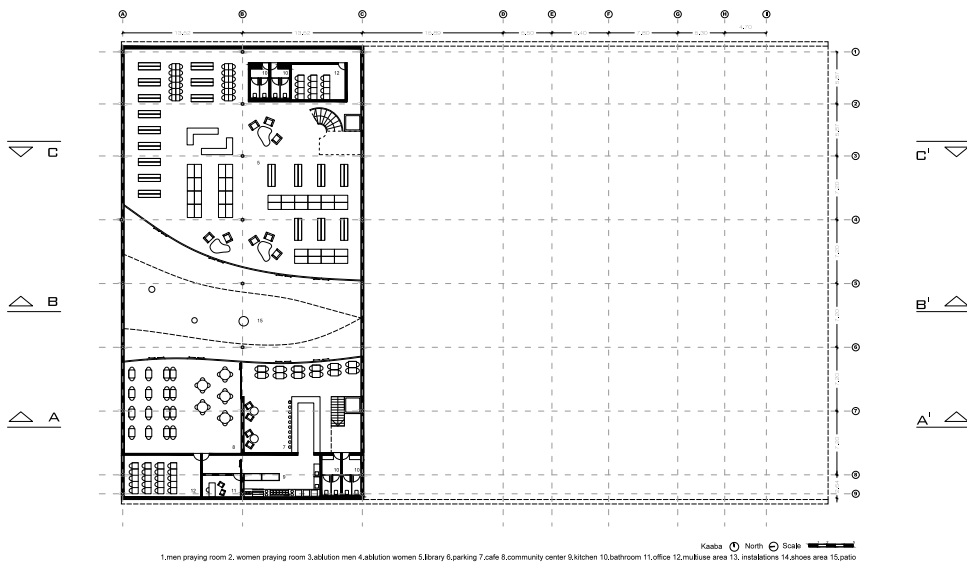


FIGURE 19

Floor plan underground level: library, sunken patio, and community center.



CONCLUSION

Although over the past 14 centuries many mosques have been built, and there are clearly patterns and traditions visible that have developed over time, some applied in most if not all mosques, some differing per region, there is very little actual written instruction that prescribes how a mosque should be designed, other than the direction of prayer.

With the design of the Ray of Light Mosque we have gone back to one of the earliest mosques, built by the Prophet Muhammad himself, and from there on have attempted to find innovative solutions that attempt to create a mosque for the 21st century, an expression of modern ethics.

Developing a curving shape that creates an impressive and uplifting prayer hall, then orienting it such that the entire building point toward the *qiblah* axis, fulfills the liturgical requirements yet is different from what has been seen before. This sanctuary is one big space, but has a curtain of natural light creating a metaphorical separation between the two halves, allowing for a space where both genders can pray together in one space.

Although there is a strong upward movement from the minaret, which is not a separate tower but an integral vertical part of the main volume, the effect of the building as a whole is also strongly horizontal, rooting it to the essence of what prayer is: prostration.

Instead of a formal portal, access to the prayer hall is over a sloping and meandering path that bridges the transition from everyday life to the spiritual realm of prayer. The building meets with all modern standards of sustainability in terms of climatization and materials.

ACKNOWLEDGMENT

I would like to thank Professor Mona Siddiqui, Professor of Islamic and Interreligious Studies, Assistant Principal Religion and Society and Dean International for the Middle East at Edinburgh University (UK) for her kind and patient attention and reflection on the issues I laid out in this paper.

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AN EVALUATION OF PRAYING SPACES IN SHOPPING MALLS: THREE CASE STUDIES FROM RIYADH, SAUDI ARABIA

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INTRODUCTION

PRAYER is an important part of daily life for a large number of staff, customers, and visitors of malls in Muslim countries. Given that prayer times are frequent and that each prayer has its own allotted time, Muslim shoppers, mall staffs, and sales clerks often need to perform one or more prayers while they are at the mall. Therefore, it is common in Muslim countries, and required by law in some of them such as Saudi Arabia, that a mall has a mosque or a prayer space within it (Ministry of Municipal and Rural Affairs, 2004).

Given the fact that shopping malls are a relatively new type of commercial buildings in the Islamic world, and since praying spaces do not exist in shopping malls in the cultures in which they have originated, praying facilities in malls in Muslim countries are a unique local element that has been introduced to an imported building type. This novel combination of functions that may be seen as at odds has led to the emergence of unforeseen design challenges. The lack of decent design guidelines and standards for praying spaces within shopping malls has led to designs that vary in meeting requirements regarding function, safety, health, and comfort. Additionally, some of these praying spaces showcase a very low-quality design that causes dissatisfaction among the users (Mukhtar, 2008).

While there is a wealth of literature about the design and architecture of purposely built mosques and Islamic centers, such as in Kahera, Abdulmalik, and Anz (2009), there is a lack of the studies addressing praying spaces (*musallas*) located within some public buildings of a different function.





Mukhtar (2009) addressed design issues for Muslim prayer facilities within public buildings, aiming to produce design standards for such spaces. He also covered prayer facilities in airports in particular in a later work (Mukhtar, 2010).

Very little literature has particularly approached design issues in praying spaces within shopping malls. Mukhtar (2008) underlined the problem of lacking design standards for shopping mall praying spaces, discussing some design issues briefly for the praying space itself, as well as its support facilities. The article listed some helpful design consideration, which can benefit the designers of such spaces. However, the article was not supported by Case Studies to evaluate the current conditions of mall praying facilities. In a more recent article, Mukhtar (2017) continued to acknowledge the need for design standards for mall praying spaces, focusing on the issue of congestion that occurs in entry to prayer areas in shopping malls. This issue is one result of lacking design standards, causing discomfort among the users and possible health and safety hazards. Hamid, Taib, Abdul Wahab, and Alias (2015) underscored the significance of design elements for prayer rooms in shopping malls, utilizing only one case study of shopping mall praying spaces. However, analyzing several Case Studies instead of one single study would have provided a more comprehensive picture of shopping mall praying spaces, allowing for a chance to compare and contrast between the case studies.

As a way to explore design-related issues of Muslim praying facilities in modern shopping malls, this study discovers the conditions of three Case Studies of praying spaces in malls in Riyadh. The aim here is to shed light on common design issues in praying spaces in shopping malls and to provide support for establishing design guidelines and standards for such spaces. The initial intention of this exploration was to give a background about mall praying spaces as part of the pre-design process of a studio-based design thesis. Therefore, the information acquired was utilized afterward in proposing a hypothetical design of a mall praying space.

METHODOLOGY

The study utilized a qualitative approach, aiming to form a background about praying spaces within malls in Riyadh, Saudi Arabia. This exploration relied on the author's observation of the praying spaces as an architect, interior designer, and a space user. An unstructured, participant observation of the praying spaces was made. The observation was particularly concerning the





praying spaces' locations and their capability to cater for the needs of the users. Besides visiting the praying spaces and documenting their conditions, the study involved performing a space analysis for their architectural plans. When available, interviews were conducted with the users or the operators of the praying spaces to gain a better understanding.

Three mall praying spaces were selected as case studies. A purposive sampling was used in selecting these Case Studies, taking a maximum variation sampling approach, which ensures as wide a variation as possible (Bryman, 2016). The Case Studies were sampled in a way that provides great diversity in the locations across the city; a range of sizes, shapes, and locations of praying spaces within the malls; and the availability of information needed to make the analysis. The observation was conducted in each prayer space at the prayer times that fall under the working hours of the malls, which are *Dhuhr* (mid-day), *Asr* (afternoon), *Maghrib* (sunset) and *Isha* (night). Since the customers' tendency to visit malls varies across the week, each praying space was visited at least once during each of the four prayers through the weekdays and once during each of the four prayers through the weekends.

FINDINGS

Upon the completion of the observation process, and based on the content analysis, seven design issues in mall praying spaces were identified. These are the location of the praying spaces within the mall, spatial dimensions of the praying space, walkability to and from the praying space, *qiblah* direction and space layout, the transition to the praying spaces, natural ventilation and daylight, and finishing materials. The findings of each case study are presented under the respective theme.

The Location of Praying Spaces Within the Mall

Case Study 1 represents a unique condition where the praying space is provided in the form of a fully functioning mosque rather than a typical *musalla*. Through an interview with the *imam* of the mosque, it was confirmed that the praying space was built to be a full-service mosque, attached to, but independent of the mall. The mosque is managed under the supervision of the Ministry of Islamic Affairs rather than the mall management, and it holds all prayers. The mosque is located in the corner of the mall. This location allows for access from both inside and outside of the mall so that anyone can use it, not just the shoppers and the staff, even when the mall is closed. The men's praying area is one floor higher than the street level





and can be accessed through either a corridor on the second level of the mall or by a stair from the street. The women praying area occupies the mezzanine floor of the mosque, and can be accessed through the third level of the mall.

In Case Study 2, men's and women's praying spaces are both located in the lower level of the center of the mall. This location strategically places the men's and women's praying spaces within a relatively short walking distance of the other mall facilities. In addition, due to the men's praying space being in front of the women's praying space, the walking distance between the two is just 50m. Although the prayer space is not on the same level as the majority of the mall's facilities, it can be accessed easily by two elevators and electrical ramps, which can be used as regular ramps when the power goes off.

In Case Study 3, the men's praying space is located on the upper level of the southwestern corner of the mall. In this location, the men's praying space is placed far from the rest of the mall's facilities. The women's praying space, on the other hand, is placed within the food court at the other end of the mall, and has the same problem of being relatively far from the rest of facilities of the mall.

Spatial Dimensions of the Praying Space

The praying space in Case Study 1 has a cube-like shape with a plan that occupies 1,020m². Its dimensions are 30m wide by 34m deep. The space includes separate men's and women's praying areas on different levels. The men's praying area occupies the entire lower level, half of which is a double height space. The women's praying area occupies the other half of the upper level, and can be separately accessed from the upper level of the mall or by the same staircase from the street that leads to the men's praying space.

In Case Study 2, the praying facilities consist of separate men's and women's praying spaces. The men's *musalla* has an irregular plan that occupies 774m², while the women's *musalla* has a rectilinear plan that occupies 85m², which is around $\frac{1}{9}$ of the men's praying space. The ceiling is approximately 3m high. There are several columns that interrupt the space. As the direction of the mall's structural system is not compatible with the direction of Mecca, the praying space has an irregular shape and seven columns that abruptly interrupt the rows of prayers.





In Case Study 3, the men's praying space has a rectangular plan, with a subtraction in the southwestern corner and an addition in the northeastern corner. The praying hall occupies approximately 700m², with a ceiling height of approximately 2.8m. The maximum capacity of the space is 538 occupants. In terms of structural elements, there is a few of columns in the space, a couple of which are located in the middle of the space, while the rest are located along the perimeter. The horizontal structural elements are hidden above the ceiling.

Walkability to and from the Praying Spaces

Walkability to and from the praying spaces in the case studies was assessed by measuring the distances between the praying space and other key elements in each mall: the grocery store, the entertainment area, the food court and the praying space of the other gender. Table 1 lists the distances between both men's and women's praying spaces and the rest of the elements in each case study.

Qiblah Direction and Space Layout

In Case Study 1, the rows are perfectly parallel to the front wall, and the imam's location is on the exact axis of the mosque plan. This ideal arrangement was achieved because the mall and the mosque were designed to have independent axes. The structural elements of the mosque are also compatible with the ideal prayer arrangement, with columns that do not interrupt the rows. It is notable that the structural grid of the mosque is not in line with that of the mall, as the mosque's grid was oriented toward Mecca, but the mall's was not.

In Case Study 2, the layout of the space is not in line with its intended function as a *musalla*. The plan has an irregular shape and the direction of Mecca is neither parallel nor perpendicular to any of the walls of the space. In order to be oriented toward Mecca, the praying rows must be run diagonally. In addition, there are seven columns that interrupt the prayer rows.




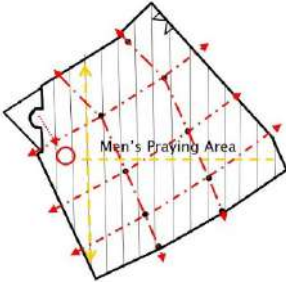
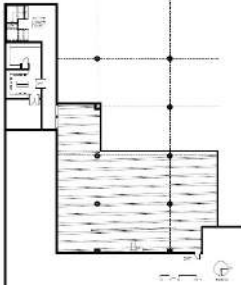
TABLE 1

The distances between both men's and women's praying spaces and the key facilities in each case study.

	Case Study 1		Case Study 2		Case Study 3	
Distance from	To men's praying space	To women's praying space	To men's praying space	To women's praying space	To men's praying space	To women's praying space
Men's praying space	–	754ft. (229m)	–	167ft. (50m)	–	1,233ft. (375m)
Women's praying space	754ft. (229m)	–	167ft. (50m)	–	1233ft. (375m)	–
Grocery store	778ft. (237m)	1,092ft. (332m)	754ft. (229m)	731ft. (223m)	468ft. (142m)	799ft. (243m)
Entertainment area	1,011ft. (308m)	1,370ft. (417m)	1,019ft. (310m)	1,018ft. (310m)	1,199ft. (365m)	381ft. (116m)
Food court	754ft. (229m)	112ft. (34m)	1,019ft. (310m)	1,032 ft. (315m)	1,148 ft. (349m)	51 ft. (15m)
Notes	Women and men are on different floors		Women's and men's paying spaces are on the same floor		There is a special staff-only praying area inside the grocery store	

TABLE 2

Qiblah direction and space layout among the case studies.

	Case Study 1	Case Study 2	Case Study 3
Praying space plan			
Observation	The plan shape of the praying area is regular and has a typical <i>masjid</i> configuration due to having separate axes	The plan shape of the praying area is irregular, and the <i>imam's</i> location is not in the centerline	The rows are not perfectly parallel to the front wall, as there is a very slight divergence

Positive	<ul style="list-style-type: none"> • Provides equal rows • Makes the space easily perceived as a praying space 	<ul style="list-style-type: none"> • Avoids dead spaces that may be created when rectifying the praying space to in order to be rectilinear 	<ul style="list-style-type: none"> • Providing equal rows
Negative	<ul style="list-style-type: none"> • A dead space was created outside the praying space where the two axes meet 	<ul style="list-style-type: none"> • Resulting uneven prayer rows and improper location of the <i>imam</i> 	
Notes	The praying space in this case study is in the form of a fully functioning mosque	In order to fix the problem, the <i>imam</i> 's location was moved to be in the centerline of the praying space	The structural elements do not affect the praying arrangement with the exception of two columns in the center of the space that interrupt just a single row

In Case Study 3, the rows are not perfectly parallel to the front wall, but the slight divergence is barely noticeable. With the exception of two columns in the center of the space, which interrupt a single row, the structural elements do not affect the praying arrangement. Table 2 illustrates the *qiblah* direction and space layout in each case study.

The Transition to the Praying Space

In Case Study 1, patrons can access the praying space (the mosque in this Case Study) from either outside or inside the mall. The outside access is provided through an exterior set of stairs that link the street to the praying space, which is one floor above the street level. The inside access is provided through a corridor that starts from the mall and ends up at a lobby that leads to the praying space and its support facilities.

In Case Study 2, the men's praying space has no transitional space between the mall facilities and the praying space. Instead of having a lobby or a vestibule to the praying space, the door of the men's *musalla* opens directly to one of the mall's hallways. The women's praying space, however, does not lack a transitional space. In order for women to reach their praying space, they must pass through a corridor that links their praying space to the rest of the mall facilities. This corridor provides a degree of demarcation and allows worshippers to mentally separate the secular and spiritual spaces.

In Case Study 3, while there is a transitional space that leads to the praying area, it lacks the same level of attention spent to design and finishes



throughout the rest of the mall. In fact, the transitional space seems more like a neglected back-of-the-house or a maintenance corridor; the finishing is very generic and gives no hint that it leads to a place of religious worship. Furthermore, the shoe rack is far away from the entrance, forcing people to walk barefoot on the cold, occasionally dirty floor, or ignore the rack and leave their shoes in a disarranged pile just outside the door.



FIGURE 1

Picture shows the entrance of the mosque from the mall in Case Study 1.

Natural Ventilation and Daylight

In Case Study 1, the men's praying space has access to natural light, which is not a common feature in mall praying spaces. Because the men's space is located in the northeast corner of the mall, it receives natural light from windows in the north facade. Since these windows are operable, they work as natural ventilation devices as well.

In Case Study 2, there is no access to natural light in either the men's or women's *musallas*. Due to their internal location in the lower floor, the men's and women's *musallas* have no exterior facade or roof to host any type of glazing. The spaces are therefore totally dependent on artificial lighting. In addition, the lack of exterior openings affects the spaces' air quality.





The air is trapped inside the space as there is no access to the outside to naturally circulate the air, which decreases the air quality. In order to avoid that, the space will need to depend on mechanical systems for ventilation even if there is no need for heating or cooling, which increases the energy consumption.

In Case Study 3, the men's praying space has access to natural light. Since men's praying space is located in the upper floor of the mall, it has the luxury of skylights for natural lighting. However, the sunlight is direct and causes glare during *Dhuhr* (noon) prayer. Because the skylights are not operable, there is no natural ventilation in this praying space, and it is totally dependent on mechanical systems.

Finishing Materials

In Case Study 1, the interior of the praying space features conventional mosque finishing materials in the floors, walls and ceilings. As a flooring material, the space has broadloom patterned carpet that covers the majority of the floor. In the perimeter of the space, ceramic tiles provide clear perimeter walkways for people who have completed their prayers to exit the space without disturbing others. These walkways also have short railings to further define the area. The walls are mainly painted off-white; however, the lower parts, up to a height of about 15cm, are covered by the same ceramic tiles as the perimeter walkways. This tile offers protection from the wear and tear caused by people brushing the wall as they pass. The ceiling is made out of streamlined coffered drywall, on which a series of downlight fixtures are mounted. It has the same off-white color as the walls.

In Case Study 2, the interior of the space exhibits a somewhat minimal use of finishing materials. A broadloom red carpet with a pattern of dark blue stripes is the main flooring material. A narrow path of ceramic tiles, approximately 60cm in width, is used to define the perimeter walkway. The walls are painted the same off white as the mall corridors. The lower 170cm of the walls are covered by the same ceramic tiles as the floor perimeters, which, as in Case Study 1, protects them from the wear and tear of constant pedestrian traffic. The upper part of the ceramic tiles features a dark green strip that contrasts with the light beige of the lower part. The same wall covering design is used for the column as well. The ceiling features a multi-level contour-like design that utilizes the soffits to host the HVAC grills. The ceiling is made out of drywall board with a series of downlight fixtures.





In Case Study 3, the interior of the space features a green broadloom carpet as a flooring material, with patterned orange and red stripes to arrange the prayer rows. The walls are made out of gypsum board, painted tone on tone off-white and protected by a black vinyl baseboard. The ceiling is made out of drywall that covers the structural elements and is the same off-white color as the walls. It features openings for the skylight and hosts a series of downlight fixtures and HVAC system elements.



FIGURE 2

Picture shows the windows in the north wall of the men's praying area in Case Study 1.

DISCUSSION

The variation in the locations of praying spaces within the case studies highlights several factors associated with the location of the praying spaces within malls. Centralizing the praying spaces within the mall provides equal distance between the praying spaces and the rest of the mall facilities. However, it often results in praying spaces that have no direct connection with the exterior, and therefore, no access to daylight and natural ventilation, which can be seen in Case Study 2. On the other hand, locating the praying spaces where they could have direct connection to the





exterior, such as in Case Study 1, requires that the praying spaces be placed at the perimeter, which could result in long walking distances to and from the praying spaces, especially for some mall facilities that are located in the farthest points from the praying spaces, which is the case in Case Studies 1 and 3.

The relationship between the men's praying space and the women's praying space within a mall can also be a factor when considering the praying spaces' location. In malls where men's praying space is placed a relatively long distance from the women's praying space, such as in Case Study 3, male and female family members need to go to their assigned praying spaces when the prayer time comes. Since these praying spaces are placed far away from each other, either males or females in a family have to walk a long distance from where their family members of the other gender pray. This phenomenon supports the suggestion of Mukhtar (2008) of the preferability of having male praying spaces and female praying space separate but close-by each other so family members can wait for one another. On the other hand, in malls where men's and women's praying spaces are placed too close to each other, such as in Case Study 2, circulation problems could arise. Making the doors of both praying spaces in close proximity from each other may cause a bottleneck, as men and women exit at the same time. The situation can escalate when male family members are blocking the flow while they are waiting for their female family members (and vice versa).

Walkability to and from the praying spaces should be significantly considered when designing the routes that link praying spaces to the rest of the mall. To date, there is no standard for the distances to and from praying spaces in malls. Routes to the praying spaces must be walkable within a limited amount of time, so the shoppers and sales clerks can perform their prayers and resume their work in a timely manner. The case is particularly crucial for *Maghrib* prayer, which, as Mukhtar (2008) suggests, have a short timeframe and coincide with the peak hours of the malls. In Case Study 3, and to save the time used for traveling to and from the praying spaces, a praying space was established within the grocery store for its staff to be used instead of the main praying space that is located at one corner of the mall. Accessibility should also be greatly considered when choosing the location and the level of the praying space, as well as when designing ramps, corridors, door openings and doorknobs. Equal attention should be paid to the accessibility of support spaces such as ablution areas and toilets,





since physically handicapped users who are unable perform ablution or even use the toilet may, as a result, be prevented from using the prayer space altogether. Case Study 3 demonstrates an example of accessibility problems. The way to the men's praying space is not barrier-free as there are no accessible vertical circulation elements from the lower level to the upper level. This case shows inconsistency with the recommendation of Hamid, *et al.* (2015) on providing a praying space without obstruction.

While it is preferable for praying spaces to have a plan layout that helps make the rows straight and parallel as possible, as suggested by Mukhtar (2008), not all malls provide this option. In many cases, the spaces provided for *musallas* in malls are not the ideal. The praying space of Case Study 2, for example, features an irregular plan shape. This resulted in uneven prayer rows and in a location of the imam that is not on the exact axis of the space, which is not the optimal position. Case Study 1 exhibits a solution to the problem of the incompatibility between *qiblah* direction and the mall axis direction. The problem was solved through subtracting the space created by the divergence between the two directions from the praying space and using it to host transitional spaces and support services.

The mall users' journey to the praying spaces is different from the one made by people travelling from their homes to a local mosque. Walking from the secular atmosphere and materialistic temptations of the mall to the spirituality of the praying space, worshippers encounter a sharp atmospheric shift. This dramatic change could affect their level of concentration (*khushu'*) during the prayer. The design of a mall praying space should include an effective transition between the mall facilities and the praying space itself. This transition can be made by creating a space that separates the two areas. Besides acting as a buffer zone, this transitional space will help reduce the amount of sound that spills over from the noisy mall to the quiet prayer hall. Moreover, this transitional space will help reduce congestion issues. Case Study 2 exhibits a lack of transitional space between the men's praying space and the rest of the mall. This condition exposes the praying room to the audible distraction from the mall. Case Study 3 features a long corridor that works as a transitional space. However, this corridor features an opposite movement, which results in severe congestion when the patrons exist the space, exhibiting a safety hazard that Mukhtar (2017) has warned. Although Case Studies 1 and 3 include transitional space between the malls and the praying spaces, the atmosphere of such space is too austere. This can





be seen as a negligence to the praying space, especially when comparing the finishing materials of these transitional spaces to the lavish finishing materials used in the entire malls.

Due to the pervasive use of artificial climate control, many shopping malls in the gulf countries continuously run HVAC systems for ventilation, even during the cooler months when the weather can be tolerable. Besides being extremely wasteful, both environmentally and financially, these mechanical systems do not introduce as much fresh air to the space as natural ventilation. Case Studies 2 and 3 exhibit the case where there praying spaces have no direct access to fresh air. This decreases the indoor air quality; it is well known that insufficient ventilation in crowded environments can increase the risk of respiratory and other communicable diseases. This could result in air circulation and ventilation problems, which Hamid *et al.* (2015) warned. Case Study 1, however, has direct access to fresh air, which allowed the praying space to be dispensed with HVAC Systems during some of the days when the observation was performed in December and January. Considering that a large number of users come from inside the mall, which is often fully dependent on HVAC systems all-year-round, natural ventilation while praying would be a welcome change during moderate weather.

Natural light is an essential factor that influences occupants' feelings toward, and perceptions of, a space. In Muslim praying facilities, where the space is used periodically throughout the day, the user could experience the space in different natural lighting conditions. Natural changes in lighting help worshippers to be aware of the passage of time from one prayer to another. In mall praying spaces, the importance of natural lighting is paramount because a large number of the users are mall employees, who may lose their sense of time after spending long working hours indoors under artificial light. Independent of the psychological ramifications, natural light also reduces energy consumption by decreasing dependence on artificial lighting. Since Case Study 1 has access to natural light through a series of windows along its north wall, it was attainable to perform *Dhuhr* and *'Asr* prayers without the need for artificial lighting. This would be impossible in Case Study 2, where there is absolutely no access to natural daylight.

CONCLUSION

This article was developed from a report that was conducted as a pre-design phase of a studio-based design thesis. The intention was to use the





data acquired in the development of a hypothetical design of a prototype of mall praying space rather than producing a conventional research paper. However, the information found in this study could be relevant to shed light on the conditions of praying spaces in malls given the lack of literature concerning such a topic. Not only would this case study analysis work as a platform on which design consideration could be based, but also it will draw the academic, professional, and societal attention to common design issues in praying spaces in shopping malls.

There are several limitations to this study. To a great extent, observation was the only method of data mining. Incorporating other research methods would further enhance the validity and reliability of the study. Additionally, Time was a great constraint in collecting the data for this study. The data collection was performed in a very limited time (during a short visit of the author to Saudi Arabia while he was pursuing his master's degree in the United States). Additional limitation can be found in the lack of direct observation of women's praying spaces, as it was impossible to enter the women's praying spaces during the prayer time, not to mention documenting and taking pictures.

It might be useful to utilize this study as a starting point for future research concerning Muslim praying spaces in malls, aiming to improve their quality. Future research may be directed towards addressing issues such as the appropriate distances to the praying spaces from the mall facilities, the appropriate distance between praying spaces of both genders, and the reasonable time used for travel to and from praying spaces within malls. Such issues should be covered in order to produce specific design standards and guidelines for mall praying spaces. These standards would help assisting architects, designers, developers, and other stakeholders of Muslim praying spaces in shopping malls.

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HAS MOSQUE DESIGN REALLY DEVELOPED? NOTES ON THE HIDDEN COMPLEXITIES OF MOSQUES' ARCHITECTURAL BRIEF

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INTRODUCTION

THE MOSQUE is a rich building typology with a great history, long architectural traditions and a wide potential for expression and symbolism. Contemporary mosque architecture shows an ongoing competition over representing this richness, producing varied outcomes that reflect the different architectural cultures of practice behind their conception. Current trends of mosque design often fall under a variety of cultures of architectural practice that can be loosely classified as vernacular, historicist, regionalist, formal-iconic, and what is often imprecisely named the modern approach (Khan, 1990). Within these diverse cultures of practice, mosque design has been a rich pool for architects to show off their skills and adopt new visual and formal languages that became possible by the technologies of the information age, advances in structural engineering and the increased ability to build complex forms. Mosque architects compete in deploying the capacity of art forms to express the symbolism associated with this building typology and suggest cultural and religious meanings through its built outcome (Al-Jasmi and Mitias, 2004; Hoffman, 2010; Kahera, 2009).

Still, while the architectural outcome of contemporary mosque approaches shows a level of creativity and a sincere desire to capture the sacred in the Islamic culture and religion, however, its growing tendency to focus on the formal and symbolic side of this typology may have come on the expense of targeting the specific architectural brief of the mosque. The seemingly straightforward functional requirements of the mosque have tempted architects to focus more on its formal, visual and metaphoric qualities. This has pushed mosque architecture to confine





itself into a perpetual loop of formal and visual manipulation, raising concerns about the actual value of such development aside from its artistic ingenuity.

This paper, therefore, displays a provocative argument critiquing the current development of mosque architecture as insufficient for a critical evolution of this building typology. This argument builds upon ideas from the architect and theorist Jeremy Till as well as the philosopher and sociologist Henri Lefebvre against the domination of visual and formal values in contemporary architectural production. Through an interpretation of their views into contemporary mosque architecture, the paper aspires to open a different path for the development of mosque architecture that builds upon re-visiting the mosque architectural brief to unleash the possibilities embedded within its hidden complexities. The paper will present two examples from mosque's brief: the entry space and the dynamic prayer hall to illustrate certain complexities associated with these spaces that can act as a base for a critical and creative development of the mosque typology. The paper will conclude with speculations upon Jeremy Till's idea of the "creative brief" as a clue for a deep and long-lasting development of mosque architecture.

METHODOLOGY

The paper tackles contemporary mosque design in a conceptual philosophical level through a critical analysis of the values dominating the contemporary outcome of mosque architecture. The theoretical framework of this paper draws on the work of two scholars: the theorist and architect Jeremy Till around contingency in architecture and the creative brief as well as the works of the philosopher and sociologist Henri Lefebvre around the production of space. More broadly, the paper builds upon a survey of the literature on mosque architecture in general but in particular on writings related to mosque function. It concentrates on the works of Mohamed Hassan Nofel and Ahmed Mokhtar as a central source for the analysis. The main reason for that is that the works of both scholars have been extensively used in other academic literature and in planning guidelines for mosques in different Muslim cities including Abu Dhabi, Al Doha, and Mecca. Finally, the paper builds upon a series of observations done by the author in Egypt and in the UK in the period from 2016 to 2019 that focused on understanding how the users of the mosque interact with the space.





THE ARGUMENT

Questioning the Current Development of Mosque Architecture

Many Islamic cities are in a race to secure an iconic status among other global cities. In this view, the architecture of the mosque has become an important means for rebranding these cities and show off their vision and aspirations towards the future (Sklair, 2017). This, in turn, led to an obsession with new morphologies and formal taxonomies in their approaches to mosque design.

This is not something confined to mosque architecture but it reflects a broader architectural culture dominating contemporary building production that prioritizes iconicity and formal innovation (Till, 2013). This global architectural situation has become under scrutiny from many architectural critics and theorists who believe that architectural attention has deviated from its social, cultural and functional purpose (Koolhaas, 2002; Sklair, 2017; Till, 2013).

On this view, the architect and theorist Jeremy Till argues that the wizardry of contemporary architecture started to distract architects from their role in conveying the cultural and social complexities inherent in the architectural thinking process. He believes that there is a confused assumption that since the contemporary architectural outcomes started to look radically different, this means that the processes that led to those outcomes must be critically different as well (Till, 2013). This global architectural situation has significantly influenced contemporary mosque architecture. While much can be said about the spatial creativity and technical efficiency of many of contemporary mosques, however, it looks like the game of mosque design has stopped at this point.

In his book, *The Architectural Representation of Islam*, the researcher Eric Roose states that since the new millennium, contemporary mosque design is experiencing a self-chosen standstill in a loop of formal and the visual manipulation – a tendency that is not confined to mosque architects but has proved addictive to plenty of architects over the last decades (Roose, 2009) (Figure 1). Nonetheless, this formula has been legitimized by the global domination of this view as well as its accordance with the common expectations of the clients and users which is often limited to a certain image of the mosque that prioritizes scale, imagery, ornamentation, and symbolism.



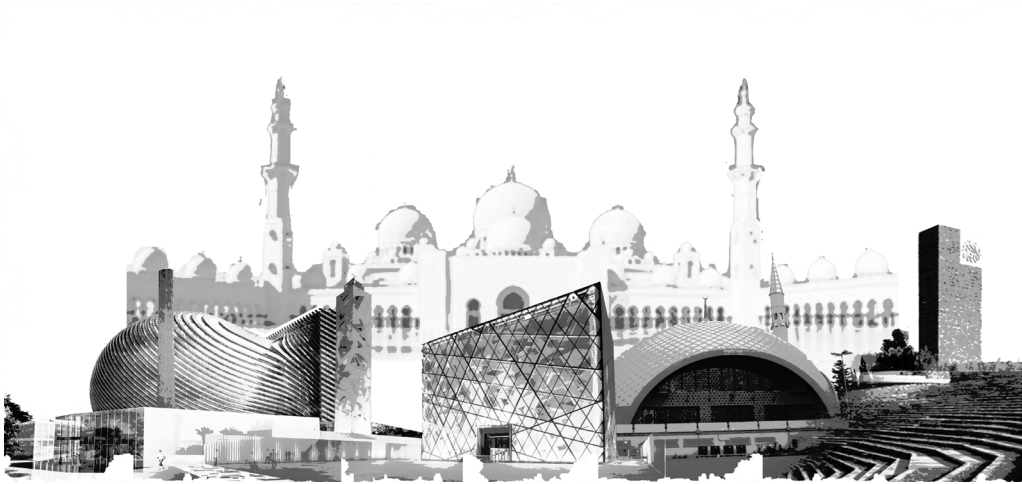


FIGURE 1

A collage of examples of form manipulation
in contemporary mosque architecture.

(The Author).

On the other hand, another reason that has directed contemporary mosque architecture to follow this path is the relatively straightforward brief of the mosque which has tempted architects to put their energy more on the image and metaphoric quality of this building typology. In general, the main function of the mosque is to provide a space for praying. The laws of Islam do not mandate the shape or form of sacred spaces in which the rituals of prayer are performed. The one essential requirement for this space is to accommodate rows of worshippers standing behind a leader of the prayers (the *imam*) and oriented towards Mecca (Mustafa and Hassan, 2013). This alone is sufficient; everything else is discretionary. In bare architectural language, mosques are no more than one large space for praying with some substantially smaller ancillary spaces adjunct to it. The client, say it is the state, the local authority, an institution or an individual; will ask for some broad requirements about the area, capacity, some stylistic preferences as well as (often in the case of the state or an institution) the need for iconic features in shape or height. This is the common brief for mosques (Figure 2). Therefore, architects used to deal with this brief by the same recipe of a generic multipurpose hall and put their full powers instead into the visual novelty of the building.



**FIGURE 2**

The state, as the client, often asks for iconic features in shape or height.

Nevertheless, while many of the contemporary mosques may show genuine creativity in their visual and symbolic approach, these beautiful objects are often powerless in the face of the forces of users' everyday needs. These needs – which are not usually considered in the conventional brief of the mosque – later come back to haunt the mosque in the shape of unplanned amendments and informal additions to make the space suits the purpose of the building. This reflects Till's argument in his book, *Architecture Depends*, that if removed from its everyday, architecture will not be much more than a play with formal and technical devices (Till, 2013). This situation raises a critical question about the value of the current evolution of mosque architecture which started to restrict itself into a series of formalistic games that are not sufficient to call the mosque typology as substantially developed.

The Mosque between the “Hard” and the “Lived” Space

The previous dilemma around the formal or functional development of the mosque resonates with the writings of the philosopher and sociologist Henri Lefebvre around the difference between the “hard” space and the “lived” space. Lefebvre argues that the way out for architecture to get up from the trap of visual and rhetorical obsessions is by focusing on a new mind-set that concentrates on creating “lived” spaces (Lefebvre, 1992). His concept of the “lived” space lies in prioritizing the everyday elements in the design instead of the denial, and subsequent ridding, of the elements that lie outside the direct control of the architect. It is a view that affirms human agency in architectural spaces, where users become subordinate actors in the lifecycle of the space. In the “lived” space, architecture is seen as an intimate, eminently habitable place, which infiltrates memories





and becomes integral parts of day-to-day use of the building (Lefebvre, 1992; Till, 2013). This position appreciates that architecture has multiple authors and that its authorship is not decisive to the expert knowledge of the architect but its role is to appropriate this knowledge to suit the lives of the users of the space (Sharr, 2012).

The idea of the “lived” space directly targets the architectural brief. It means redefining the architectural brief with a deeper level of personalization as a source for creativity and therefore into a visually and socially intertwined architectural outcome. This approach moves architects beyond the quick rush towards the visual and the straightforward functionality into a different form of engagement around the intimate relation between the building and its users (Lefebvre, 1992). By applying this view to mosque architecture, we may find that creating the “lived” space can be the clue for critically developing mosque architecture in a different path outside the formal one. This new path will celebrate human agency and hence choreograph the formal and spatial expression of the sacredness in Islamic culture around the users’ everyday needs.

RE-VISITING MOSQUES’ BRIEF

The main function of the mosque is to provide a space for praying that accommodates rows of worshippers standing behind the *imam*. It is generally a large unobstructed free space facing the *qiblah*. This direction is identified by a niche called (*mihrab*) in the *qiblah* wall and the pulpit (*mimbar*) from which the leader of the prayers can deliver the sermon (*khutbah*) (Serageldin and Steele, 1996). Those are secondary elements that originated from historical and cultural traditions and have an indirect symbolic and functional purposes serving the main praying hall (Imam, 2000). This is more or less what a mosque is, and for that, the mosque brief is often seen as a simple task in the broader process of designing a mosque. Regardless, the mosque brief is not straightforward as it may seem. Mosques have a rich dynamic function. It varies widely throughout the day, during the week, and through different times associated with Islamic rituals and also in its wide range of users from different gender and age groups. Mosques mainly host the five daily prayers as well as Friday congregation prayer. It comprises various functions that have their certain particularities as well; from the logistics of organizing the entry movement, the exit of large numbers of people in close time intervals; the specific requirements that also differ between what is customary and what is mandatory. All these instances among many others are evident in mosques and show how its architectural brief can be complex if we target them.





Practitioners tend to deal with the different functionalities embedded in the mosque space by the same recipe of an open-plan hall that mainly focuses on the issue of capacity and hence fails to appreciate the underlying complexity of the vivid brief of the mosque. This may be enough to call it a mosque, but not to tackle the complexity of the mosque's functionality or to add life to its architecture and its social space. Accordingly, the essential design elements in the mosque are often added not by the architect but by the occupants who complement what is missing in the design, their actual needs. These needs, however, are fulfilled by improvised solutions done by those who are praying or by the mosque's management – which obviously lack the qualities of specialized architectural intervention to deal with these issues.

The next section will present two moments from the everyday life of the mosque (the entry space and the dynamic prayer hall) showing through them some complexities found in the mosque brief and highlighting potential clues for making the mosque a “lived” space.

The Entry Space

The first point in the mosque is the entry space. It is the transitional space receiving the worshippers entering into the mosque through the portal that splits the outside busy and profane to the divine and sacred of the inside. This part of the building is the place where the worshippers further discard the remnants of the earthly concerns taking off their worldly footwear – usually after passing a low wooden barrier – and prepares the worshippers to direct their thoughts towards their Creator (Gabr, 1992). In architectural term, this transition is called a threshold: the architectural element that is associated with deep social and emotional significance about transition. A threshold defines a sense of arrival that comes from opening a door and a sense of identity for the place beyond the threshold (Porter, 2004). This threshold has been represented in mosques historically in many different ways through its entry experience. Mosques entrances were usually located in a position to lead the people inside the mosque through a shaded entrance followed by the open court (*sahn*) and finally to the *riwaq*. Later, the *majaz* defined this relationship with its high cave-like ceiling and its bent orientation that morphs the city's grid into the *qiblah* direction. Afterward, in the Ottoman era, this threshold has been expressed by moving the courtyard (the *sahn*) from its traditional central position to become an external transition leading to a domed praying hall (Fathy, 1960s; Gabr, 1992). In contemporary times, variations of these architectural solutions are used for both symbolic and functional reasons.





Aside from this architectural definition, the entry space can bring a totally different experience when adding to it the everyday element. In action, the entry space is usually the most under-designed space in the mosque (Mokhtar, 2009). This space involves putting-off the worshippers' shoes and carrying those in hands for safekeeping from theft. Simultaneously, other users collect their shoes from the racks and put them on, making this space often busy and congested. The situation becomes worse at the end of prayers or after the Friday congregation where a large number of worshippers try to leave the mosque immediately after the prayer. Additionally, the process of taking off and putting on shoes may not be convenient to elderly people who cannot easily stand on one foot while a large amount of human traffic is moving, let alone people with disabilities. Moreover, a big part of the design of the mosque's entry space is about keeping shoes safely without violating the sacredness of the mosque (Figure 3). This trivial problem is also a big headache for the worshippers, who keep thinking about their shoes while praying!! As the researcher Sheikh Muhammad Najrul Imam summarizes this situation:

"It is an irony of fact that shoe-thieves have played a vital role to set design criteria for the entry space."

(Imam, 2000)



FIGURE 3

The entry experience in action.

(The Author)





Another issue associated with the entry space is its relations with the complex zoning and circulation connections with the mosque wet zone: the ablution/toilets. This zone involves taking off shoes and go to the wet zone to perform the ablution routine, then move to the prayer hall, or visit the bathroom, which typically necessitates a visit to the ablution space, and then go to the prayer hall. This process also involves putting on communal slippers to walk to the toilet space and sometimes other communal slippers for the ablution – a confusing as well as unsanitary situation (Mokhtar, 2003, 2005).

Architecturally speaking, this is a very complex logistical situation that architects face and cannot just simply solve by creating a wide entry or by making the shoe-changing area large and wide enough to mitigate the problem. Researchers such as Nofel and Mokhtar recommended that the design should provide sufficient space in front of each shoe rack to allow the simultaneous activity of one person taking off his/her shoes, one person putting on his/her shoes, and one person moving (Mokhtar, 2005, 2009, 2010; Nofel, 1999). This requirement translates to a space width of around two meters in front of each shoe rack as well as the provision of as many seats as the space allows (outside the suggested two meters). Other specific recommendations target the ablution and toilet spaces (Mokhtar, 2003, 2005; Nofel, 1999). Traces of these recommendations can be found in different building guidelines for mosques in some Muslim cities, however, architects are still short of applying these recommendations and testing their validity in a large and documented scale.

The Dynamic Prayer Hall

After the entry experience, the users move to the main event of the mosque typology: the praying hall. Historically, three generic forms appeared to accommodate the prayer hall: the pillared rectangular *riwaq* in hypostyle mosques, in the *iwans* in the mosque/madrassa design, or in the square domed praying halls such as in Persian and Ottoman mosques (Behrens-Abouseif, 1992). The praying hall is simply a large open space, empty of furniture, used for the performance of prayers. The main target for the praying hall is to host the five daily prayers as well as Friday congregation prayer. Several activities can be performed simultaneously in the prayer hall: starting or joining a group prayer, praying alone, sitting on the floor reading the Qur'an or carrying out a similar quiet activity.





The praying hall also accommodates other activities such as “*taraweeh*”, “*tahajud*”, and funeral prayers, in addition to study lessons, Ramadan breakfasts “*iftar*”, marriage ceremonies, *Eid* prayers, and celebrations, to name a few.

On the other hand, the praying hall has also certain particularities that can be a clue for a creative approach. These may include the logistics of organizing the entry movement and exit of a large number of people in close time intervals; specific requirements such as avoiding the crossing in front of other praying people, the proper evacuation of the mosque after congregation prayers, as well as the management of certain praying requirements such as for those who may need special assistance (e.g. praying on a chair) or those who have children with them. These also include the preference to see the *imam* in the Friday speech (*khutbah*) in order to get the full message, the overall experience, facial expressions, body language, etc. not just listening to the speech (Hoffman, 2010). These may also include the logistics of second *jama’ah* for those who came late to the formal praying time without interfering with other praying people or those who want to leave immediately after the prayer. Other instances may include users who finish group prayer earlier than others specially if in the front rows, with the result that they have difficulty in leaving the prayer hall without passing in front of those in the back rows who have not yet finished praying or late-comers arriving at the mosque after the congregational prayer has started (Figure 4).

One suggested design solution tried to target this issue by having a perimeter zone in the prayer space of different – and usually cooler – flooring material. This difference in material is aimed to give users an indication that the zone is not part of the prayer area and should be kept free of people at prayer, thus allowing those in the front to leave via this zone (Mokhtar, 2009). Again, this issue has not been properly defined as part of the brief of the mosque and hence most of the suggested solutions have become a “nice-to-have” requirements and not an essential part of the brief.



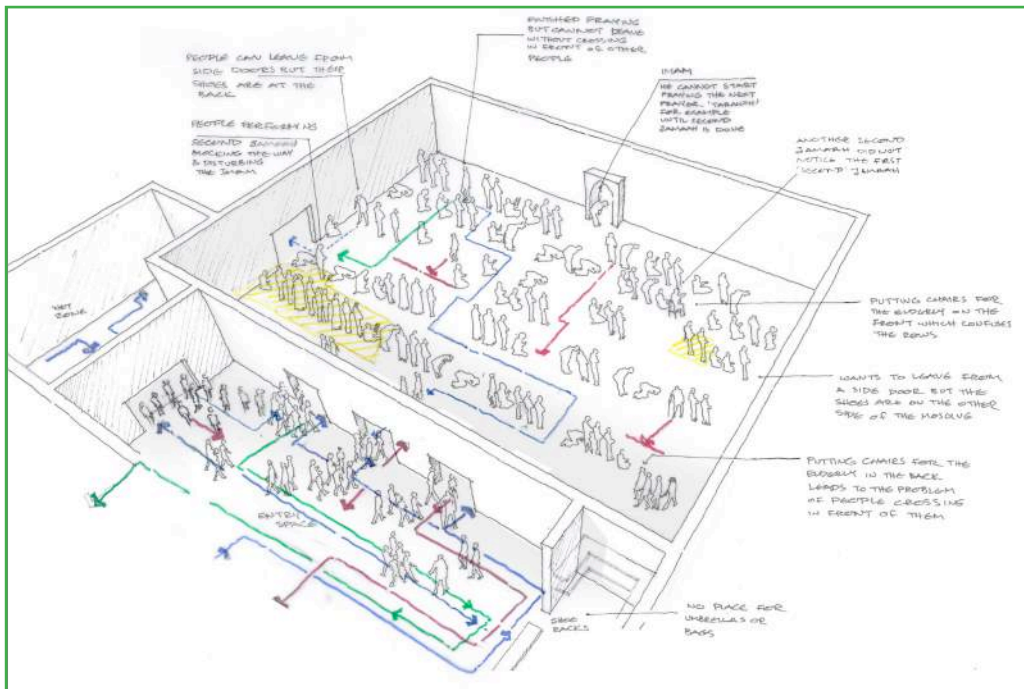
**FIGURE 4**

Diagram of the Dynamic Prayer hall.

(The Author)

DISCUSSION

The two examples presented act as quick pointers on some of the complexities found in contemporary mosques and show some clues that can direct a new understanding of the mosque architectural brief. The inevitable problematic relationship between the above-mentioned spaces is one of the main causes of uncomfortable experiences of many users at mosques. The different activities happening within the praying hall require a generous level of flexibility in the space which has created many circulation problems among worshippers who use the space and mainly when leaving the praying hall. If we add to this, the entry and ablution zoning requirements, we can see how complex the function of the mosque is.

Not much has been written about the complexities of the brief of the mosque. There is relatively limited literature that focused on the issues of the mosque's brief from an architectural point of view compared to those about the formal and symbolic expression of the type or others that are centrally historical or jurisprudential. This functionally-focused literature





is usually found in small bits in architectural standard and metric books and in the guidelines and building regulations documents of Muslim cities. Few academic literatures focused purely on tackling the brief part of the mosque without immersing itself in the mazes of the jurisprudential side of mosque design. Among these literatures, the works of Mohamed Hassan Nofel and Ahmed Mokhtar from the late 1990s and early 2000s act as the central source for several mosques' guidelines and other academic literature that were written afterwards. These are valuable sources to the topic; however, their focus is more on providing general guidelines and specific recommendations for certain spaces in the mosque but not as part of a broader conceptual approach for a philosophy that guides mosque design. Additionally, even with the few recommendations found in some guidelines and literature, still, more work needs to be done in the area of defining the different activities happening within the mosque space and hence informs the architectural brief of this building typology. By targeting these activities as a central part of the brief, new solutions can be found and a more meaningful development of the mosque can be achieved.

CONCLUSION

Architects need to approach the mosque typology with deep and multi-layered levels of thinking that focus on the expression of its rich functionality side-by-side to their focus on its imagery and metaphoric qualities. They need to properly reflect on the actual needs of the space, proposing an architecture unisolated from the everyday function; an architecture that does not restrict itself to the high culture. While these needs may seem almost trivial, they, among various others are evident and often reproduced in most of our mosque design. But what we should learn from Henri Lefebvre and Jeremy Till is to banish the fear from such trivial "everyday". Rather, the "everyday" should be the site to find the extraordinary within the ordinary. As Till states, if one is prepared to look, the everyday is the place where the creative energy is stored in readiness for new creations (Till, 2013).

Till argues that there is an understandable urge among architects to escape the ordinary and to look for inspiration, to the special, to the formal, the symbolic and to the extraordinary. *"But what if that original content does not always lie beyond the everyday but actually within it?"* Till therefore calls for adopting the notion of "creative brief" which aims to bring to the fore the different social and cultural aspects as well as everyday routines that are associated with any certain building typology to allow them to be negotiated through spatial design. The creative brief is about negotiating





a new set of social relations, it is about juxtapositions of actions and activities, a possibility to think outside the norm in order to project new spatial and social conditions. As Till argues, if the architectural concept and its tangible outcome of space and form are defined as the activity of making sense together of the different design conditions, then a creative brief is the full force that allows addressing the complete range of conditions with which the design of any building typology might be involved (Till, 2013). This process of re-visiting the brief may help resisting the immediate rush of visual stimulation that is associated with contemporary mosque design – a rush which has proved addictive to architects over the ages but does not have a long-term profound effect. Finally, as Lefebvre may describe it, for the mosque to be a “lived” space, it needs investment in the repetitive practices of its users. This will move mosque architecture from focusing on creating static and complete beautiful objects into approaching them as “lived” spaces that keep developing, accumulating traces of the past, refining its present incompleteness, and thus orientated toward a significant development in the future.

ACKNOWLEDGMENT

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HOW CHILDREN USE SPACES IN THE *MASJID*?

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MASJID AND CHILDREN

THIS study focuses on two main domains which are *masjid* and children. The term “*masjid*” originates from the word “*masajid*” which is the plural of “*sajada*” – which brings the meaning of prostration with full respect and obedience¹. While Mohamad Tajuddin agreed in his book that the definition of a “*masjid*” derived from an Arabic word “*masjid*” as the root word of it is “*sajd*” means to prostrate. In Islam, the act of prostration is praying. This explains why the main activity of the *masjid* is a congregational prayer. Furthermore, the word “mosque” as understood by today’s architectural term as a religious building for a Muslim². Besides as the place for worship, the functions of has been evolved since the era of the Prophet Muhammad PUBH as a centre of spiritual contents and a platform of communication, and it develop the unity and brotherhood among the Muslim communities. Besides that, many studies have shown that *masjid* has served many functions such as the centre for the community, educational institution, the economic hub, healthcare institution and accommodation centre for the Muslim community^{3, 4, 5, 6}. In Islam, the term “child” refers to a person who has not reached puberty or *baligh*. Before children reach an age of puberty, they go through a stage of pre-*mumayyiz* and a stage of *mumayyiz*. The pre-*mumayyiz* stage begins from the moment a child is born until the age of seven. The *mumayyiz* stage will begin when the child reaches seven or eight years of age. It is the age at which a child can distinguish between rights and wrong⁷.

Childhood is a critical phase of the human being as this is the period whereby they absorb and adopt values in life. There is a Malay proverb which says, “Melentur buluh biarlah waktu rebungnya” and its direct translation would be “bending bamboo must be done since its shoot”. This analogy is





used to portray that sharpening the character and the kind of person of a child would be must be started from his/her tender years. Thus, understanding the stages of development of children according to their age and ability in order to recognise the best approach in educating and nurturing values in their life is deemed very important. As for the Muslims, this can be done by following the guidance from al-Qur'an, *Sunnah*, the Muslim's Scholar perspectives and also from the contemporary world's views. According to Tahir⁸, childhood is considered the best period to shape and develop their personality, physical, and emotions. Therefore, bringing children to *masjid* is one of the many steps to develop a good Muslim as it becomes difficult for children to develop socially adept as adolescent and adults if the developmental tasks of social competence such as trust, self-awareness, self-esteem, interpersonal communication skills, pro-social attitudes, and behaviours, friendship dispositions and skills, self-discipline and self-regulation are ignored⁹. Hence *masjid* can be seen as one of the vital institution for children's development as suggested by Dr. Abdullah Nasih Ulwan – the leading scholar on children's early education from the perspective of Islam, where he mentioned that there are three suggested physical places for children's education, namely the home, the *masjid*, and the school¹⁰.

ISSUES, AIMS, AND BACKGROUND OF THE STUDY

The issues are also derived from the two domains of this study as discussed below.

Social Issue

It has been mentioned that the concentration of *jama'ah* in the *masjid* is disturbed by the behaviour and activities of children. Some *jama'ah* also may perceive that *masjid* is supposed to be a place of serenity that specific noise is taken negatively. A situation which was reported in Malaysia by Azmi¹¹ where a mother and her children were cast out by a member of the *jama'ah* because that person personally felt children is not allowed to be in *masjid* assuming that they were not clean. Seeing children as physically unclean and therefore, they should not be in a *masjid* is somewhat extreme as usually the "noise" that they are making is the primary concern. A similar case where a child was lifted out of *masjid* was reported in Indonesia where Mrs. Gheny Purbo whined that her three years old son treated as such – he was placed outside the prayer hall by other *jama'ah*. The child was said to disturb other *jama'ah*'s focus¹². Such incidents took place could be due





to the society being ignorance on the importance of exposing children to *masjid* from their tender years. *Masjid* should be a community place that includes parents and their children to build a relationship with others. Thus it is hoped that *masjid* would assist them in developing good characters of a Muslim. If the society keeps on neglecting the importance of children to be in the *masjid*, acquainting *masjid* to them at a later stage would not be effective or very challenging¹³.

Physical Issue

Several studies indicate that the *masjid* design in Malaysia focuses on space functions and its architectural influences rather than the social needs of the users^{2, 14, 15}. Some *masjid* in Malaysia has started to build a tall fence and even being locked². Hence, making *masjid* exclusive to certain people and activities. At least, this would be the impression or message conveyed to the society.

During the era of the Prophet (PBUH), the *masjid* welcomed everyone. Mohamad Rasdi also commented on the trend of building a large *masjid* in Malaysia as if the size would determine the grandness of Islam and that *masjid* is seen as a physical product rather than fulfilling its function as a community centre. On the size, he believes that a medium-sized *masjid* would propagate brotherhood of Islam as it increases the chances for the people to know each other. When a *masjid* is very big, the personal space would be more extensive. It may widen the physical gap that discourages people from talking to each other. He went on suggestions on how the *masjid's* compound can be utilised to maximize its functions in bringing the society together while avoiding isolation.

In the present day, *masjids* in Malaysia are governed by the Islamic Council of every state. Some agencies have come out with Masjid Design Guidelines. This can be observed in documents such as the Malaysian Standard MS2577:2014 – *Architecture and Asset Management of Masjid – Code of Practice* by the SIRIM Malaysia, the *Draf Garis Panduan Perancangan Masjid dan Surau* by the Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia; and *Garis Panduan dan Peraturan bagi Perancangan Bangunan 2015 Edition* by the Economic Planning Unit, Prime Minister Department. Therefore it may seem the lack of deliberation in terms of space provision and the layout of the *masjid* to cater the needs of children and their families in the existing design guidelines has discouraged the presence of children in *masjid*. The existing design guidelines may only focus on the average person who is the adult as the target user.



Purpose of the Study

This study aims to observe children's whereabouts, behaviour, and activities concerning the spatial layout of the *masjid*. Observing how children use the space according to their nature shall help to understand their needs in *masjid* better.

Background of the Study

In studying on *masjid* and children, two main domains are being focused, which are the physical design of the *masjid* and the nature of the children. These two domains are then connected to understand the current and typical design of *masjid* and how children use and behave within the spaces in *masjid*.

Physical Design

In terms of space provision and the layout of *masjid* in the existing design guidelines, a deliberation might be overlooked as *masjid* to cater to the needs of children and their families. The existing design guidelines may only focus on the average person who is the adult as the target user. Based on the three existing documents that touch on the design of *masjid* in Malaysia^{16, 17, 18}, the essential spatial development requirement for *masjid* can be summed up in Table 1 below.

TABLE 1
Basic elements in *masjid*.

<i>Main component</i>	<i>Islamic perspectives</i>
<i>Qiblah</i> direction	One of the valid condition in prayer
Prayer hall	Clean, tranquil, can perform congregational prayer
Ablution	Obligatory – cleanliness before pray
<i>Mimbar</i>	For <i>khutbah</i> (sermon), sense of authority
<i>Mihrab</i>	Indicates the direction of Ka'bah
Minaret	Call to perform prayer and symbol of Islam

These main component reflect the must-have elements that complement the routine of the significant function which is praying. Other areas are also being added to support other activities. In Malaysia, some of the *masjids* are facilitating the religious studies or known as KAFA – Kelas al-Qur'an dan

Fardhu 'Ain for school children which is under the purview of the religious department. Classrooms within the *masjid's* building or totally in a separate building within the *masjid* compound are provided for this. Some *masjids* also have halls for the use of the surrounding community for various social activities such as a wedding.

Nature of Children

Playfulness is a progressive trait that leads to a sense of bliss and joy. The opportunity to play freely, or playfulness, contributes to psychological health, learning and more productive life¹⁹. This statement suggests that it is the permanent nature of a child that all adults must accept. Early childhood is a crucial period of development, starting from birth until eight years of age. It is critical to the healthy cognitive, emotional, and physical growth of children. The rapid development of a child's brain starts in the prenatal stage and continues after birth²⁰. The following Table 2 is the summary of children's capabilities according to age and their needs.

TABLE 2
Children's capabilities according to age and needs.

Skills	Age		
	0–6	7–10	11–14
Cognitive	Developing, concentrating, difficulty in differentiate.	Understanding more, better to differentiate, and develop problem solving.	Capable of adult-like abstract and logical thought.
Behavioural/ Physical	Learning by doing, repetition, developing motor skills.	More independent, learning to follow instruction	Increasing independence and breaking away from adult authority.
Social/ Emotional	Dependency, frightening, playing with each other's.	Friends are needed. Learning about right and wrong. Developing exclusionary and stereotyping behaviours.	Often influenced by peer culture.
Communication needs	To know they are loved and safe, to feel good.	To test their skills and to have their feeling understood.	To be informed and guided into adult life, including about behaviours.

Meanwhile, there is a scholar who described child's development from the perspective of psychology²¹ – refer to Table 3.

TABLE 3
Children's development from psychology views.

Early childhood stage (2–5 years)	<ul style="list-style-type: none"> • Increase in skills and strength related to bodily movement. • Cognitive immaturity, playfulness, creativity, and imagination further develops.
Middle childhood (6–12 years)	<ul style="list-style-type: none"> • Sporting strength and skills increases. • Self-concept redevelops. • Peers of similar age become a main importance in life.
Adolescence (13–20 years)	<ul style="list-style-type: none"> • Physical changes accelerates and become apparent, ability to think. • Finding self-identity becomes their priority. “Adolescent egocentricity” sometimes remains in certain behaviour.

The outlined criteria shall help us to understand children better – socially, physically, emotionally, and psychologically. Understanding the needs of children will lead to higher tolerance of their behaviour.

Children and Masjid

One of the top Muslim's scholar, Imam Al-Ghazali explained that a child is God's gift entrusted to the parents to bring up the child and shape the heart and the mind of the child who is still pure and untainted to become a precious and valuable person.

“No child is born except on *al-fitra* (Islam or primordial human nature), and then his parents make him Jewish, Christian, or Magian, as an animal produces a perfect young animal: do you see any part of its body amputated?”²²

This *hadith* states that Allah has created children pure, sinless, and with a natural tendency for good and a belief in the one God. No child has any intention of doing wrong except that he is only imitating or applying what he has seen, heard, felt, and learnt from his environment.

The presence of children in a *masjid* in Malaysia has been discussed by the members of the society and expert at official and unofficial platforms. Mainly the issue is on the unsuitability of their presence at *masjid* as the children's activities are said to disturb others²³. Harsh action such



as preventing young children from entering the main prayer hall of the *masjid* is also reported, while some signs show children are prevented from coming to *masjid*.

Thus, the Mufti of the Federal Territory, Dato' Dr. Zulkifli bin Mohamad Al-Bakri gives a lengthy explanation on this through his article entitled “Masjid dan Kanak-kanak” in *Bayyan Linnas* number 63²⁴. Children friendly *masjid* will have a physically and socially positive environment that would welcome and make children comfortable being at the *masjid*. The opportunities to know the Creator better is essentials as *masjid* is the most suitable place to get the chance²⁵. Hence, their faith, character, and *akhlaq* (behaviour) towards becoming a good Muslim will be strengthening. A quality individual would form a good quality society towards secure nation-building. Having strong faith and good *akhlaq* would hinder a person from falling into immoral activates.

METHODOLOGY

This study mainly discusses two significant elements which are children's behaviour and the spaces they usually occupy in the *masjid*. Thus, the techniques applied for the data collection for this study are site inventory and analysis and structured observation. Nine *masjids* are identified as the case studies sites – namely: Masjid Al-Akram (AA), Masjid Muadz bin Jabal (MBJ), Masjid Abu Ubaidah Al-Jarrah (AU), Masjid Ar-Rahimah (AR), Masjid Saidina Abu Bakar (SAB), Masjid Imam Al-Ghazali (IAG), Masjid Al-Khairiyah (AK), and Masjid Sultan Hj. Ahmad Shah (SHAS), UIAM Gombak. Eight *masjids* are in the residential area while Masjid Sultan Hj. Ahmad Shah, IIUM is in campus area which caters the campus community. The *masjids* are selected based on the typology of the *masjid*, which is urban communal *masjid* with seven *masjids* are in Kuala Lumpur, and the other two are in Selangor. The process of data collection is described below:

1. site inventory and analysis; and
2. structured observation.

Site Inventory and Analysis

Site inventory and analysis – is aimed to investigate the physical design and spatial layout of the nine *masjids*. Site visits were conducted to first observe the physical aspects of the *masjids*, such as the main and supporting spatial areas. An inventory list of these spatial areas is prepared. Photos



are taken, and the layout of the spatial areas is drawn diagrammatically to show the spatial organization, circulation, and functions of the *masjids*.

Structured Observation

Structured observation is an observation of specific events, for instance, whereby a guide is planned. The structured observation for this research aims to map the children whereby their whereabouts, number, and activities while in *masjids* are recorded. These shall help to understand better how they utilise spaces in *masjids*. Enumerators are engaged as the observation involved more than a space in the *masjid* at a time. The layout of the *masjids* prepared earlier was used to indicate the locations of the children. Photos are taken to record their activities. The structured observation was done during *taraweeh* prayer with three sessions of 15 minutes duration each and 10 minutes interval in between. The observation took place in Ramadan because it is considered as the liveliest month at the *masjid* in Malaysia and all around the world, and more children can be seen in *masjids*. “When Ramadan arrives, the gates of Paradise are opened, and the gates of hell are locked up, and devils are put in chains”²². Thus, the Muslim seems to be more engaged with *masjid* than in other months to increase their good deeds during Ramadan. The behavioural map was to be produced.

FINDINGS AND DISCUSSION

Data from the site inventory and analysis and structured observation are screened and analysed. As mentioned earlier, the layout plan of the *masjids* is prepared. It helps to understand the spatial organization, circulation, and functions of spaces in these *masjids*.

TABLE 4
Physical findings from the selected *masjids*.

	AA	AU	MBJ	KGB	AR	SAB	IAG	AK	SHAS
Area (m ²)	7,875.9	14,323.0	8,284.7	6,818.7	9,256.6	5,515.2	21,918.3	6,997.6	15,210.0
Floor level	2	2	2	3	3	3	1	3	4
Carrying Capacity	3,000	4,000	3,000	7,000	4,000	3,000	5,000	4,000	9,000
Ratio of carrying capacity	0.28:1.0	0.44:1.0	0.33:1.0	0.78:1.0	0.44:1.0	0.33:1.0	0.56:1.0	0.44:1.0	1.0:1.0

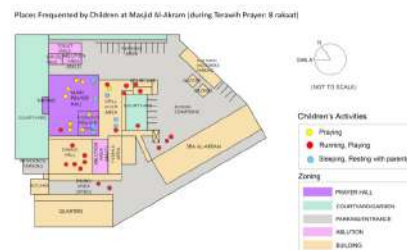
Table 4 shows the floor area, number of floor levels, and the carrying capacity of each case studies *masjid*. This provides some idea of the size of the *masjids* and the number of *jama'ah* they can cater. It can be seen that the Masjid SHAS is the largest, while the smallest *jama'ah* carrying capacity is 3,000. In order to relatively compare the carrying capacity, the ratio is calculated by dividing the carrying capacity of each *masjid* with the Masjid SHAS. The result indicates the approximation of the ratio to the Masjid SHAS. The prepared layout plan is then used for the behavioural mapping of the children in the *masjid*. The followings are the findings and discussion.

Spatial Organization and Behavioural Mapping

The spatial organization of the *masjids* are analyzed and zoned, as shown in the following Figure 1 until Figure 9. On the same layout, the behavioural mapping of the observed children is indicated and can be classified into three types of activities which are praying, running and playing, and sleeping and resting.



Masjid Al-Akram, Kg. Dato' Keramat



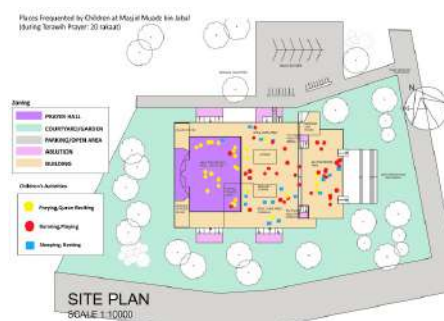
Layout of Masjid Al-Akram

FIGURE 1

Behavioral mapping at Masjid Al-Akram.



Masjid Muadz bin Jabal, Setiawangsa



Layout of Masjid Muadz bin Jabal

FIGURE 2

Behavioral mapping at Masjid Muadz bin Jabal.



MOSQUE ARCHITECTURE: PRESENT ISSUES AND FUTURE IDEAS



Masjid Abu Ubaidah Al-Jarrah,
Taman Sri Rampai



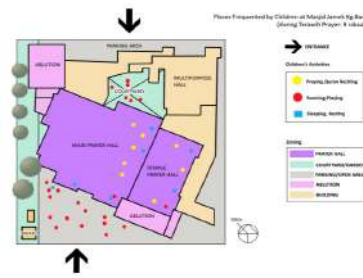
Layout of Masjid
Abu Ubaidah Al-Jarrah

FIGURE 3

Behavioral mapping at Masjid Abu Ubaidah Al-Jarrah.



Masjid Jamek Kg. Baru



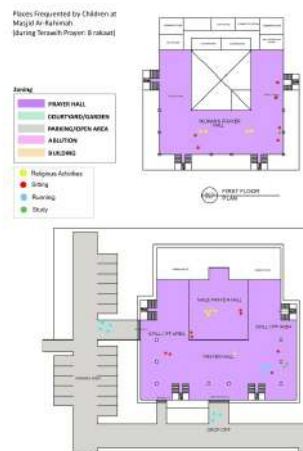
Layout of Masjid Jamek Kg. Baru

FIGURE 4

Behavioral mapping at Masjid Jamek Kg. Baru.



Masjid Ar-Rahimah, Kg. Pandan



Layout of Masjid Ar-Rahimah

FIGURE 5

Behavioral mapping at Masjid Ar-Rahimah.

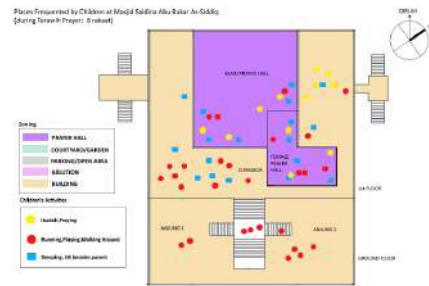




SPACE AND BOUNDARIES



Masjid Saidina Abu Bakar As-Siddiq,
Bangsar



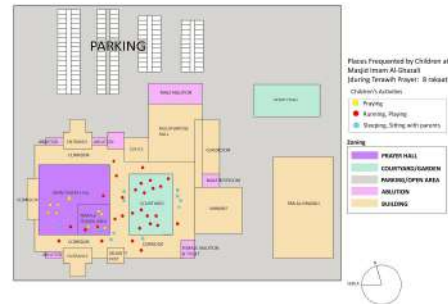
Layout of Masjid
Saidina Abu Bakar As-Siddiq

FIGURE 6

Behavioral mapping at Masjid Saidina Abu Bakar As-Siddiq.



Masjid Imam Al-Ghazali,
Bandar Sri Menjalara



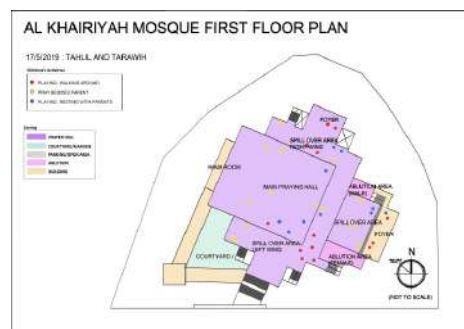
Layout of
Masjid Imam Al-Ghazali

FIGURE 7

Behavioral mapping at Masjid Imam Al-Ghazali.



Masjid Al-Khairiyah,
Taman Sri Gombak



Layout of Masjid Al-Khairiyah

FIGURE 8

Behavioral mapping at Masjid Al-Khairiyah.





Masjid Sultan Hj. Ahmad Shah,
UIAM



Layout of Masjid
Sultan Hj. Ahmad Shah, UIAM

FIGURE 9

Behavioral Mapping at Masjid Sultan Hj. Ahmad Shah, UIAM.

From Figure 1 until Figure 9, the number of children with their activities can be visually seen. Several impressive results are obtained. In terms of the number of children's presence, Masjid Ar-Rahimah seems to have the least while Masjid Sultan Hj. Ahmad Shah had the most significant number of children. This could be due to the size of the Masjid Sultan Hj. Ahmad Shah itself. It was also reported that this *masjid* is said as one of the Top 10 most child-friendly *masjid* in Klang Valley²⁶. As for Masjid Ar-Rahimah, one of the committee members once mentioned that they had warned children not to be playing in the main prayer hall and not to make any noise. Another interesting result is Masjid Jamek Kg. Baru whereby quite many children were observed playing outside the *masjid's* building – at the main entrance area.

TABLE 5

Activities of the children based on the percentage (%).

	AA	Au	MBJ	KGB	AR	SAB	IAG	AK	SHAS
Praying/Religious activities (%)	25.0	34.7	21.1	21.6	25.0	19.3	19.6	43.9	29.1
Playing/Running/Wandering (%)	52.8	43.1	52.6	59.5	27.8	49.1	58.8	31.7	36.7
Sitting/Sleeping (%)	22.2	22.2	26.3	18.9	50.0	31.6	21.6	24.4	34.2

From Table 5, it can be said that almost $\frac{1}{3}$ to $\frac{2}{3}$ of the children observed at these s would be playing and running around. These reflect the normal behaviour of children of being active and playful. It is interesting to see

that the percentage of the children that were praying or doing religious activities is quite high at the Masjid Al-Khairiyah. Almost $\frac{2}{3}$ of the observed children at the Masjid Kg. Baru was playing/wandering, and as mentioned earlier, most of them were observed at the parking area. As for the Masjid Imam Al-Ghazali, the number of children playing/wandering was also high (58.8%), and this could be due to the availability of the wide courtyard that is located quite near to the main prayer hall. It may be perceived as “an open field” to the children. 50% of the children at Masjid Ar-Rahimah were observed doing passive activities such as sitting or sleeping (this *masjid* has the least number of children observed as mentioned earlier).

From the behavioural mapping, on average, the most dominant spaces occupied by children can be summarized, as shown in Table 6 below (in ranking 1–4). It can be said that these children are comfortable in these four areas. This could be due to the spatial arrangement of these spaces as the children are still in the visible distance to their parents, and the wideness of these spaces attracts them.

TABLE 6

The most dominant spaces occupied by children.

Most dominant spaces occupied by children in <i>masjid</i>	1	Prayer hall
	2	Building corridor
	3	Courtyard
	4	Open area

As for dominant activities of the observed children, it can be summarized, as shown in Table 7 (in ranking 1–3). These type of activities are common among young children, as mentioned by UNICEF²⁰.

TABLE 7

The most dominant activities by children in *masjid*.

Most dominant children's activities	1	Praying
	2	Playing/running
	3	Sitting/sleeping

In terms of the most apparent activities in the most dominant spaces occupied by children, the result is shown in Table 8. Playing/running is very synonym with children. It is their desire and their nature. However, they can

be reminded to control their behaviour from time to time to help discipline themselves and to nurture them to respect others in the *masjid*. This is where the roles of adults are important to help shape their behaviour and mindfulness.

TABLE 8

The most obvious activities in the most dominant spaces occupied by children.

	<i>Praying</i>	<i>Playing/Running</i>	<i>Sitting/Sleeping</i>
Prayer hall	✓	✓	✓
Open area		✓	
Courtyard		✓	✓
Building corridor	✓	✓	✓

Visual Recording (Photos)



(a) In between the adults



(b) At the corner of corridor



(c) Special *saff* (row)

FIGURE 10

Children praying: (a) Masjid Al-Khairiyah; (b) Masjid Imam Al-Ghazali; and (c) Masjid Jamek Kg. Baru.

Based on the visual recording, some scenes are turned into still images. Activities of these children can be seen. Some of the children were praying the prayer hall or at the corridor. At the Masjid Jamek Kg. Baru, it can be seen that the masjid came out with the approach of segregating the *saff* (row) of adult and children where children were placed at the back of the main prayer hall.



(a) Main Entrance



(b) Courtyard



(c) Inside the prayer hall



(d) At the corridor of the *masjid*

FIGURE 11

Children playing: (a) Masjid Jamek Kg. Baru; (b) Masjid Imam Al-Ghazali; (c) Masjid Sultan Hj. Ahmad Shah, UIAM; and (d) Masjid Muadz b. Jabal

As can be seen from the photos, children are comfortably running and playing. This is commonly observed at the prayer hall, corridor, and courtyard, and even at the open area outside of the building. Hence, this basic and regular needs of children could be integrated with the spatial arrangement of the *masjid* as an approach to attract young children to come to *masjid* from their tender years. From the observation, it can be suggested that Masjid Imam Al-Ghazali and Masjid Sultan Hj. Ahmad Shah seem to be very inviting for children as they have good numbers of children's presence at these *masjids*.





(a) Children seating in a group



(b) Children seating besides their parent



(c) Children gather at the back



(d) A child playing with gadget at the corridor

FIGURE12

Children sitting together with friend and besides parents:
(a) Masjid Abu Ubaidah Al-Jarrah; (b) Masjid Sultan Hj. Ahmad Shah, UIAM; (C) Masjid Al-Akram and (d) Masjid Ar-Rahimah.

Besides praying, playing, sleeping, and running, some children were seen comfortable by just sitting with their friends, observing people, while the younger children would normally be beside their parents.

CONCLUSION

From this study, it can be concluded that children act in the *masjid* accordingly to the needs of their development stages. One cannot assure a child to stay at one point in a long duration. Thus, there is a great need for the *jama'ah* and *masjid's* management to understand the children behaviour in order to facilitate them and be tolerant with them. In terms of spatial design, indeed there is a need to provide specific space for active children and very young

children at *masjid* so that the needs of parents to come to the *masjid* can be facilitated too. This is also to ensure other *jama'ah* members are not distracted as to create harmony among various members of the *masjid*. The safety of the children should be given the utmost attention.

This study has provided some insight into the needs of children in the *masjid*. It is recommended to study further why at particular *masjid* the number of children is quite small. As for *masjid* with a good number of children, it can be further investigated by the factors that seem to be inviting these children.

ACKNOWLEDGMENT

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PHYSICAL DIMENSION OF *MASJID* – TOWARDS CHILDREN FRIENDLY *MASJID*

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MASJID AS THE CENTRE FOR COMMUNITY

THIS study emphasis on the *masjid* as the centre for the Muslim community and the physical design of the *masjid* shall complement the purpose of the *masjid*. Thus it should address all walks of life, including children as they are part of the community and users of the *masjid*. The presence of children at *masjid* has been discussed by many particularly during the month of Ramadan as more families will bring their children to the *masjid* and for a more extended period than other months. Some perceived it as positive while others may not be comfortable with the presence of children at *masjid* as it is said as distracting the focus of other *jama'ah* (congregational) members. This shows a different level of acceptance and tolerance of the *jama'ah* members towards children in the *masjid*. Sabri¹ in his writing expressed his great concerned that if this issue is not well addressed, children may not be in *masjid* anymore. Should this happen, the future generation is at high risk. He also outlined a few suggestions that require physical design considerations, including the provision of a nursery to ensure the safety of children, and the provision of specific prayer area for parents/guardians with small children. From his comments and suggestions, it can be seen that the approach of the physical design of *masjid* needs to be revisited. The existing guidelines concerning *masjid* and *surau/musolla* which are the Malaysian Standard (MS) 2577:2014) – Architecture and Asset Management of Masjid – Code of Practice; by the SIRIM Malaysia², the *Draf Garis Panduan Perancangan Masjid dan Surau* by the Jabatan Perancangan Bandar dan Desa (JPBD), Semenanjung Malaysia³; and *Garis Panduan dan Peraturan bagi Perancangan Bangunan – 2015 Edition* by the Economic Planning Unit, Prime Minister Department⁴ may have overlooked on the needs of families with young children physically.





Masjid and the Muslim cannot be separated. It is clearly outlined in the Islamic regulations as a significant place, and thus, it has become an indispensable part of any Muslim settlement all over the world. The Muslim men particularly must try their level best to perform the obligated five daily prayers in congregation in *masjid*. Not only due to its multiplied rewards (twenty-seven times more)⁵: “Prayer in congregation is superior to prayer alone by twenty-seven degrees” (*Sahih Bukhari*, Book 11, No. 621), moreover this is where the members of the society shall get the opportunity to meet and know each other. Taking care of each other is among the fundamental teachings in Islam. Moreover, the *masjid* is the best place to nurture this among Muslims, particularly. Hence, *Masjid* – as the House of God, has an exceptional place in the life of the Muslims⁶.

The importance of *masjid* for the people to know and love Allah SWT, empower and unite the *ummah* (community) cannot be denied. Besides as the place for worship, the functions of *masjid* has been evolved since the era of the Prophet Muhammad (PBUH) as a centre of spiritual contents, a platform of communication, and it develops the unity and brotherhood among the Muslim communities. Besides that many studies shown that *masjid* had served many functions such as the centre for the community, educational institution, the economic hub, healthcare institution, and accommodation centre for Muslim community^{6, 7, 8, 9}.

ISSUES, AIMS, AND BACKGROUND OF THE STUDY

Issues and Aim of the Study

Many studies show the *Masjid* design in Malaysia is focuses on the space functions and its architectural influences instead on the needs of the users^{10, 11, 12}. Some of the *masjids* in Malaysia have a tall fence and even being locked. It is so to safeguard the *masjid*. However, at the same time it conveys the message to the society that *masjid* is very exclusive and only for specific purposes mean while during the Prophet (PBUH) era, *masjid* was physically open to welcome all¹¹. It is also said that a very big-sized *masjid* will lead to a degree of individuality of the *jama'ah*, and also unutilized space. It is perceived that a small-sized *Masjid* will encourage the community in the *kariah* to strengthen their brotherhood as they are likely to bump into each other more, and space would be fully utilized as a community centre. It can be observed that the various issues highlighted all these while might have not to address the needs of specific physical space design for young children. Therefore, there is a need to study the current physical design of *masjid* in an attempt to identify the inclusiveness criteria





of *masjid* that address the needs of children and their families. This is set as the aim of this study. To investigate the spatial configuration of spaces in the *masjid*. It is to relate the needs of children and their families as part of the users.

Background of the Study

Masjid's Architecture

Islam came to Malaya (named as Malaysia following the independence declaration in 1957) since the late 7th century. Since then, *Masjid* has evolved dynamically from architectural design to a rich range of vocabulary in its designs. The earliest *masjid* typology was believed to be built from timber. The roof is pyramidal in shape consists of two or three-tier with a long gable house type. It is the influence of the Nusantara archipelago coming from Java Land (Indonesia)¹¹. The earliest living *Masjids* were (18th century) the Masjid Tengkeru (Melaka) and Masjid Kampung Laut (Kelantan). They have fewer columns and more clearly defined open space for prayers focusing on the *qiblah* (the direction of the Ka'bah). The interior space is deliberately oriented towards the *mihrab* and *qiblah* wall developing a strong axis as a datum collecting the three areas; portal, veranda (intermediate space), and praying area spearheaded by the *mihrab* (a niche in the wall of a mosque, at the point nearest to Mecca towards which the congregation faces to pray). Most of them are categorized under vernacular Malay design.

In the middle of the 19th century, the construction material, and the appearance of *masjids* began to change as a result of the colonization. It is stated on the information board outside Masjid Pengkalan Kakap (Kedah) that the building of the *masjid* was built using limestone mixed with clay, coarse salt, egg yolk, and honey¹². Even though the overall look is different from other *masjids*, the interior organization is almost similar, with the exception that the floor level is not raised on stilts. It is also explained that *masjid* in Malaysia was built with three basic elements – the entrance, the prayer hall, and the veranda (shaded space provided to cool off outdoor air before entering the building). During the early 20th century, the British started using bricks as a base material for buildings. Thus, the architecture of *masjid* also started to change. In 1909, a British architect, A.B. Hubbock built Masjid Jamek Sultan Abdul Samad in full bricks that came from Brickfield. The design is influenced by Moorish and Mughal architecture¹². This shows that culture influenced the development of *Masjid* in Malaysia and has changed the architectural language. The evolution of Malaysia's *masjid* architecture is illustrated in Figure 1.



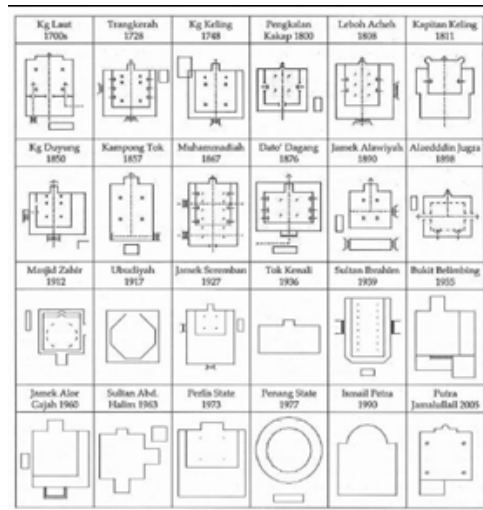


FIGURE 1

The evolution of *masjid* in Malaysia.

(Source: Othman, 2007)

Spatial Design

Based on the three existing design guidelines in Malaysia^{2, 3, 4}, the basic spatial requirement for *masjid* development can be summed up in the following Table 1.

Main Component	Islamic Perspectives
Qiblah direction	One of the valid condition in prayer
Prayer Hall	Clean, tranquil, can perform congregational prayer
Ablution	Obligatory – cleanliness before pray
Mimbar	For <i>khutbah</i> (sermon), sense of authority
Mihrab	Indicates the direction of Ka'bah
Minaret	Call to perform prayer and symbol of Islam

TABLE 1

Basic needs in *masjid*.

In terms of spatial organization, JPBD has outlined the appropriate spatial arrangement for the *masjid*, which is for 1,000 *jama'ah* capacity, the prayer hall/space need to be 1,000m² which is equal to 1m² for each person¹⁶. Below is the illustration of spatial arrangement in *masjid* prepared by JPBD in Figure 2.



Concepts of Spatial Relation and *masjid*'s Components.

(Source: JPBD)

As mentioned, the ideal personal space for each *jama'ah* is 1m^2 . This can be considered as sufficient as the approximate size of a standard prayer matt is 0.77m^2 . This would be the personal space of a person while praying as it is required for everyone to stand close while the shoulder is touching one and another. The primary activity of *masjid*, which is the congregational prayer, is aimed to develop unity and brotherhood among Muslims, and this is well translated in the manner of Muslims standing side by side. However, beyond congregational praying, the personal space of a person would be bigger. The personal space is important as one of the primary purpose for people going to the *masjid* is to perform *ibadah* in tranquillity in order to be focused/*khusyu'*.

In studying the physical attributes of the *masjid*, which include spatial configuration and space functions, site inventory and analysis, and observation techniques, are adopted. Seven *masjids* in the urban area of Kuala Lumpur were identified with the help of the Jabatan Agama Islam Wilayah Persekutuan, namely – Masjid Al-Akram (AA), Masjid Ar-Rahimah (AR), Masjid Abu Ubaidah Al-Jarrah (AU), Masjid Saidina Abu Bakar As-Siddiq (SAB), Masjid Muadz bin Jabal (MBJ), Masjid Imam Al-Ghazali (IAG), and Masjid Jamek Kg. Baru (KGB). The other two *masjid* selected *masjids* in Selangor are Masjid Al-Khairiyyah (AK) and Masjid Sultan Haji Ahmad Shah (SHAS), UIAM, Gombak. The former is well known for being very active in conducting various activities for society, while the latter is said to be liked by families with young children. All eight *masjids* are in the residential area while Masjid Sultan Haji Ahmad Shah is located in a campus setting. The site inventory includes identifying the spaces, and



their layout/spatial configuration, – indoor and outdoor. The observation helped to identify the space functions. The layout of these *masjids* has to be drawn diagrammatically due to unavailability of the floor plan at the *masjids'* office, except for the Masjid SHAS. These diagrams are sufficient to study space configurations. The dimension of the main praying area and other areas where it is also used to pray like the adjacent corridor was also measured to calculate the width using Laser Distance Meter (Leica DISTO, A2) – Figure 3. This is done to double-check the width of areas meant for praying.



FIGURE 3

Laser Distance Meter equipment used in the study.

FINDINGS AND DISCUSSION

Figure 4–12 shows the layout of the case studies *masjids*, including the width of the floor area, *jama'ah* capacity, and the calculated personal space of a person based on approximation (floor area/*jama'ah* capacity).



FIGURE 4

The layout of Masjid Al-Akram.



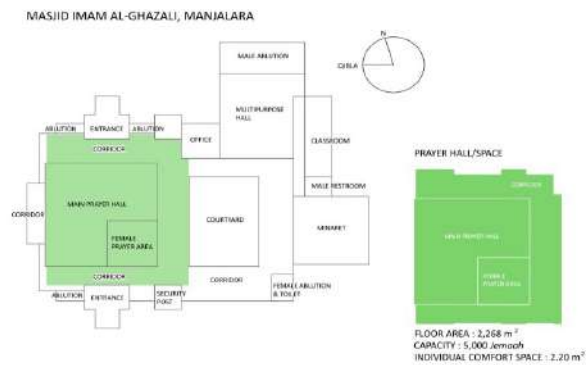


FIGURE 5
The layout of Masjid Imam Al-Ghazali.

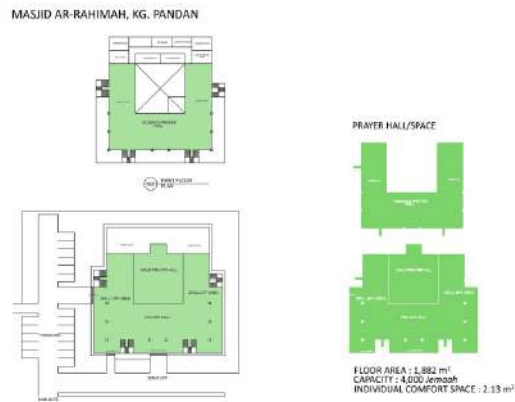


FIGURE 6
The layout of Masjid Ar-Rahimah.

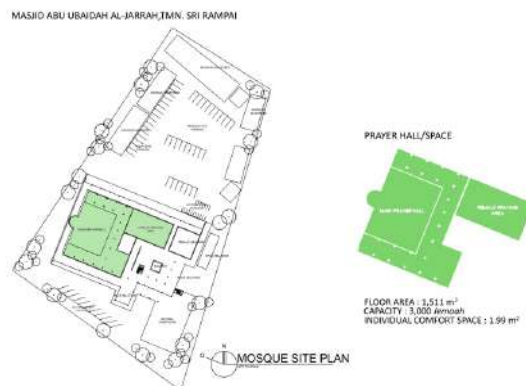


FIGURE 7
The layout of Masjid Abu Ubaidah Al-Jarrah.

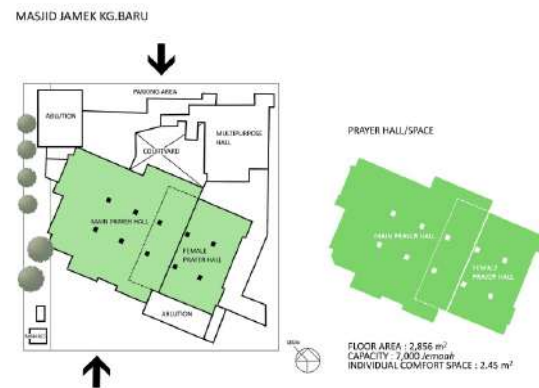


FIGURE 8
The layout of Masjid Jamek Kg. Baru.



FIGURE 9
The layout of Masjid Muadz bin Jabal.

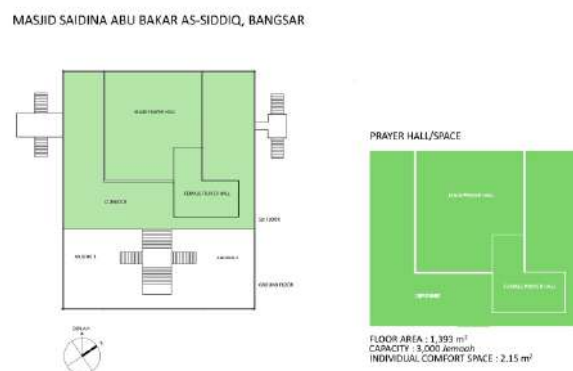


FIGURE 10
The layout of Masjid Saidina Abu Bakar As-Siddiq.



SPACE AND BOUNDARIES

MASJID AL-KHAIRIYAH, TMN SRI GOMBAK

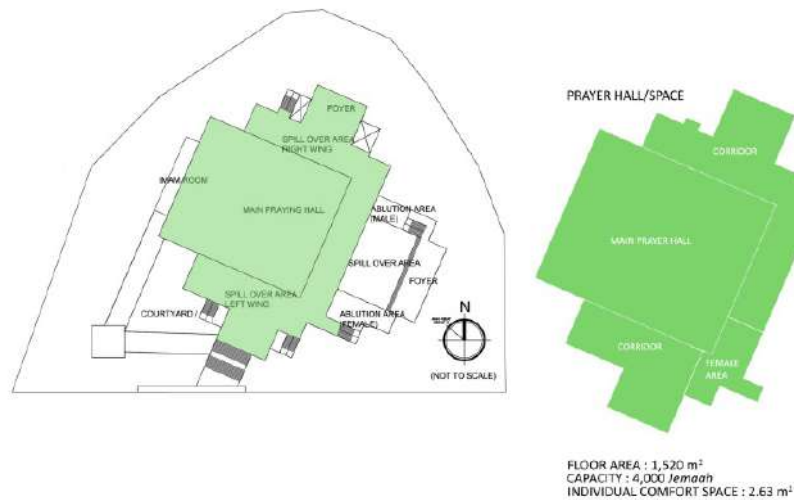


FIGURE 11

The layout of Masjid Al-Khairiyah.

MASJID SULTAN HJ. AHMAD SHAH, UIAM GOMBAK



FIGURE 12

The layout of Masjid Sultan Hj. Ahmad Shah, UIAM Gombak.

The following Table 2 is the analysis on the space dimension concerning the carrying capacity of the *masjids* as informed by the imam or obtained from the webpage of the *masjids*.



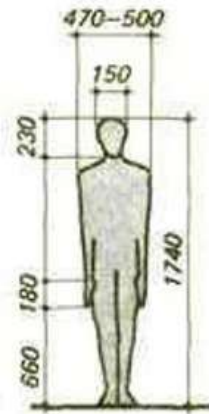
	AA	IAG	AR	AU	KGB	MBJ	SAB	AK	SHAS
Width of praying area (m ²)	1,080	2,268	1,882	1,511	2,856	1,900	1,393	1,520	5,192
Ratio of the praying area	0.21:1.0	0.44:1.0	0.36:1.0	0.29:1.0	0.55:1.0	0.37:1.0	0.27:1.0	0.29:1.0	1.0:1.0
Floor level	2	1	3	2	3	2	3	3	4
Maximum carrying capacity	3,000	5,000	4,000	3,000	7,000	4,000	3,000	4,000	9,000
Ratio of carrying capacity	0.28:1.0	0.56:1.0	0.44:1.0	0.33:1.0	0.78:1.0	0.44:1.0	0.33:1.0	0.44:1.0	1.0:1.0
Width/ person (m ²)	0.36	0.45	0.47	0.50	0.41	0.48	0.46	0.38	0.58

TABLE 2

Analysis of space dimension of the case studies *masjids*.

Most of the studied *masjids* have two and more floor levels except for Masjid Imam Al-Ghazali. Such a situation is typical for *masjids* in urban area due to the high population while the land area is somewhat restricted. Based on the width of the praying area and maximum carrying capacity, SHAS Masjid can be said as the largest *masjid* among all while Masjid Al-Akram is the smallest although its carrying capacity is similar to Masjid Abu Ubaidah al-Jarrah and Masjid Saidina Abu Bakar As-Siddiq. In order to relatively compare and contrast the width, ratio of the praying area is calculated by dividing the width of the praying area of each masjid with the width of SHAS masjid. Masjid Jamek Kg. Baru seems to have the second-largest ratio (after SHAS Masjid) while Masjid Al-Akram demonstrates the smallest ratio. In other words, the width of the praying area of Masjid Jamek Kg. Baru and Masjid Al-Akram is about 55% and 21% from the width of SHAS Masjid, respectively.

It was mentioned earlier that the JPBD proposed 1m² per person for the personal space. Based on the measurement and calculation of the praying areas, when it is divided with the carrying capacity of the *masjids*, the result indicates smaller personal space for every case studies masjid except for SHAS Masjid. Referring to the human anthropometric (Figure 13), on average, the shoulder width is about 500mm (0.5m). When a person prostrates, the length is 1.0m (this is also the typical length of a praying matt). Hence, the width needed for a person would be about 0.5m². Thus, it is suspected that the maximum carrying capacity is based on human anthropometric rather than referring to the proposal by the JPBD.

**FIGURE 13**

Human anthropometric.

(<https://i.pinimg.com/originals/c6/7f/c2/c67fc25c3ef8369c2d1f9e5f8f2b2b33.jpg>)

Thus, it can be concluded that the selected masjid are providing a comfortable space for their *jama'ah*. The overall layout of the nine *masjids* as shown in the Figure 4–12 and it also aligned with the guideline from JPBD, thus it can be seen that the layout of each masjid is according to the spatial arrangement of an ideal masjid.

CONCLUSION

Studying the space dimensions of these *masjids* and relating it to the human scale/anthropometric is very important as it is about the personal space of a person particularly when a person is trying to be focused on his/her *ibadah* at the *masjid*. It is fascinating to see that when the praying area is further compared with the maximum carrying capacity, the result indicates that the human anthropometric might be the basis in calculating the maximum carrying capacity, rather than following the proposal by the JPBD. However, it is worth to be noted that typically *masjids* would be reaching their maximum capacity when the Friday prayer is performed – that is once a week.

Personal space of a person at masjid should be studied more in the future in order to identify the optimum size of the area. It is anticipated that the larger the personal space, the lesser the person would be feeling disturbed. Moreover, this is particularly important to be investigated





when it comes to having young children who are commonly active at the *masjid*.

ACKNOWLEDGMENT

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SPATIAL PLANNING FOR NON-MUSLIM ACCESS IN A *MASJID*

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INTRODUCTION

M*ASJID* is a place where purity and sanctity are kept for the Muslim to perform their *ibadah*. Nevertheless, the role of *masjid* also expanded to respond to the teachings of Prophet Muhammad (PBUH) that *masjid* also act as a centre that could provide services for the non-Muslims. In the Qur'an verse (2:143) – “*And thus we have made you a just community that you will be witnesses over the people and the Messenger will be a witness over you*” – every aspect of life people live in a community, where each and every one depend on one another. The Prophet's Masjid was a place for shelter to those who were in dire need where lodging were provided, a place for Prophet's (PBUH) guest who were non-Muslim were welcomed and a place for discussion or dialogue for the non-Muslim (Omer, 2013). Under the *Irsyad Al-Fatwa* number 271: “The Ruling for Non-Muslim Entering the Mosque”, non-Muslim are permissible to enter *masjid* (Tarmizi, 2018). However, the ruling is applicable on several conditions, which are to follow the dos and don'ts while visiting the *masjid* (Omer, 2018).

In relation to the function of a *masjid*, the *masjid* also contributes to the development of the community. As mentioned by Amnah, Bahari, and Shihabbuddin (2016), *masjids* are institutions of critical social importance because they are at the same time a place for spiritual devotion and a centre for community development. *Masjid* is the centre of activities during the Prophet Muhammad (PBUH) era and still the concept is applicable till today. According to Wates and Knevitt (2013) cited by





N. 'Athiqah Baharudin and Ismail (2014) considered these communal facilities as “community architecture” and the term to be commonly used to describe the architectural space for conducting communal activities.

The goal and activities of the users are reflected through the floor plan that are interpreted by the architect (Van der Voordt, Vrielink, and Van Wegen, 1997). As mentioned in a study, *masjid* should give the feeling of comfort through spatial planning that satisfy the psychological tranquility to the users in different cultural needs (Othman, Inangda, and Ahmad, 2015). Despite that, the components of the *masjid* should be maintained as they were applied in the Prophet's Masjid.

ISSUE AND PROBLEM STATEMENT

Non-Muslim involvement and entering the *masjid* has not only raised multiple perception of Muslims', but also impacted on the non-Muslim perception towards Islam. Reported by Shamsuddin (2018) the *masjid* held a *masjid* open day program for the public in conjunction with Chinese New Year celebration. An approach done by the *masjid* to create the communal engagement with the non-Muslim in the neighbourhood. An attendee who felt honoured to attend the event and learn about the uniqueness of the *masjid's* architecture (Mohamad, 2018). The role of the *masjid* could expand towards the society with the involvement of non-Muslim. *Masjid* as a platform to encourage peaceful coexistence through communal engagement with non-Muslim (Amnah *et al.*, 2016). Thus this leads to the research gap as to understand the accessibility of non-Muslim entering the *masjid*.

METHODOLOGY

This paper applied qualitative methodology design approach. Several method tools were used for this study; literature review, case study, content analysis, and interview. As to understand the *masjid* as an institution, literature review were done on the matter. According to Sarantakos (2013), literature review are done to review studies that have already been published. Case study method was employed for general observations regarding the design matter (Othman *et al.*, 2015). The selection of case studies were selected based on its relation with non-Muslim entering the *masjid*. The selected *masjid* for the case study located five areas in Malaysia and one in Singapore, they are Masjid Negara, Masjid Wilayah, Masjid Putra, Masjid Tuanku Mizan, Masjid Al-Faizin, Kepong, and Masjid Sultan in Singapore. The *masjids* were chosen for being a tourist attraction especially to the non-Muslim, whereas Masjid Al-Faizin



was due to an event held in the *masjid* open to the public, targeting the non-Muslim community. Content analysis method tool were applied due to the *masjid*'s involvement of a devastating event happened recently, that led to non-Muslim entering the *masjid* in enlightening the world with the unfortunate story. The selected study for content analysis was Masjid Al-Noor, Christchurch, New Zealand. Lastly, interview sessions were done with the management team of the *masjid* or *masjid* tour guide team in regards to how the management address the matter.

LITERATURE REVIEW

Non-Muslim Entering the *Masjid*

Non-Muslim entering the *masjid* is not alien in the tourism sector, a common activities for the non-Muslim to visit when coming to Muslim countries. However certain ground rules are to be set and abide by the non-Muslim when entering the *masjid* as a sign of respect. As stated by Spahic Omer (2018) in his article on "The Benefits of Non-Muslims Visiting Mosque", where he stated non-Muslims should be allowed to enter and visit *masjid*, but under conditions where permission are to be granted before entering, followed by the dos and don'ts inside *masjid*. This was to keep the purity and the sanctity of the *masjid*.

(Omer, 2018)

Components of *Masjid*

According to the Malaysian Standards (2014), the basic components of a *masjid* consisted of prayer hall, *mihrab*, ablution area, and toilet. The main spaces are followed by the supporting spaces, depending on the needs and the size of the population. Based on Figure 1 shows the connection of the main spaces and the supporting spaces in a *masjid*.

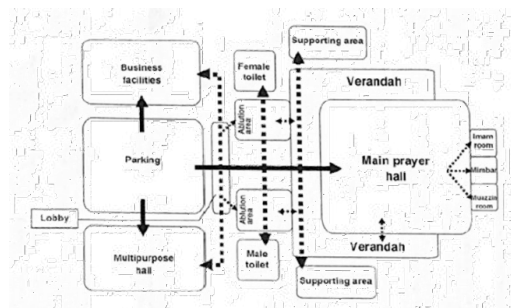


FIGURE 1

Connection of *masjid* components and the accessibility.



RESULTS AND ANALYSIS

The results was derived from the selected case studies and interviews done for all six selected *masjids*; the *masjids* within Malaysia which are Masjid Negara, Masjid Wilayah, Masjid Putra, Masjid Tuanku Mizan, Masjid Al-Faizin, and Masjid Sultan in Singapore. Whereas the *masjid* selected for interpretation method done from the content analysis of Christchurch, New Zealand; Masjid Al-Noor. The findings are based on the consideration of the four main spaces of the *masjid* area, the supporting spaces and the level of accessibility addressed by the *masjid* management. The results are as follows:

This completes the entire process required for widespread of research work on open front. Generally all International Journals are governed by an Intellectual body and they select the most suitable paper for publishing after a thorough analysis of submitted paper. Selected paper get published (online and printed) in their periodicals and get indexed by number of sources.

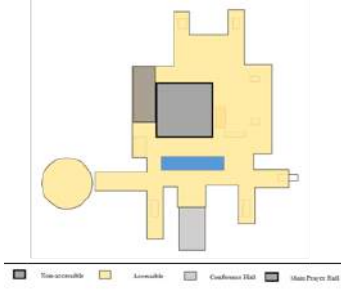
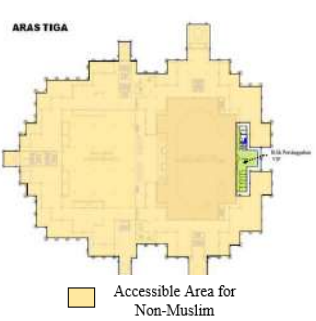
The analysis done and shown in the table shows the similarities and the differences of the selected *masjids*. The level of accessibility within the *masjid* differs from one another because of the intention or the purpose in allowing non-Muslim entering the *masjid* area. Majority of the selected *masjid* were mainly tourist attraction location – Masjid Negara, Masjid Wilayah, Masjid Putra, Masjid Tuanku Mizan, and Masjid Sultan. However, there were two *masjids* that were entered by non-Muslim not for tourism purposes – Masjid Al-Faizin was open for the non-Muslim in the neighbourhood through an event that the *masjid* held and Masjid Al-Noor caught the eye of the world and were open to non-Muslim after the mass shooting event.

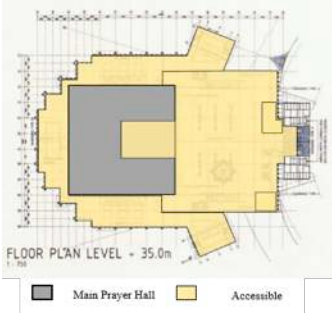
The result shown in Table 1, that not all the *masjids* allows non-Muslim to enter the main spaces of the *masjid* which are; main prayer hall, *mihrab*, ablution area, and the toilet. The *masjid* that are permissible to enter all the areas of the *masjid* are Masjid Wilayah, Masjid Tuanku Mizan, Masjid Al-Faizin, and Masjid Al-Noor. Whereas, for Masjid Negara, Masjid Putra, and Masjid Sultan addressed differently on the approach of managing the non-Muslim entering the *masjid* area.

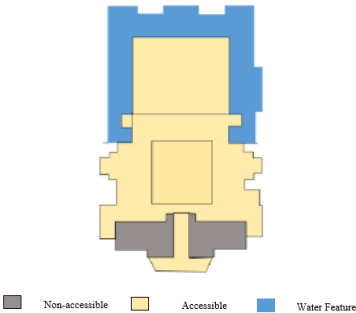
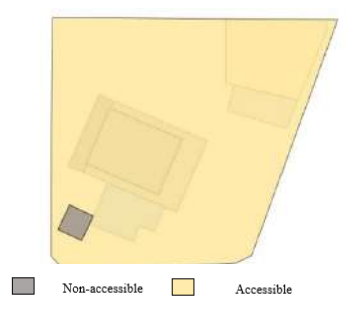


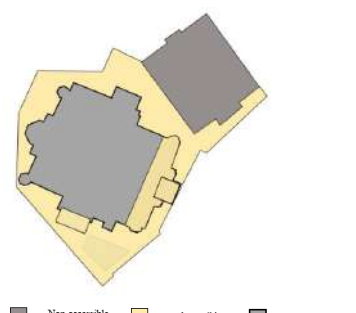

TABLE 1

Comparison table of the *masjid* in relation to non-Muslim accessibility.

	<i>Masjid Negara, Kuala Lumpur</i>	<i>Masjid Wilayah Persekutuan, Kuala Lumpur</i>
Level of Accessibility for non-Muslim		
Main Spaces Accessible for Non-Muslim	Toilet Ablution Area	Prayer Hall <i>Mihrab</i> Toilet Ablution Area
Non-Muslim Activities in <i>Masjid</i>	Tour <i>Masjid</i> Fruit Festival	Tour <i>Masjid</i> Masjid Open Day
Spaces for Non-Muslim Activities	Foyer Courtyard/ <i>Masjid</i> Compound	<i>Masjid</i> Courtyard/ <i>Masjid</i> Compound

	<i>Masjid Putra, Putrajaya</i>
Level of Accessibility for Non-Muslim	
Main Spaces Accessible for Non-Muslim	Prayer Hall
Non-Muslim Activities in <i>Masjid</i>	Tour <i>Masjid</i>
Spaces for Non-Muslim Activities	Foyer Courtyard/ <i>Masjid</i> Compound

	<i>Masjid Tuanku Mizan, Putrajaya</i>	<i>Masjid Al-Faizin, Kepong</i>
Level of Accessibility for non-Muslim	 ■ Non-accessible ■ Accessible ■ Water Feature	 ■ Non-accessible ■ Accessible
Main Spaces Accessible for Non-Muslim	Prayer Hall <i>Mihrab</i> Toilet Ablution Area	Prayer Hall <i>Mihrab</i> Toilet Ablution Area
Non-Muslim Activities in Masjid	Tour <i>Masjid</i>	<i>Masjid</i> Open Day
Spaces for Non-Muslim Activities	<i>Masjid</i>	<i>Masjid</i> Courtyard/ <i>Masjid</i> Compound

	<i>Masjid Sultan, Singapore</i>	<i>Masjid Al-Noor, Christchurch</i>
Level of Accessibility for Non-Muslim	 ■ Non-accessible ■ Accessible ■ Main Prayer Hall	 ■ Accessible Area for Non-Muslim
Main Spaces Accessible for Non-Muslim	Toilet Ablution Area	Prayer Hall <i>Mihrab</i> Toilet Ablution Area
Non-Muslim Activities in Masjid	Tour <i>Masjid</i>	Interview with Reporters
Spaces for Non-Muslim Activities	<i>Masjid</i> / <i>Masjid</i> Compound	<i>Masjid</i> Courtyard/ <i>Masjid</i> Compound



Masjid Negara, Kuala Lumpur

The spaces that Masjid Negara limits for the non-Muslim to enter are the main prayer hall and *mihrab* area. Nevertheless, the non-Muslim visitors are able to view the main prayer hall from the foyer that is surrounding the main prayer hall. Other than the limitation from the mentioned spaces, the non-Muslim are allowed to go to the toilet and ablution area in the *masjid*.

Masjid Putra, Putrajaya

Masjid Putra has a different approach in allowing the non-Muslim when entering the main spaces of the *masjid*. The main prayer hall are partially opened for the non-Muslim to enter with red rope pole as indication of the limit of access. Within the pole area, the non-Muslim are able to experience the main prayer hall as well as a displayed gallery explanation about Islam. Unfortunately, the toilets and the ablution area are restricted for the non-Muslim from entering.

Masjid Sultan, Singapore

Masjid Sultan is similar to Masjid Negara in terms of the accessibility for non-Muslim in the *masjid* area. The main prayer hall limitation is indicated with low fence to show the limit for the non-Muslim from entering. Still they are able to observe the main prayer hall from the foyer at the rear end of the main prayer hall. The toilet and ablution areas are open to the non-Muslim to utilise, furthermore it functioned as a public toilet for the people passing by to use.

Masjid Wilayah, Kuala Lumpur

Masjid Wilayah is more flexible in allowing non-Muslim entering the *masjid*. The non-Muslims are able to experience every spaces in the *masjid* but with supervision and attended by a tour guide. They are allowed to enter the main prayer hall area up until the *mihrab* area if requested by the non-Muslims. Moreover, the *masjid* also provides a designated space for the non-Muslim in the main prayer hall to observe the perform of *solat* during prayer time.

Masjid Tuanku Mizan, Putrajaya

This *masjid* is similar to the rules and regulation stated for Masjid Wilayah, non-Muslims are permissible to enter any spaces in the *masjid* but accompanied by a tour guide.





Masjid Al-Faizin, Kepong

This specific *masjid* has no restriction for non-Muslims to enter any space in the *masjid* area, either requested accompanied or walk freely without a tour guide. The intention are to allow the non-Muslim from the neighbourhood to feel the sense of welcoming and comfortable inside the *masjid* area. Other than that, the event were a *masjid* open day program, where other activities were organised for the non-Muslims within the *masjid* compound.

Masjid Al-Noor, Christchurch, New Zealand

This *masjid* was publicly known to the world after the horrific event that happened in the *masjid* itself, a mass shooting during Juma'ah prayer. Thus, the *masjid* is approached by many people including non-Muslims from the prime minister, the authorities, police forces, reporters from around the world and the people of New Zealand that came to give respect and share their grieve. The *masjid* is mainly a small but fully utilised functional *masjid* for the Muslim, with merely any aspect of tourism attraction is intended. Thus, the spaces within the *masjid* are accessible to enter for the story to be told and shared.

CONCLUSION

In conclusion, this study of spatial planning on non-Muslim accessibility into *masjid* has proven that the non-Muslims are permissible to enter. However, the level of access into certain areas of the *masjids* differ from each other. Certain *masjids* may allow non-Muslims to enter into all areas in the *masjid* but with supervision, yet there are a number of *masjids* that control the accessibility of the non-Muslims when entering the spaces in the *masjid* area.

Masjid has always been associated as a place of tranquility and a place that gathers the community. *Masjid* as an institution that connects the people is proven through the Islamic history, the transformation of *masjid* in a community created a great impact to a peaceful society. Currently in Malaysia, the idea of allowing non-Muslims entering the *masjid* has not been fully accepted in the society, resulting of *masjids*' different approach in responding to the users' perceptions. The findings showed that the user perceptions are slowly changing as efforts of *masjids* to create better understanding and awareness regarding the issue of non-Muslim entering the *masjid* to be accepted by the society. Thus the approach intends to





create the relationship towards a peaceful coexistence between Muslim and non-Muslims.

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THE CLEANLINESS AND PURITY OF ABLUTION AND TOILET AREA IN *MASJID*: AN ANALYSIS OF USERS' UNDERSTANDING AND BEHAVIOUR

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INTRODUCTION

ONE of the best good that a person can do is the upkeep and sustaining of *masjid* as bountiful in return are promised (Hasan Lam, 2018). Believers should exercise the above mentioned in accommodating “Allah’s guest” as well as in enhancing the quality of *ibadah* (worship). As commanded by Allah SWT to Prophet Ibrahim in *Surah Al-Hajj*, verse 26: “*Purify My House for those who circle around it, those who stand to pray, and those who bow and prostrate themselves*”.

An encryption of morals was scripted “under the guardianship of Prophet Muhammad, peace and blessings be upon him (PBUH), and divine revelation” (Omer, 2017). Omer explained that this scripture served as a guideline enhancing the development of *masjid* and the practices in it. Among which preservation of the cleanliness of *masjid* was detailed “for cleanliness is part of faith”. Harmoniously, the requisite for one to prostrate before the Almighty, his figure, cloth, and space of worship must be pure (Baz, 2007).

Issue

The background of the study highlighted the importance of cleanliness and purification in Islamic context and its vital need to be preserved in *masjids*. On another note, the psychological and cultural influence in a space also has its part in justifying the pertaining issue (Johari *et al.*, 2013).





It is important to understand subject behaviour on site at specific time throughout the day, focusing on behaviour in the ablution and toilet areas of the *masjid* to provide a valid, acceptable, and reliable data in relation to human perception regarding the issue (Sarantakos, 2005).

A successful design and layout of the *masjid* includes the projection of human norm and culture into consideration (Johari *et al.*, 2013). Improper spatial layout of *masjid* can lead to disruption of the purity due to human behaviour (Nashirudin and Jasmi, 2008). The way the spaces are planned and designed can heavily influence the way people carry themselves in a *masjid* (Abd Hamid *et al.*, 2015). Poorly planned spaces can potentially affect the purity of the praying area.

Aim and Objective

The aim is to comprehend the *masjid's* users attitude towards developing a more holistic approach in planning the ablution and toilet area; with regards to safeguard its cleanliness and purity. Following suit, the objective of the study is to understand the users' level of sensitivity towards cleanliness and purity of the ablution and toilet area in *masjid*.

LITERATURE REVIEW

Cleanliness and Purity in Islam

“*Taharah* (purity)” in Islam is a fundamental concept pertaining to “physical” and “spiritual” part (Perlmutter, 2014). The first part involves observing of oneself, garments and environment from impurity and the later part refers to “*tazkiyatun nafs* (purification of the soul)” where one leads a moral lifestyle. The rulings regarding impurity or pollution in Islam sets around the principle of two categories that is “*hadath*” and “*khathath*” (Gauvain, 2002). The first is described as “of a *hukmiyah* (legal/technical) or abstract kind” while the latter is mentioned by the term “*najasah*”, referring to “physical” or “actual/tangible” impurity. The abstract impurity is also classified into “minor and major” forms.

A believer must not prostrate before God when they are in the state of minor *hadath* as mentioned in the Qur'an (5:6, 4:43). Minor *hadath* are purified by performing “minor ablution” called “*wudhu*” with “water which is pure and purifying”. Purifying the second classification of *hadath* (major) requires Muslims to have a “ceremonial bath (*ghusl*)”. In Islam, water that is “pure” and purifies includes “rain, snow/hail water, running water such





as rivers, springs, wells and seas, and distilled water” (Al-Fawzan, 2005). Water that is impure and does not purify refers to water which its “odour, taste, or colour” has been altered by an impurity. During travel, sickness (where liquid may cause further implication) or when water is hard to find, a Muslim can carry out “*tayammum*” to “lift his *hadath*”.

Masjid

Numerous *hadiths* and Qur’anic verses stipulate indications for the approach of building such space for worship. In a nutshell, providing the area for prayer with convenience and specific amenities made available for all walks of life including travellers and disabled is very much sought after (Ahmad Sarkawi *et al.*, 2016). Key features suggested for “*masjid* and *surau*” as listed by Malaysian Standard (2014) includes “*qiblah* direction, prayer hall, *mimbar*, *mihrab*, dome/minaret, ablution, and toilet.

Spaces Design

Dr. Ahmed Mokhtar (2005) stressed on “the concept of *taher* (pure) zone”. He placed emphasis on defining a clear boundary line of where the pure zone starts; differentiating it by the use of different material, a change in level, a sill or a door. This is to ensure the footwear of *jama’ah* (congregation) which may be contaminated by impurity does not cross over to the zone. Islam teachings also requires male and female to be segregated when in prayers. Mokhtar made clear that pathway connecting ablution area and praying area for both genders should not cross.

The concept of *aurah* (private parts) further necessitates the need of segregation for ablution and toilet area. This is agreed by a study recommending the separation in order to maintain the cleanliness and purity of the spaces (Nashirudin and Jasmi, 2008). When performing ablution, it is best orientated facing *qiblah* based on prophetic *sunnah*. According to Islamic teachings, the toilet neither face toward nor against the *qiblah* but rather it should face perpendicular to it either to the east or west (Sahih Bukhari, *Kitab al-Wudu*).

Generally, the spaces are to be adequately illuminated by both sunlight as well as light fixtures (MS2577:2014). Allow gradient on floor and furniture to channel water towards drainage in passively maintaining an area’s dryness as suggested by Mokhtar (2005) and agreed by Nashirudin and Jasmi (2008). The area, furniture, and fittings should accommodate to users’ needs in ensuring a user-friendly space (Rahim *et al.*, 2015).





Maintenance

According to the MS2015:2006 on *Public Toilet Code of Practice for Maintenance*, the cleaning of toilet is done based on daily, weekly, and fortnightly task. Best choice of materials are those that have high cleanability rate and are light-coloured for further easing the cleaning duty (MS2577:2014). Surfaces “colour and pattern” must ease user in detecting presence of water while “non-slippery, anti-fungi, and anti-bacteria” material is highly recommended for area most commonly in contact with water (Mokhtar, 2005). However, usage of carpet in praying area hinders the accessibility of wheelchair user and arise the concern of purity due to the possible contaminated wheels, suggesting floorings such as tiles as a solution (Abdul Rahim and Abd. Samad, 2014). “Individual” praying mats are best in perspective of maintenance and cleanliness of the praying area (MS2577:2014).

RESEARCH METHODOLOGY

This study employed a qualitative research and explored the role of triangulation in research. Triangulation strengthens the validity of data by obtaining it from two or more sources through several research methods (Honorene, 2017). This research carried out the “collective case study” approach to visually analyse the specific real-time scenarios at the different sites studied as suggested by Stake (1995) (as cited in Sarantakos, 2005).

Data was collected from four case studies of different towns, all under the classification of residential area *masjid*: Masjid Al-Hidayah, Taman Melawati (M₁), Masjid Al-Azim, Pandan Indah (M₂), Masjid Al-Ikhlas, Shah Alam (M₃), and Masjid Al-Falah, Subang Jaya (M₄). The findings are tabulated description of the relationship between space arrangement and users’ behaviour. This research also carried out a semi-structured interview to obtain data related to the societal perception from the authority’s point of view. Individual interviews were carried out with an authority representative of each *masjid* – Mohd Ruslan Sarib, Secretary (M₁), Siti Rasyidah Md Nor, staff (M₂); Ashraf Jazari, Imam 3 (M₃); and Hafizal Harun, Bilal 2 (M₄).

ANALYSIS AND FINDINGS

Identification of pure zones in a *masjid* may be grouped into three types, rather than encompassing the *masjid* ground as a whole. Firstly, there is the main pure zone which refers to the *masjid* floors itself, often with walkways



as the boundary or transition element as shown in Table 1. This zone necessitates for the removal of shoes by patrons. Secondly, the ablution pure zone; for ablution areas that are linked to toilets. It focusses on the demarcation of pure zone for the ablution area as shown in Table 2. It may include provision of designated slippers strictly for ablution purpose or prohibit usage of toilet slippers there.

Thirdly is the void pure zone; where it marks the area of pause in the concept of pure as shown in Table 3. These areas such like toilets, are highly likely to be tainted with impurities. Usually, users in this area are requested the wearing of slippers or/and washing of feet when stepping out of this zone. The description of the spaces and behaviour of users in it are recorded accordingly to evaluate the effectiveness in protecting the cleanliness and purity.

TABLE 1
Main pure zone of *masjid*.

M1	M2	M3	M4
Distinction of main pure zone by: <ul style="list-style-type: none"> • change of level and material; • boundary mark; • instructional signage. 	Distinction of main pure zone by: <ul style="list-style-type: none"> • change of level and material; • instructional signage. 	Distinction of main pure zone by: <ul style="list-style-type: none"> • change of level and material; • instructional signage. 	Distinction of main pure zone by: <ul style="list-style-type: none"> • change of level; • instructional signage.
<ul style="list-style-type: none"> • Users abide by signage. • Users less frequently arrange shoes on floor. 	<ul style="list-style-type: none"> • Users abide by signage. • Users less frequently arrange shoes on floor. • Shoe racks are moderately used daily but highly used during rainy days. 	<ul style="list-style-type: none"> • Users abide by signage. • Users less frequently arrange shoes on floor. • Shoe racks along the interior walkway are less frequently used as users are unaware of its presence and need to carry their shoes inside. 	<ul style="list-style-type: none"> • Users abide by signage. • Users less frequently arrange shoes on floor. • Shoe racks are moderately used as users need to carry their shoes inside.

TABLE 2
Ablution pure zone of *masjid*.

M1	M2	M3	M4
Distinction of ablution pure zone from linked adjacent toilet by: <ul style="list-style-type: none"> • change of level, material and doorway; • no clear instructional signage. 	Distinction of ablution pure zone from linked adjacent toilet by: <ul style="list-style-type: none"> • change of level, material and doorway; • inadequate and poor placement of instructional signage; • pipe for washing of feet. 	Distinction of ablution pure zone from adjacent toilet by: <ul style="list-style-type: none"> • change of level, material and doorway; • transition buffer zones; • no clear instructional signage. 	Distinction of ablution pure zone from linked adjacent toilet by: <ul style="list-style-type: none"> • change of level and material; • large and repetitive display of instructional signage.
<ul style="list-style-type: none"> • Users often intentionally/ accidentally breach the pure zone with slippers due to lack of signage 	<ul style="list-style-type: none"> • Users often intentionally/ accidentally breach the pure zone with slippers due to lack of signage 	<ul style="list-style-type: none"> • Users often intentionally/ accidentally breach the pure zone with slippers due to lack of signage 	<ul style="list-style-type: none"> • Users abide by signage.

TABLE 3
Void pure zone of *masjid*.

M1	M2	M3	M4
Distinction of void pure zone by: <ul style="list-style-type: none"> • change of level and doorway; • usage of slippers easily understood without instructional signage. 	Distinction of void pure zone by: <ul style="list-style-type: none"> • change of level, material, and doorway; • instructional signage. 	Distinction of void pure zone by: <ul style="list-style-type: none"> • change of level, material, and doorway; • transition buffer zones; • instructional signage. 	Distinction of void pure zone by: <ul style="list-style-type: none"> • change of level, material, and doorway; • instructional signage; • only the cubicle is set as the void pure zone; • usage of slippers limited only in the cubicle.
<ul style="list-style-type: none"> • Users abide by signage. 	<ul style="list-style-type: none"> • Users abide by signage. 	<ul style="list-style-type: none"> • Users abide by signage. 	<ul style="list-style-type: none"> • Users often accidentally breach the pure zone with slippers while getting accustomed to this system.



IMPROVEMENT AS PER REVIEWER COMMENTS

Evaluating the type of marking used for these zones is important in ensuring its effectiveness of space demarcation while still promoting accessibility and safety. A boundary mark, an archway/doorway, and change of material is seemed more universal friendly than change of level or presence of sill. The change of level could be improvised with providing ramp or having a sloped floor.

For the main ablution area, all *masjid* ablution areas are accessible from inside the pure zone but is separated from the prayer hall with a walkway. It eliminates the needs of providing slipper, dissipates the noise of *wudhu*' water from the praying area, and reduces the occurrence of humid prayer hall situation. However, as some ablution area are linked to the toilet within the main pure zone, these *masjids* had opted to the provision of slippers, protecting the cleanliness and purity of the space and its users.

Taps for washing of feet at the doorway of the void pure zone is recommended due to shortage of slippers during peak hours. M₄ devised a clever alternative by limiting slipper usage in the cubicle only, whereas the rest of the entire toilet is considered as a pure zone. Apart from the effectiveness of design approach, users' degree of adherence to zone segregation could also be due to firstly, visibility and placement of signage to guide the people and secondly, their level of sensitivity towards this step of precaution.

On the other hand, the findings of the interview are summarized into five categories encompassing *masjid* organization, *masjid* attendance and activity, *masjid* maintenance, *masjid* cleanliness and lastly, comments and suggestions as shown in Table 4. It provided the management strategy in the context to preserving the cleanliness and purity of *masjid* and details the users' level of sensitivity towards it.



TABLE 4
Interview summary.

Masjid Organization

- All four *masjids* have dedicated division and appointed officer in the organization structure in charge for cleanliness.

Masjid Attendance and Activity

- The average crowd flow in all *masjids* would account for *jema'ah* (congregation) around two to three *saf* (rows). However, the total number of *jema'ah* differs as each *masjid's saf* differ in length according to the *masjid's* capacity.
- Each *masjid* carries out *kulliyyah* throughout the week, most uniformly during Maghrib. This can be seen as one of the peak hours of each *masjid* in terms of crowd attendance.

Masjid Maintenance

- Every *masjid* is led by the head of the bureau teamed with *siak* and general workers.
- All *masjids* follow a schedule for the task of cleaning and maintenance.
- All four *masjid* collectively believe that the task of upkeeping the *masjid's* cleanliness lies in the hands of both *masjid* management and the community themselves.
- The view differs in community responding towards disruption of cleanliness or purity:
 - ~ Inform *masjid's* keeper for further action; better safeguarding cleanliness and purity.
 - ~ Encouraged them to attend it themselves due to lack of manpower.

Masjid Cleanliness

- Cleaning: M1 and M4 based on particular guidelines or standard of procedure while M2 and M3 based on readily known knowledge pertaining to cleanliness and purity.
- Cleaning equipment: all *masjids* differentiate equipment base on different areas to uphold the cleanliness and purity of it. Generally, cleaning equipment are accessible by public upon request but some *masjids* discourage public use of it in avoiding tampering the purity.
- Provision of slippers issue could be solved by limiting usage of slippers only within the toilet cubicle itself while maintaining the rest of the space as pure zone.
- Supervision of children in ablution and toilet areas: highlighted issue of child's safety and their behaviour correlating to their level of knowledge regarding purity and safety.
- Universal design: all *masjids* agrees on the need of universal design approach in *masjid*.
- Facilitative features should be easily identified by people who are unfamiliar there.

Comments and Suggestions

- Users' attitude: M2 highlighted the prominent vandalism as well as M3 whose close distance with the stadium and bus terminal, received users with various mentality, treating the *masjid* as a public toilet resulting in frequent issue of damages and lost.
- Users' awareness toward cleanliness and purity: involved the heart of individuals and not by the community. Donation are entrusted to the committee in managing the operation.



- Community involvement: *masjids* welcomes involvement and emphasized on collective responsibility. They urged on implementation of early education in the society. Committee must be cleaver in planning activities to ensure it receives warm reception.
- Ideas and suggestions to improve the cleanliness and purity: requires intervention from local authority or government to address the matter and schools in implementing early childhood education regarding cleanliness – placing emphasis on purity. Propagation of education to all walks of life by digital platforms; television, social media, and mobile applications. Encouraged generation of ideas to cultivate the sense of belonging in the *masjid* to the congregation. Lastly, starting small and develop into impactful efforts.

CONCLUSION

This research concluded that effective spatial planning of the ablution and toilet area in *masjid* plays a major role in influencing its users' attitude towards preserving the cleanliness and purity of *masjid*. It can also be perceived that the public awareness of the issue of cleanliness and purity is present but needs to be greatly improved. It needs to be propagated that the responsibility in protecting these aspects rests not only upon the *masjid* management, but also the shoulder of the Muslim community collectively. This effort is ultimately to strengthen the confidence of the congregation in respect with their *ibadah* (worship). The findings also act as a stimulant aiming towards modification of existing policies and guidelines such as MS2577 and MS1184.

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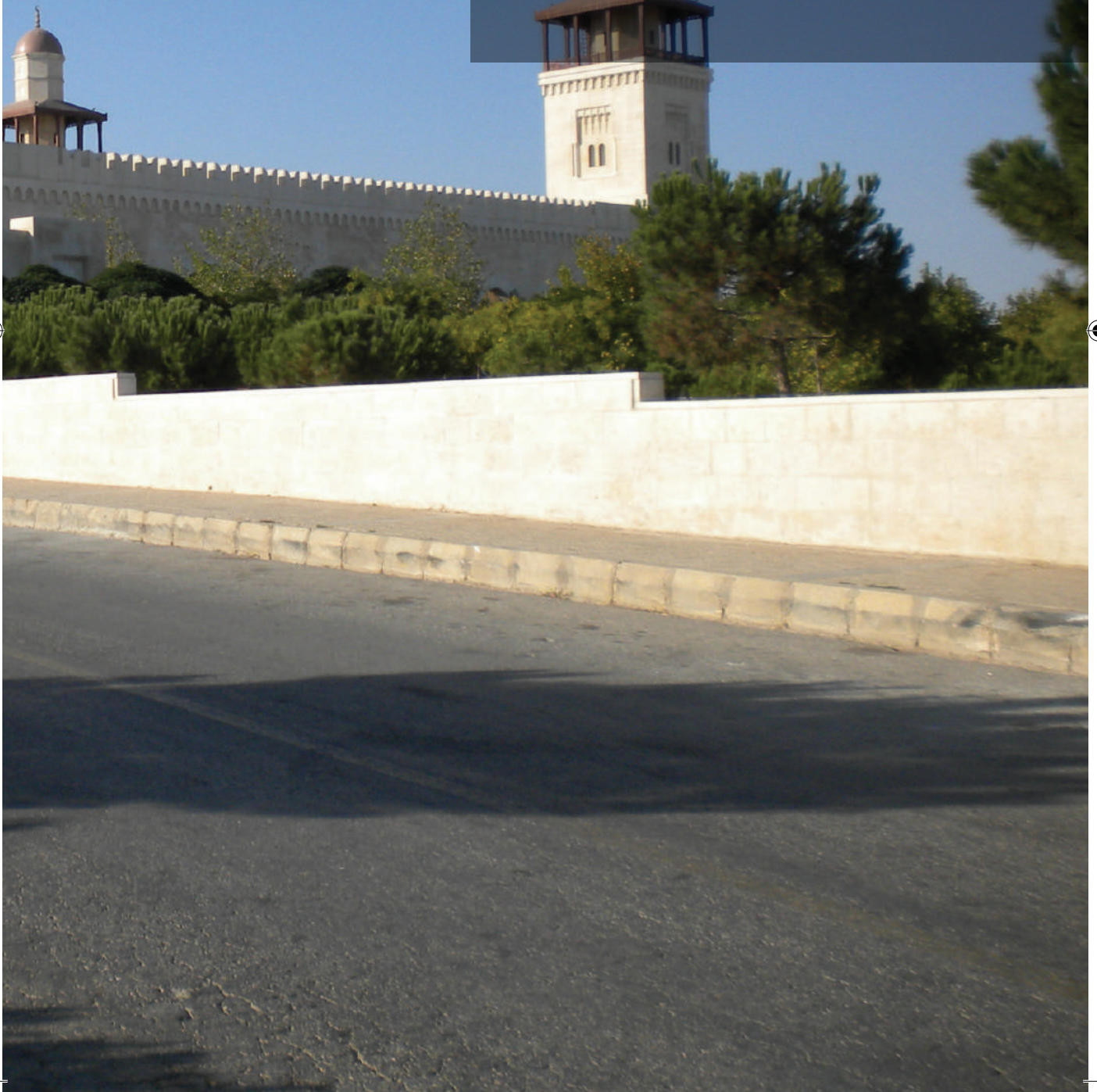
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COMMUNITY MOSQUES IN URBAN CENTRES







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URBAN TRANSFORMATION IN THE
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**BRITISH MUSLIMS AND
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**دراسة تحليلية للدراسات
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أحمد بن رشدي طومان







GRAND MOSQUE AS A STRUCTURAL APPROACH TO URBAN TRANSFORMATION IN THE TRADITIONAL CITY CASE STUDY: BURAYDAH, QASSIM, KSA

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INTRODUCTION

THE ROOT of the concept of the city main structure goes back to the ideas of Edmond Bacon¹:

Through the leaves go and come each fall and spring, the trunk and branches of the tree remain, and it is they that determine the form of the tree.

(E. Bacon, 1974)

The process of the formation and transformation of a city's main structure is not spontaneous but is the manifestation of internal and external factors working within a complex and highly evolved mechanism. The city's main structure plays an important role in the evolution of the entire planning and development of a city, that is, the transformation of a city's structure is directly or indirectly related to its structure². The city's main structure remains a constant all the while its surface structure undergoes physical or functional changes.

1. Paper hypothesis: The city is a living organism, which has a structure comprising of its whole physical entity and related parts. The city form and pattern depends on its main structure, the city main structure. Other parts of the city are ancillary to this fundamental frame.
2. Paper objectives: The main purpose of this paper is to present a structural approach to our understanding of the mechanism behind the urban transformative processes, based on the city's structural properties and implement it to the role of the grand mosque in the processes of forming the main city structure in the cities that have





had many urban layers though its urban history. It addresses this by studying the surface structure or manifestations of the city's main structure and seeks to understand how its many structural forces demonstrate themselves in urban elements, urban land-uses, and human activities. There is a further intention to identify the physical and functional manifestation of the deep structural elements within the city.

Understanding the interaction the underlying forces (political, socio-cultural) as deep structural elements in this process of urban transformation. The final objective is discover the transformative rules in cities regarding their structural properties and to clarify the laws of composition and structural order of the city and bridging this to the rules of the grand (main) mosque as a urban regulator for the main city structure.

STRUCTURALISM: DEFINITIONS AND APPLICATIONS

The objective of part one is literature review that builds up a concept of the city main structure properties particularly in the process of urban transformation based on the structuralism paradigm on structural properties.

The proposed structural approach to urban transformation of the built environment in this paper is coming from an awareness of the meaning and concepts of city structure, City Center and city evolution, comparative studies on the ideas of the theory of structuralism, are presented. These cover descriptive, explanatory, and analytical discussions.

The entire part reviews the specific properties associated with the city's main structure. Those key properties are the criteria against which to test the significances behind urban transformation.

Structuralism

The significance of structuralism is to look into knowledge as an entity. The concept of structure is used in a variety of academic disciplines and cross-cultural contexts to question form, order, systems, and transformation. Structuralism proposes in essence the reconstruction of what is already known³.





Piaget (1968) claims that there are two important differences between global structuralism and the deliberative, analytical structuralism of Levi-Strauss, where the former speaks of laws of composition. Durkheim's structuralism, for example, is merely global because he treats totality as a primary concept explanatory, as such, the social whole arises of itself from the union of components, and its emerges⁴.

Two major points of structuralism theory are content and the relations, otherwise it will be hard to understand why a notion as abstract as that of “*system closed under transformation*”⁵.

In the 18th century, the word “*structure*” was used to define physical phenomena in terms of observable assemblages, the composition and arrangements of the pieces that make up a body (Figure 1).



FIGURE 1

The structuralism approach.

(Source: The Author)

A structuralize approach argues that much of our world is structured of, and by, binary oppositions (being/nothingness, hot/cold, culture/nature); and one can describe fields of cultural thought by describing the binary sets with which they are composed⁶.

For structurelists, a structure is a system that evolves over time. It is subject to a continuous process of inputs and outputs, leading to its progressive replacement. It nevertheless retains its internal coherence, unity, and identity. It stays the same when everything appears to change. It is invariant under the transformation of a particular set of phenomena⁷. Structuralism theorists go beyond the abstract meaning of an object, but try to establish the verifiable links between the various elements that underpin said object, aiming to detect the mental patterns, which would explain the inner processes within the objects group.

Structuralism is a theoretical point of view that explains the object's consistency and its sensibility; it is a transformative pattern under; this pattern has three attributes: totality, transformation and self-organization⁸.



Structure and System

Structure is an abstract set of formal relations underlying the greater manifest richness of observable forms. It is a field that is not an aggregation of elements, but an expression describing a set of relations between things governed by some overriding formative law. Boudon (1971) believed that structure could be defined as system of relationships. He states that these relationships are stable. He believes that the set of relationships, characterize the structure. The system of relations is thus perceived as the basis of the structure⁹.

The first principle of any system of organization hinges on the question of relation. The crucial elements of structure are not the things in and of themselves but the relationships between things. System must be seen as “holistic”, in a structuralize sense¹⁰ (Figure 2).

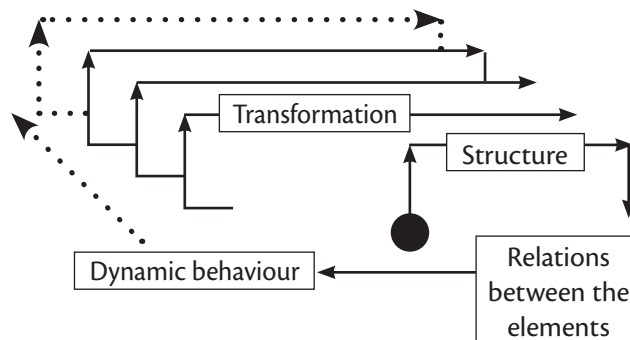


FIGURE 2

The concept of a structure as a system.

(Source: M. Hamidi, 2003)

Properties of Structure

Structure has certain common and perhaps necessary properties¹¹. It is an entity formed by consistent elements which are comprised of three key ideas: wholeness, transformation, and self-regulation. A review, in this paper, of these fundamental properties of structure leads to establishing the implicit properties of structure, such that the city structure is a phenomenon that transforms the city as an entity and this is the most significant contribution of structuralism theory in relation to the urban environment. The paper defines structural properties as follows:



1. Transformation: a structure is a system of transformation, inherited in it, and never leads beyond the system but always engenders elements that belong to it and preserves its laws¹².
2. Dynamism: there exists a dynamic interrelationship between the components of a structure. Dynamism is considered a specific property of a structure; and the notion of a structure in structuralism theory contains an inherently dynamic aspect.
3. Self-regulation: is one of the basic properties of a structure. It may be achieved by various procedures or processes, and these can be ranked in order of increasing complexity. Rhythm, regulation, and operation are three basic mechanisms of self-regulation and self-maintenance which are real stages of a structure's construction.
4. Wholeness: a structure is usually defined as a whole and by its associated definitions: structure-totality, structure-system of relationships, and structure-whole irreducible to the sum of its parts. In structuralism, the idea of wholeness is the transformation of knowledge in a given structure through time, consequently, it is possible to say that the concept of structure is conditioned by this transformational process¹³.

Deep Structure and Surface Structure

A structure is considered to be an abstract set of formal relations underlying the greater manifestation of observable forms. Eisenman distinguishes a surface or perceptual structure and a conceptual or deep structure. Deep structure is specified as an abstract underlying order of elements that makes possible the functioning of transformational rules¹⁴. The surface structure is the transformation of a deep structure.

Structuralism and Urban Studies

Forrester (1969)¹⁵ describes an urban area as a complex system which he defines as a high-ordered, multiple-loop, non-linear feedback structure. All social systems belong to this class.

According to structurelists, social structure may be viewed as the trial, which determines the social distribution of space and the evolution of an urban spatial structure. Their interpretations of the urban structure are concerned with the ordered relation of parts to a whole, in which the elements are





linked together in a structural hierarchy, implying relations between them and the patterning of multiple interactions¹⁶.

The roots of Alexander's ideas (1963–1964) on urban transformation matches structuralize ideas on transformation. He applies a system of rules to the central notion of change (transformation) in urban spatial structures when he claims that the environment gets its spatial structure, not by sudden design, but through continual growth and change. These changes are far from random. They are controlled, at any given moment by a system of rules; legislative rules, rules of incentive, and unspoken rules of habit¹⁷.

In addition, structuralism is also based on the expectation of finding articulated buildings within the overall urban structure. Structurelists claim that the structuring of a building's volume is one of the fundamental principles of structuralism. So, they are concerned with two things:

1. the articulation of the building blocks into smaller units that is humanly comprehensible; and
2. the articulation of the urban fabric.

THE CITY STRUCTURE ACCORDING TO STRUCTURALISM THEORY

This review has considered literature that regards the built environment, particularly the city center which has most of urban elements such a *Grand Mosque* in case of Arab's traditional cities, as a living organism. It has looked at the ideas that indicate how the existence of the city and its vitality are conditioned by an ordering phenomenon called city structure.

The city structure is organized in a hierarchical system, that is, there are super-ordinate and sub-ordinate entities embodied in the city structure, including a central core of energy and also sub-centers, which feed from the central source of energy¹⁸. The central entity and core of energy is called the city's main structure.

Madanipour (1996) refers to some characteristics of cities like their being autonomous, self-regulating, self-organizing, dynamic wholes, having rhythmic function and maintaining a dynamic, homeostatic balance, and sees that these are properties of a structure, according to structuralize ideas. But he also mentions some differences between living organism and cities, like the mechanism of growth²¹.





The City Structure

The city structure is based on a whole entity; it is a global structure, which provides the relation among local structures of various areas. It gives both a sense of identity to, and a grasp of relations between the parts and the whole. Continuity is a physical property of the city if it is used to integrate the whole territory of the city. The city, as a spatial system, consists of a complex and bounded whole, encompassing a set of activities or constituent elements and the relationships among those elements which together make up the system²² (Table 1).



FIGURE 3

Map of around 1800, the dashed lines indicate the boundaries of the former Fatimid city main structure¹⁹.

(Source: S. Bianca, 2000)

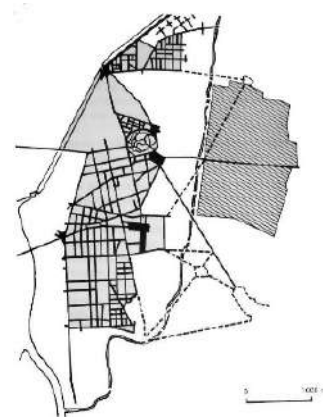


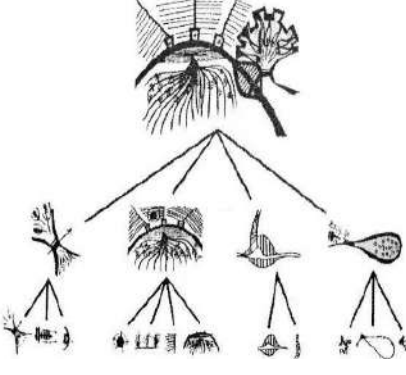
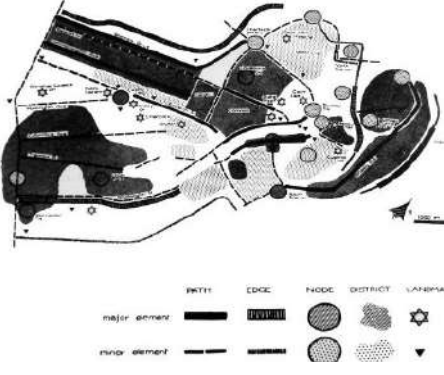
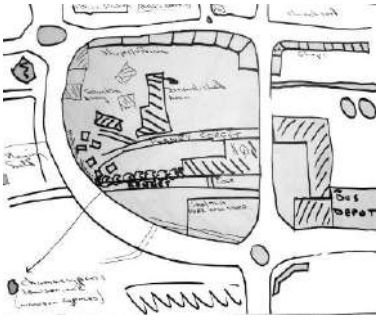
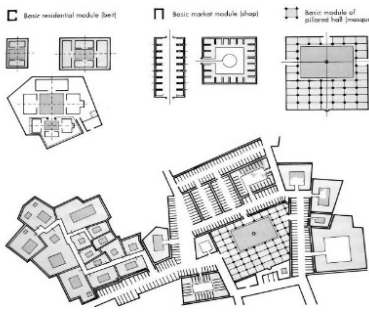
FIGURE 4

Planned new urban development in Cairo under the Khedive Ismail, around 1881. Hatching marks the old Fatimid nucleus or Cairo main structure²⁰.

(Source: J. Abu-Lughod, 1971)
(Re-representation by the Author)



TABLE 1
Different approaches to the city main structure analysis:
urban elements as built vocabularies.

 <p>(a) C. Alexander (1964): City structure as a group of relations among local structures of various areas. (Source: C. Alexander, 1964)</p>	 <p>(b) K. Lynch (1980): City structure as a public image which is the overlap of many individual images. (Source: K. Lynch, 1980)</p>
 <p>(c) I. Bentley et al. (1985): City structure to be clarified by the users' cognitive images using their mental maps. (Source: I. Bentley et al., 1985)</p>	 <p>(d) S. Bianca (2000): City structure as a consistent cellular composition of the main urban fabric of the city. (Source: S. Bianca, 2000)</p>

Urban areas in the built environment can be regarded as concentrated collections of buildings linked by physical pathways for the movement of people and materials and sustained by power and other networks²³, and the function of the city structure is to offer different potentials for inhabitants, in relation to their life activities. The city structure's organisation is thus a network of energy and communication, or a living organism, from which growth and change emerges. It consistently assembles events



and people in a clear pattern, in which the public spaces are the most important elements in the city plan, and where all other functions are effectively located alongside these public spaces.

Transformational Process in the City Structure Elements

Human settlements are continually changing²⁴.

(J. Lang, 1994)

Transformation in cities is described as a system of behaviour; all systems exhibit specific types of behaviour (e.g., growth and change). Moreover, that behaviour is subject to a dominant set of principles (or mechanisms) that underlie its form and determine its temporal pattern of change²⁵. Formation and transformation of the city is a basic purpose of the city structure²⁶.

The content of the city images so far studied, which is preferable to physical forms, can conveniently be classified into five types of elements: paths, edges, districts, nodes and landmarks.

(K. Lynch, 1982)

According to Lynch (1982), the main city structural elements are: the major path system, the major centers, focal points or nodes, the peaks of density, special activity. The special structure of the city is thus concerned with the location of these nodal points, their general perceptual character, their relation to each other, to the path system and to natural features²⁷.

Surface and Deep Structure of the City

The surface structure and the deep structure of the city can be considered as elements, interrelationships and organizing rules. The surface aspects of the city structure indicate urban form or the spatial pattern as an arrangement of individual elements such as buildings and land uses (or, collectively, the built environment). The city's spatial structure can be viewed as a set of economic zones centred in the city's main structure.

The deep city structure is the underlying set of interrelationships, linkages and flows that act to integrate the pattern and behavior of individual land uses, groups and activities into the functioning entities that are its subsystems; that is, the social groups, economics activities, and public institutions within an urban area²⁸.





The built environment's structure formally combines an urban form and an overlay of patterns of behavior and interaction within subsystems with a set of organizational rules that link these subsystems together into a city system within structural dimensions of the city's physical and social space.

This paper argues that surface structure is the physical manifestation of an underlying order in the built environment but deep structure refers to the socio-cultural norms and values that have a great influence on the visible characteristics of the urban structure. Moreover, the city structure is mostly observed in terms of its physical aspects.

... morphology refers to the underlying shaping forces of urban form which, drawing on related, deep-rooted human attitudes, constitute the real agents of physical manifestation and are the source of the non-material qualities transpiring through material expressions²⁹.

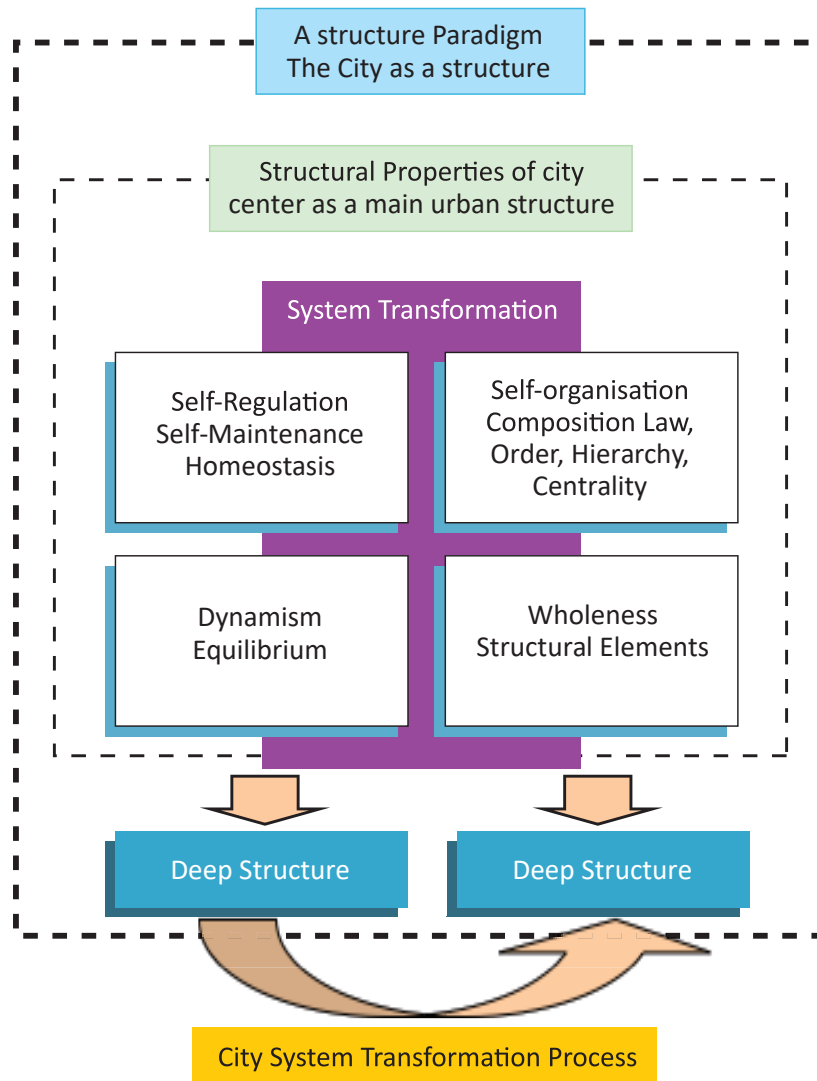
(S. Bianca, 2000)

Structure is a system of transformation. It depends on laws of transformation. The concept of transformation is based on the evolution of the surface structure. This concept covers the dimension of time. The transformation of structure depends on information or programmes that lead the structure from a lower to a higher level of complexity. Transformation increases the complexity of system, always guiding it from a simpler to a more complex system and structure (Figure 4).

Structural Models for Urban Transformation of the City's Main Structure

The central concern in any study of the internal form and structure of the city should refer to the interrelationships of the transformative underlying forces. The physical environment determines social needs, demographic pressure, culture and religion, the power of the market, agents of trade, political issues, technological development, all of which could be considered as some of these forces (rFigure 6).



**FIGURE 5**

Structuralism Paradigm: City System Transformation.

(Source: after M. Hamidi, 2003)



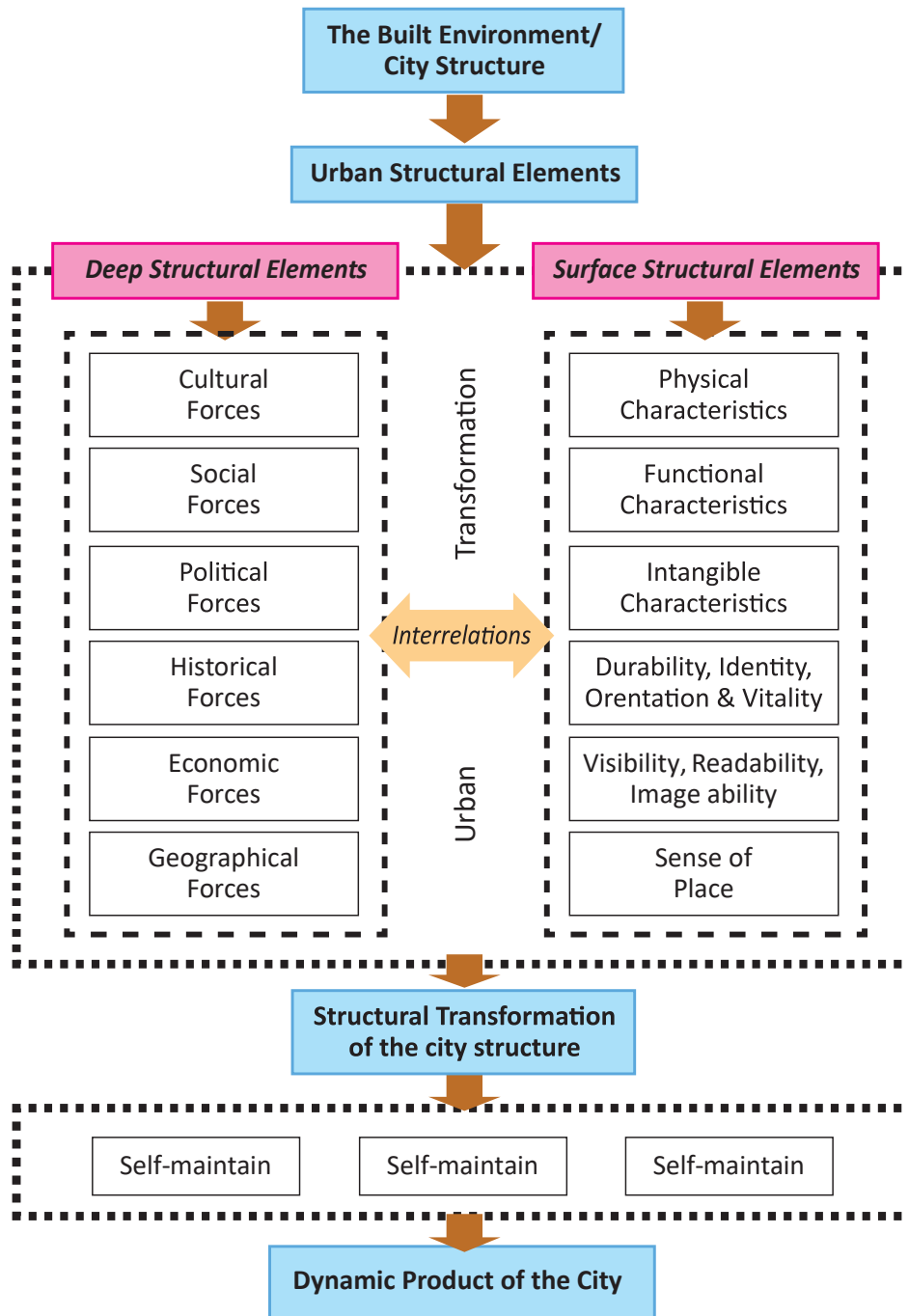


FIGURE 6

The wholistic structural model for urban transformation in the traditional city.

(Source: The Author)



INVESTIGATION OF THE TRANSFORMATIONAL CHARACTERISTICS IN THE GRAND CITY (CASE STUDY: BURAYDAH)

To understand the city we must first understand its material form, and most especially its spatial form; and that we cannot understand its material form until we understand the “laws” underlying the form – that is the ‘laws’ of the urban object itself. Only through these laws can we understand the city as an object in all social, cultural and psychological complexity³⁰.

(K. Lynch, 1980)

This paper focuses on the city of Buraydah, Saudi Arabia, with which the papered had a close affiliation. This is a city that has experienced both traditional and planned growth phases. The investigation of the city aims to establish how the city main structure as a system of transformation, has been operating in the city and to investigate the role of the main mosque in city main structure transformation.

The Project of Developing the Buraydah City Main Structure, Qassim: The Detailed Drawings for Urban Upgrading for the City Center (The Grand Mosque and Surrounding Included)

The UNESCO report on the moral heritage of the project represented an intellectual platform for the project. It stated that “the rehabilitation process of the historical centers can’t be carried out by preserving the urban heritage in isolation from the moral heritage. Rather, it should be integrated into a single system with the urban heritage to restore the spirit of the memory of the place. The social environment of the physical and physical environment of the city”³¹.

Buraydah city center is located north to south of the city. The old traditional area is the main spine of the city, including the main activities and functions of the city as per its nature of urbanization, the concentration of public services and commercial activities as well as residential and commercial use; this assembles the main action area of the project.

The main city center includes the heart of the city, which is bordered to the north by Ali bin Abi Talib Street (the northern side of the inner ring road), to the south by Sheikh Mohammed bin Abdul Wahab Street, to the east by King Khaled Road, to the west by the western axis of the inner ring road. The main city is the northern extension to the north of the second ring



road. It extends south to the Medina/Riyadh road and the regional service area between Buraydah and Onaizah. This strip center extends between King Abdullah Road to the west and King Khaled Road from the east (Figure 7).



FIGURE 7

The action area in Buraydah City Center and location of Grand Mosque (King Fahd Mosque).

(Source: Qassim Municipality, 2014)

Basic Work Data of the Project

1. Duration of the project: 18 months started on 15/1/1435 and ends on 15/7/1436.
2. Total area of project: 55km².
3. The basic stages of the project.
4. Detailed area profiles for detailed work areas.
5. Monitor and analyze the current situation of the study area.
6. Prepare the proposed planning alternatives and the proposed plan.
7. Project brochures.

Detailed Projects (Main Surface Structure Urban Elements of the Buraydah City Center)

1. Development of the urban spaces for grand mosque and its surroundings in the city center.



2. Development of the municipal markets (vegetables and fruits) as a venue for major celebrations.
3. Development of the Alsenaa Road as a pedestrian and public transport track.
4. Development of Sabakh Farms as a recreational and agricultural tourism area.

Project Methodology and Vision: City Main Structure Development

Civil society – as deep structure component – has been integrated into the process of applying the methodology of the project based on being the most important theoretical pillars for achieving the sustainability of the development project (Figure 8).



FIGURE 8

The sustainable vision of development for Buraydah City Center project.

(Source: Qassim Municipality, 2014)

The Detailed Project: Urban Development for the Spaces Pattern (al-Qasas/al-Jarda/al-Rabia) and Grand Mosque Surrounding: Based on the Structural Approach

Within the framework of the development of Buraydah city center, central nodes were selected as main reference areas and implement the suggested framework for urban transformation (Figure 6). The first detailed work area was defined in the urban sequences of squares of al-Qasas/al-Jarda/al-Rabia, and the surrounding area of The King Fahd Mosque; east of the traditional city of Buraydah, east of its great mosque known as the Grand Mosque (currently King Fahd Mosque) and near its



eastern wall, to develop the city main structure of Buraydah, which has the historical and economic layers of past and present and considered as a site of mobility and economic activities (Figure 9).



FIGURE 9

An aerial view of the current status of the detailed work area of the squares (al-Qassas/al-Jarda/al-Rabea) and the adjacent Grand Mosque.

(Source: Qassim Municipality, 2014)

The Urban Developer (Al-Qassim Municipality) aims to eliminate randomness in this area, which impedes the provision of appropriate services to the commercial and human traffic in the Buraydah main city structure and aligned with Buraydah urban and social development in all layers (deep and surface) development of the project.




Examples of Problems with Spatial Patterns and Their Development Vision

The following table illustrates some of the urban problems in the work area and the suggested solution for its implementation in accordance with the work methodology and the general development vision of the city main structure (Table 2).



TABLE 2

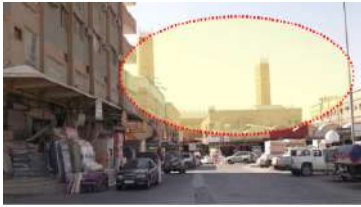
The current status for surface structure elements and its development vision with consideration to deep structure (Grand Mosque and surroundings).

<i>Surface structure for urban realm</i>	<i>Development vision with considering the deep structure</i>
<p>Poor distribution of parking lots and waiting areas and commercial activities.</p> 	<p>Re-design for parking lots, and set a new traffic vision for pedestrian flow inside urban spaces.</p> 
<p>The absence of urban and architectural character. Many activities in a random distribution which not compatible to traditional character.</p> 	<p>Re-design and development of commercial facades and architectural restoration.</p> 
<p>Interference of vehicles and pedestrian movements. Due to the lack of streets, traffic density & the lack of separation between the movement of vehicles and pedestrian movement.</p> 	<p>Separate movement between vehicles and pedestrian along with re-design of safe paths for pedestrians within urban spaces.</p> 



The negative visual impact of activities around the Grand Mosque.

The lack of commitment to the urban and architectural component leads to a distortion of the distinctive visual character of the Grand Mosque.



Re-domination of the distinctive visual character of the area in proportion to the architectural character of the Grand Mosque.



(Source: Qassim Municipality, 2014)

RESULTS OF THE PROJECT

1. In structuralism theory, the structure is a system of transformation not change.
2. The transformation of structure depends on the dynamic interrelations between the structure's elements.
3. Through an investigation of the structural properties of the case study, the application of the suggested structural framework (Figure 6) identified the structural properties which affect the underlying forces, and clarified its transformative role in the city structure. The manifestation of the structural framework is visible in the nature of the surface structure of the city, in its elements and the patterns by which they are composed (Figure 10).



Before: Grand Mosque and Al-Qasas plaza



After: Maintaining the city's main structure (Deep & Surface)

**FIGURE 10**

The development for Grand Mosque and its adjacent urban context based on the structural framework.

(Source: Qassim Municipality, 2015)

4. According to the interrelationship between the deep main structure's underlying forces, the surface main structure (physical and functional characteristics), and also the transformation based on structural properties, the mechanism of transformation in Buraydah city center is based on deep structure and underlying forces. Evaluation of the influence of each force for the case study reveals that the economic and political forces had the strongest effects of the transformation process of the city main structures.
5. In structuralize thought, structure and transformation are bonded together and their interrelationship is reflected in the surface appearances of phenomena. The structure, then, can be understood by investigating its evolutionary process, which has transformed their entity while keeping identity.
6. Buraydah Grand Mosque (King Fahad Mosque) is the first signs of political forces in structural transformation. These surface elements responded to the necessity of defense and were considerable factors in the nucleus of the city. The economic revolution (last 70th) is the sign of economic force which was the most effective transformation force.
7. The most mentioned aspects of importance which reflect the underlying forces are historic, cultural (identity). Social forces were highly important for people, because in Buraydah case these were reinforced by being supported by economic and cultural facilities and activities.

CONCLUSION

A structural approach to urban transformation is thus able to show connections between different observable forms over time and to explain connections in terms of structural laws that underlie these sequences of form.





The Grand Mosque is the most urban elements that effects on the city main structure in both its surface and deep layers, it is one of the main Urban Regulators of the city that carries the unique urban sense through the structural transformation of traditional city over its sustainable live cycle.

ACKNOWLEDGMENT

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BRITISH MUSLIMS AND THE 21ST CENTURY MOSQUE

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INTRODUCTION

RESearch which addresses the role of mosque architecture in the contemporary age requires being able to link a broad Islamic world view, along with its numerous archetypes of expression to a local frame of reference. The wider archetype of what constitutes as a mosque is contested with a local framework in regards to the respective community's needs or desires. It is from these two (at times contrasting) *modus operandi* that gives fruit to what we observe and broadly refer to as, "mosque architecture".

While pre-modern models of mosque architecture through the Muslim world were based on vernacular models entwined with visual reminders of Islamic concepts of *tawheed* and unity, the relationship between the structure, environment, and social is a contested territory. In fact, a community's vision of the local and "traditional" is blurred between a mirage of symbolic markers of authenticity and the search for expressions of "modernity".

The dynamic balance of these two factors described is vividly covered by commentators and commented on and forms what is broadly termed the British mosque experience.

As largely post-war communities began to arrive on the British Isles, new imaginations of a mosque began to take fruit. These visions, respectful to the congregation they served expressed at times what faith meant for that particular community in their "new" lands.





The article will observe how late 19th century mosque architecture in the UK is, in fact a hybrid between idealistic visions of the faithful adherents and the wider movement of orientalist architecture of that period¹.

There are approximately 1,500 mosques in the UK. However, only approximately 15% of these are new builds². Converted buildings were those buildings which were converted from their previous use into a mosque. External design changes were largely restricted and, in most cases, buildings cannot be distinguished unless one would read the sign that it is a mosque. The purpose built mosques will form the main reference points of this research article since these mosques were announcements of a vision of a particular community at a moment in time.

EARLY BRITISH MOSQUES

The story of Muslim faith in Western Europe is not a new phenomenon. Despite the prominence of Islam in Europe in the middle-ages where mosques and Muslim craftsmen inspired complete artistic styles of building traditions there is little mention of Islam in Europe prior 18th century³. In fact, it is not until the late 19th century that an English convert to Islam, by the name of Abdullah William Quillium, who after having travelled the Muslim lands, is known for establishing the first mosque in Liverpool in 1887⁴.

Shortly after the Liverpool mosque, a Jewish Hungarian-British Orientalist, Sir William Leitner (1840–1899) built the first purpose-built mosque in Woking (County of Surrey). Other examples followed soon in London with the Fazl Mosque (known today as Southfields Mosque) in 1925 and the Peel Street Mosque in Cardiff in 1946.

¹ It would form an interesting subject of study, if one were to juxtapose some of Britain's early purpose-built mosques and what new visions of modernity exist for those very same communities today

² The remaining 85% are converted buildings. Shahed Saleem's pioneering work on British mosques chronologically orders and studies the story of the British Mosque, see Saleem, (2018).

³ There is a large corpus of material dealing with heritage and arts from Muslim Spain and the evolution of forms from the Muslims in Al-Andalus and how they inspired later movements in arts and building traditions. The term "*Mudejar*" (coming from Muslims) was later a unique style of architecture on its own from 14th century onwards. However, little is known of Islam in Europe from the period of Al-Andalus through to the late 19th century. For *Mudejar* arts, see Dodds (2005a), Dodds (2005b), or for general reading, see Harvey, (1992).

⁴ It is interesting to note that, the Abdullah Quillium Society today which runs the mosques hosts numerous tours connecting British Muslims to Victorian legacy of the mosque. The mosque forms part of a wider heritage village project that is being promoted by the Mosque society. Abdullah Quillium was also granted the title of *Shaykh al-Islām* for the British Isles by Sultan (Ottoman) Abdul Hamid II. Further info, see <http://www.abdullahquillium.org/>.





Each of these mosques were established in diverse communities and not confined to one region. They were established by trade communities of Yemeni, Somali, Bengali seamen, or by early converts to Islam. It was not until after the second world-war that we observe larger numbers of South-Asian Muslims settling into industrial zones of activity in urban areas, such as London (East London), West-Midlands (Birmingham), and Yorkshire (Bradford). These predominantly industrial areas, were designed around a work based living standard with compact housing in relatively dense inner city neighbourhoods. This model of housing, sometimes referred to as Victorian Terraced housing worked well for the newly arrived, they were built with a common model in mind which helped with the longevity of the dwelling i.e. a building repair issue in one house would be the building repair issue on another house. Such a localised modular maintenance system provided a robust dwelling place in areas where close-family ties could be developed.

If we observe the site of the Shah Jahan Mosque site, to the lay person it appears similar to a mosque with its large onion dome and turrets flanking a central arch. However, upon closer inspection we observe that the mosque was at best, an “interpretation” of Mughal architecture for an age that was fascinated with the orientalist kitsch which made its way into UKs landmark architecture. It was the style of its age in the late 19th century, and William Chambers (1723–1796) was renowned for having travelled the eastern world and bring with him new dreams of an empire. In fact, if one observe the Shah Jahan Mosque more closely, Gothic elements of architecture are observed with tall elongated windows reminiscent of a chapel with *ogee* arches. The use of the turrets, with ornamental capitals topped with mini-domes too, are also a unique interpretation of the visual imagery associated with the sub-continent for this period.

The resultant architecture is nonetheless quite unique and illustrates how the first British Mosque model relied on a Christian architect and a Jewish-Hungarian. It also shows at a deeper level how early Muslim communities relied on a post-colonial model of “Orientalist – *Turquerie*” for their visions of a mosque architecture⁵.

In fact, similar is true across Europe, the Great Mosque of Paris (1926) and the Hamburg Mosque (1972) were not only synoptic designs but were also ideologically determined by the colonial presence in the Middle East

⁵ See Conner (1979, pp. 76–85) about work of William Chambers in the promotion of Chinese architecture in particular. Works of Chambers were viewed as a type of experimental style.





and India. The emergence of post-colonial buildings is a theme outside the scope of this article but worth mentioning that the term introverted “neo-colonist” has been used to describe the situation whereby the same imperialist parameters, reconfigures a colonial fantasy into post-colonial diasporic desire⁶.

It is these post-colonial archetypes that seem to be a common phenomenon of Islamic architecture across Europe from the late 19th century onwards. It is not until the 21st century that we observe vivid mass demonstrations on the streets of Europe against mosques. For example, in Cologne, Germany in June 2007 mass protests against the mosque became a watershed moment for mosques in Europe on the whole and invited questions as what kind of architecture is acceptable in European towns and cities⁷. The problem lies as much in the question as it is in finding an answer, where one adherent would see the minaret as a call to prayer or wayfinding direction marker that has formed part of the visual make-up of a mosque vocabulary through the centuries, others observe it as a symbolic “spear” marking the dominance of Islam over the skyline⁸.

Nebahat Avcioglu, elaborates on what are double-standards, whereby in the past, decorative “self-evident” architecture of the “other” (mosque architecture) was the metropolitan conditionality and that “what is seemingly the granting of religious rights with functioning mosques turns into the peremptory enforcement of *display* not visibility”⁹. The complex issue is that mosque architecture was historically framed by an Orientalist world-view, designed by non-Muslim architects and approved by councils. Today, the Muslim community is asked to reconfigure its archetypes in the rise of a liberal culture and “conform” to a type of mediocracy based on the fear of difference and administered from right wing “specialists” commentaries on semiotics of mosque architecture and its hidden meaning.

It is architects today who are often filling the void and caught in a dual negotiation of semiology and historicity. They are being asked to navigate between symbols of authenticity but with a need to be contemporary.

6 Neo-Colonialism, Gayatri Spivak “a displaced repetition of many of the old lines laid down by colonialism”. See Spivak (1989, pp. 269).

7 Switzerland and France had already instigated the minaret ban.

8 At the INTBAU “Institute of Traditional Building and Conservation” 2018 World Congress in London. A lecture was delivered highlighting key issues faces contemporary mosques in UK and Europe. See Wood (2018).

9 Avcioglu elaborates on this point by quoting, “The Mosque and the Metropolis” Crinson, in *Orientalism’s Interlocutors: Painting, Architecture, Photography* (Duke University Press, 2002) pp.79–101, that “self evident architecture was the metropolitan conditionality”.





RISING CHALLENGES AND NEW HORIZONS

The MCB (Muslim Council of Britain) has recently attempted to initiate programmes to unify mosque visions and understand and collaborate on arising issues that are faced. The “Visit My Mosque Day” whereby mosques are open-house events where mosques organise tours, inter-faith dialogue, and numerous activities in their respective localities¹⁰.

If we look at Regents Park Mosque in London today as one example of a mosque holding numerous exhibitions and installations which are visited by hundreds of schools and organisations through the year. The same is true for other mosques, including the Shah Jahan Mosque which is part of the local heritage trail and a complete Ramadan program where food is offered on each day of the month to the wider public as open-kitchen event¹¹. If we understand mosque activities through the light of day to day running and the increasingly diverse activities being held, we can appreciate the need for spaces has also changed and along with a more educated and younger community. Spaces such as visitor suites, sports areas, lecture halls and administration areas are particularly sought after¹².

THE HERITAGE QUESTION

In March 2018, it was announced by English Heritage that mosques would be given greater protection in “recognition of their historic, architectural, and cultural importance”¹³. In fact, the London Central Mosque and Islamic Cultural Centre in Regent’s Park (1970–1977) was listed as Grade II and The Fazl Mosque, Southfields (1925–1926) also at Grade II.

Two of Britain’s earliest Islamic places of worship the first purpose-built mosque, the Shah Jahan Mosque in Woking (1888–1889), was upgraded to Grade I while the home to Britain’s first functioning mosque, 8 Brougham Terrace in Liverpool, was upgraded to Grade II.

¹⁰ The scheme has seen much success and runs each year. See <https://www.visitmymosque.org/> for more info.

¹¹ The Shah Jahan Mosque for example functions today a historic shell for visitors and main prayer services are offered on a site approximately 30m away. See Salamat (2008).

¹² In amongst the challenges of mosque and future development it would be important to mention that no other faith institution caters for such a diverse congregation nor is able to open its doors to the general public for such long hours as seen in Ramadan.

¹³ See Historic England website “British Islamic heritage celebrated by Historic England | Historic England”, 2018 and “London Central mosque given Grade II* listed status | World news | *The Guardian*”, 2018.





This has been a monumental move in commending the efforts of mosques but also to allow the British Muslim journey through architecture to be celebrated as part of the national heritage framework. Another social benefit to the listed status is that Muslims communities are able to take pride in a being part of the wider British-Muslim identity.

The evolving challenge for British Muslim communities appears to be how they are able to interpret some of the questions related to identity polemics. Are the historic mosques seen as a memorabilia of ideas attached to a country of origin which their forefathers arrived from or do they place these historic mosques as part of a continuum of architectural precedent derived from a local diasporic experience. The latter of these illustrates the wider discussions that are taking place but one that answer would allow a uniquely British mosque to derive itself from.

NEW VISIONS AND THE BRITISH ECO MOSQUE IN CAMBRIDGE

The two late 19th century samples, the Liverpool Abdullah Quilliam Mosque, today aims to develop a heritage village in the near future. The aims of the mosque are to promote Victorian and essentially a British Islam. The mosque is currently being developed and restored and raised considerable funds to rebuild its *wudhu*' areas whilst restoring some of its original Victorian fittings. The Shah Jahan Mosque is also developing its historic green site, to make use of its historic library and create additional visitor suites and conference venue¹⁴.

A new recently opened mosque on Mill Road in Cambridge, envisions itself as the 21st century mosque. The site was originally purchased by well-known celebrities such as Yusuf Islam (formerly known as Cat Stevens) and other notable persona, Sheikh Abdul Hakim Murad (Tim Winters) who is an English convert to Islam and renowned Cambridge academic.

Sheikh Murad, is a well-known author and activist who works at grass root levels with communities and spear-headed the campaign for the Cambridge mosque. He described the Cambridge mosque to be looking for a “hybrid” identity that is local yet able to transcend via its connection to the universal Islamic language.

An international design competition was held and Marks Barfield Architects winning scheme was selected. The design continues the use of the dome

¹⁴ The author of this article is Architectural Consultant to the Shah Jahan Mosque development project.





but creates a large prayer hall punctuated with natural light and wooden timber arched columns. The style is strikingly unique and the architects describe the mosque as the “first green mosque” saying the building will be a “cultural bridge” for Islam in Britain in the 21st Century¹⁵.

Whilst mosques such as Cambridge Mosque, are important to British Muslims and open the door for questions of authentic style to be derived it is equally important for British Muslim communities to think critically of language used to describe further “visions” of a 21st century mosque. For example, the trunkated columns in the prayer hall are not a new creation and it is problematic when such architectural forms are given new meaning, from within a Islamic vocabulary. The trunkated columns, are in fact exact replica’s of Shigeru Ban’s Golf Club in South Korea which was built and opened prior to the Cambridge Mosque¹⁶.

This is of course, not to devoid the Cambridge Mosque from its success as inspiring multi-functional and dynamic venue for Muslims to gather and celebrate. Whilst the mosque may be a new vision, it would be problematic if the notion of an original creation is tied to the Cambridge Mosque.

The question of authenticity and precedent is posed back to the Muslim community, who in search for an architectural continuum from the early mosques are still referring to visions of new mosque architecture from architects who would have (up until the project) had little or no experience of mosque architecture or even the journey of Muslim communities¹⁷.

MOVING FORWARD

Muslim communities in the UK evolved from early scattered towns and cities to being some of the most active economic trade centres of the UK today. Whilst early mosques in the UK were based on colonial visions of what mosques should be, these mosques were part of an exotic *turquie* derived from Orientalist traveller ventures into the unknown “Mohammedan” world.

¹⁵ “Eco Mosque’ Opens for Prayers in Cambridge” – BBC News, 2019.

¹⁶ Further to this, Shigeru Ban’s project engineering manufacturer Blumer-Lehmann AG was also the same manufacturer for the Cambridge Mosque project. The similarities of the projects are countless. An article in Turkish magazine highlighted more of these trends, “*Cami Mimarisi Işığında Gayrimüslim Mimarlar*” which translates to “Non-Muslim Architects in the Light of Mosque Architecture”. See Iqbal and Kayani (2019).

¹⁷ It is also worth mentioning that in 2012 Marks Barsfield architects proposals for a Yusuf Islam Foundation school in North London. The proposal dossier involved background images cited of the “Alhambra” in Andalusia for architectural precedent. The use of cliché precedents is not limited to such architects alone but part of a wider issue that Muslim communities face.





However, the story of mosque architecture forms part of the wider success stories of faith in the British Isles. While Churches and Chapel conversion projects are a popular attraction for developers and building companies, the congregation mosques and prayer spaces continue to rise. Currently, there are even visions of a new mosque proposed at the heart of West-End in London¹⁸.

In terms of future, whilst the early communities were mosque adherents tied between dual nationalities, the new British Muslim is home in London, Manchester, or even Birmingham. The Muslim community is therefore British but also culturally identifies with a Syrian, Sudanese, or Indian culture.

The author has tried to make a case for a more critical reading and of historic Muslim community to be comfortable within its chosen framework of reference. In whatever form the community chooses to express its faith in, it should be weary of visions of expressing a connectivity to the 21st century. Reductionist language of further integration and visions of “new” models fail to recognise the ongoing work and challenges that mosques have faced through the decades and instead focus on a similar rhetoric of enlightening the Muslim community.

Nonetheless, communities are faced with new challenges and requirements. This was equally true a century ago when the adherents were warily integrating into towns and cities, the situation today is different.

Whilst, projects in an International Architecture style may be good for media-related purposes and bolster representation it is disingenuous to employ religious language to structures that may have not been designed with conscious knowledge of wider phenomena of Islamic Architecture. It has been argued that British Mosques from their early inception have been continuously adapting their prayer spaces, types of associated use and how to serve their respective communities – all of this has taken place while other faith institutions have found to be lacking.

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¹⁸ Leicester square, usually associated with movie premieres and celebrity appearances for events in London.





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دراسة تحليلية للدراسات المهنية بالضوابط الشرعية لعمارة المساجد¹

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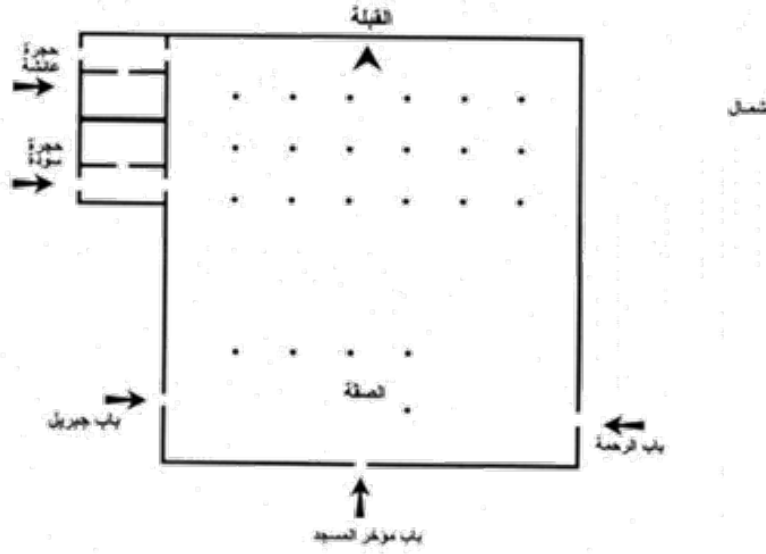
المقدمة

المساجد بيوت الله تعالى، فيها يقام ركن الإسلام. قال تعالى: (فِي بُيُوتٍ أَذِنَ اللَّهُ أَنْ تُرْفَعَ وَيُذْكَرَ فِيهَا اسْمُهُ) (سورة النور: آية 36). ويعرف المسجد لغة على أنه: اسم للمكان، من سجد يسجد سجوداً، إذا وضع جبهته على الأرض (الصنعاني، 2009)، قال الزركشي رحمه الله: ولَمَّا كَانَ السَّجُودُ أَشْرَفُ أَعْمَالِ الصَّلَاةِ، لِقَرَبِ الْعَبْدِ مِنْ رَبِّهِ، اشْتَقَّ اسْمُ الْمَكَانِ مِنْهُ فَقِيلَ: مَسْجِدٌ، وَلَمْ يَقُولُوا: مَرَكِعٌ (الزركشي، 2007). و”كلمة المسجد تطلق على بناء يحتوي مجموعة من الفضاءات المعمارية من أبرزها: مصلى الرجال، ومصلى النساء، والمنارة (المئذنة)، ودورات المياه، وسكن الإمام والمؤذن، وهناك ملحقات أخرى كمغسلة الموتى، والمكتبة، وقاعات المحاضرات، وغيرها“ (عبدالغني، 1995).

يعتبر مسجد الرسول ﷺ في المدينة الأساس لأي دراسة تعنى بالمساجد، ”... فأول خطوة خطاها رسول الله ﷺ هي بناء المسجد النبوي،... فأمر رسول الله ﷺ بقبور المشركين فنبشت، وبالحرب فسويت، وبالنخل والشجر فقطعت، وصفت في قبلة المسجد، وكانت القبلة إلى بيت المقدس، وجعلت عضادته من حجارة، وأقيمت حيطانه من اللبن والطين، وجعل سقفه من جريد النخل، وعُمدته الجذوع، وفرشت أرضه بالرمال والحصباء، وجعلت له ثلاثة أبواب، وطوله مما يلي القبلة إلى مؤخره مائة ذراع، والجانبان مثل ذلك أو دونه، وكان أساسه قريباً من ثلاثة أذرع“ (المباركفوري، 1991)، و(شكل 1) الآتي الذي يوضح تصوراً لمسقط المسجد في عهد النبي ﷺ:

¹ Analytical Review on Religious Guidelines for Mosque Architecture.





شكل 1

مسقط أفقي توضيحي للمسجد الأول في عهد النبي ﷺ.

(المصدر: الأنصاري، 1986)

وعلى خلاف المتوقع من كون المسجد هو أساس المدينة الإسلامية، وبالتالي فهناك الكثير من الدراسات بشأنه، إلا أن الباحث يجد أنه أمام عدد زهيد من هذه الدراسات، ف”مما يسترعي الانتباه أن المسجد والذي يعتبر من أهم المباني التي تخدم المجتمع المسلم، لم يحظ بما يستحقه من دراسات وبحوث علمية بالصورة التي تعكس مكانته السامية لدى المسلمين“.²

إن التجديد المستمر في عناصر المسجد بناء على تحديد الاحتياجات ومواد وتقنيات البناء يتطلب المواكبة بدراسات متجددة إضافة إلى ما أنجز سابقاً، إلا أن الأمر ليس بالشكل المتوقع، ولا أدل على ذلك من الفجوة الزمنية التي بلغت 19 عاماً بين ندوة عمارة المساجد التي عقدتها كلية العمارة والتخطيط في جامعة الملك سعود في الرياض عام 1419هـ، وبين المؤتمر العالمي الأول لعمارة المساجد الذي عقدته جامعة الإمام عبد الرحمن بن فيصل (جامعة الدمام سابقاً) بالتعاون مع جائزة عبداللطيف الفوزان لعمارة المساجد في عام 1438هـ.

² مقدمة المجلد الأول من سجل ندوة عمارة المساجد، جامعة الملك سعود، كلية العمارة والتخطيط، 1419هـ.



موضوع الدراسة (المشكلة البحثية)

تولى النبي ﷺ بناء المسجد بنفسه، وحدد ضوابط لبنائه، الأمر الذي يدل على أن المسجد بناء يخضع للضوابط الشرعية؛ لخصوص فعل النبي ﷺ، ولعموم قول الله تعالى (وما خلقت الجن والإنس إلا ليعبدون) (سورة الذاريات: آية 56) فدل على أن كل فعل يفعله الإنسان في الأرض فهو عبادة، والعبادة يجب أن تكون وفق شرع الله جل وعلا، والمسجد بناء تؤدي فيه عبادة الصلاة التي هي أحد أركان الدين. إن "تصميم الحيز الداخلي للمسجد عملية مقيدة بضوابط معينة، وغير متروكة لانطلاقات الفكر المعماري" (حسن، 2016). وقد وردت نصوص شرعية تضع ضوابط لبناء المساجد وتحدد محاذير يجب أن تجتنب، فمن الضوابط (على سبيل المثال) النهي عن وضع القبور في المساجد، أو بناء المساجد على القبور: عن أبي سعيد الخدري - رضي الله عنه - عن النبي ﷺ - قال: «الأرض كلها مسجد إلا المقبرة والحمام». رواه أبو داود. قال ابن تيمية: "اتفق الأئمة أنه لا يبنى مسجد على قبر" (ابن تيمية، 1995)، ومن الأمثلة كذلك: الأمر بأن يكون المسجد واقيا من المطر والحر والبرد، ومن النواهي المبالغة في زخرفة المساجد لدرجة الإشغال: (روى البخاري في صحيحه أن عمر رضي الله عنه أمر ببناء مسجد وقال: "أكره الناس من المطر، وإياك أن تُحْمَر أو تصفّر فتفتن الناس) (العسقلاني، 1986).

وتستجد في مجال عمارة المساجد وبشكل مستمر العديد من الموضوعات التي تحتاج إلى ضبطها بالضوابط الشرعية، هذه المستجدات كانت ولا زالت يقع حولها جدل شرعي من قبل المصممين والمنفذين للمساجد، دون وجود دراسات شاملة ومتكاملة تحسم هذا الخلاف. وقد ظهرت العديد من الأطروحات حول هذا الموضوع إلا أنها إما أن تكون غير متخصصة شرعيا أو غير متخصصة معماريا، إضافة إلى عدم شمولها لجميع القضايا والمستجدات في عمارة المساجد سواء السابقة أو الحالية؛ الأمر الذي يتطلب تظافر جهود علماء الشريعة مع متخصصي العمارة لتأصيل هذه القضايا. وهذه الدراسة تعمل على تحديد المدى الذي وصلت إليه الدراسات في هذه المجال.

فرضية الدراسة

تفترض الدراسة أن هناك فجوة بحثية في مجال الضوابط الشرعية لتصميم وعمارة المساجد، تتمثل في نقص الدراسات المتعلقة بهذا المجال، وعدم شمولية الموجود منها لكافة الضوابط الشرعية لتصميم وعمارة المساجد.



هدف الدراسة

تهدف هذ الدراسة إلى:

1. جمع وتحليل الدراسات المتعلقة بموضوع الضوابط الشرعية للمساجد والواردة في كل من ندوة عمارة المساجد، والمؤتمر العالمي الأول لعمارة المساجد على وجه الخصوص، أو الدراسات الأخرى بشكل عام،
2. تحديد حجم الفجوة البحثية في مجال الدراسات المتعلقة بالضوابط الشرعية لعمارة المساجد.

منهجية الدراسة

عملت الدراسة على تحليل المحتوى للدراسات التي تناولت الضابط الشرعية لعمارة المساجد سواء في دراسات ندوة عمارة المساجد، أو دراسات المؤتمر العالمي الأول لعمارة المساجد، أو من المراجع الأخرى والتي ألفت خلال الخمسين سنة الماضية، وذلك أن تصميم وعمارة المساجد تتأثر في كل عصر بحسب معطياته، وتقنيات البناء المستحدثة فيه.

وحيث أن دراسات ندوة عمارة المساجد، ودراسات المؤتمر العالمي الأول لعمارة المساجد محصورة ومنشورة فلم يكن هناك كبير عناء في جمعها وتصنيفها، بل إن دراسات ندوة عمارة المساجد مصنفة تلقائياً من قبل الجهة المنظمة للندوة حيث أفرد موضوع الضوابط الشرعية لعمارة المساجد في مجلد خاص من سجلها، أما دراسات المؤتمر العالمي الأول لعمارة المساجد فقد تطلب الأمر حضور المؤتمر، وقراءة كاملة لجميع الدراسات لتحديد المتعلق بالضوابط الشرعية لعمارة المساجد منها. بيد أن معظم الجهد البحثي عن الدراسات السابقة استغرقه البحث في المراجع الأخرى من غير الندوة والمؤتمر، فبالإضافة الى البحث الذاتي؛ تمت الاستعانة بالمتخصصين والطلب منهم التزويد بما يعلمون من مراجع تناولت موضوع الضوابط الشرعية لعمارة المساجد عبر الوسائل الآتية:

1. حساب خاص في تويتر لعمارة المساجد (@ahmadroshditoma) بلغ متابعوه أكثر من ألف وثلاثمائة من المتخصصين في أنحاء العالم،
2. مجموعة متخصصة في الواتس أب باسم (عمارة المساجد) جمعت أكثر من 150 مشتركاً من أساتذة الجامعات والمعماريين الممارسين لعمارة المساجد في أنحاء العالم،



3. مجموعة متخصصة في الواتس أب باسم (علم وهندسة المساجد) جمعت أكثر من 235 مشتركاً من أساتذة الجامعات والمعماريين الممارسين لعمارة المساجد في أنحاء العالم،
4. مراسلة المتخصصين عبر رسائل الإيميل والطلب منهم الاستفادة بما يعرفون من مراجع حول موضوع الضوابط الشرعية لعمارة المساجد.

وقد تم تحليل جميع الدراسات المتوافقة مع موضوع الدراسة وفق آليتين هما:

1. التحليل العام للدراسات من حيث توجهاتها، وشموليتها، ونتائجها،
2. التحليل التفصيلي؛ من خلال تطوير مصفوفة شاملة لعناصر المسجد العمرانية، لتحديد التكرارات المتنوعة لهذه الدراسات، واستخراج مواطن التركيز والنقص في كل منها.

الدراسات السابقة

لطبيعة الدراسة ولتخصصها بتحليل الدراسات الواردة في موضوع الضوابط الشرعية للمساجد فقد تم تقسيم هذه الفقرة إلى ثلاثة أقسام:

1. الدراسات الواردة في ندوة عمارة المساجد، ورُمز لها بالحرف (ن)،
2. الدراسات الواردة في المؤتمر العالمي الأول لعمارة المساجد، ورُمز لها بالحرف (م)،
3. الدراسات السابقة بشكل عام ورُمز لها بالحرف (خ). وفيما يلي استعراض لها.

الأول: الدراسات الواردة في ندوة عمارة المساجد

اشتمل سجل دراسات ندوة عمارة المساجد على عشرة مجلدات تضمنت مئة وعشر دراسات محكمة، أفرد المجلد الثامن منها مجال هذه الدراسة وهو الضوابط الشرعية لعمارة المساجد، وقد احتوى المجلد على ست دراسات باللغة العربية، ودراسة باللغة الإنجليزية، تم إيرادها جميعاً لتعلقها المباشر بموضوع الدراسة، وهناك دراسة في سجل الندوة للصاوي لم ترد في المجلد الثامن آنف الذكر، ولأهميتها فقد وضعت في القسم الثالث: الدراسات السابقة في مجال عمارة المساجد بشكل عام. وفيما يلي استعراض لأهم ما تضمنته هذه الدراسات:



الدراسة ن1: الضوابط الشرعية لعمارة المساجد. صالح بن غانم السدلان

الدراسة مقسمة إلى ثلاثة أقسام: الأول للضوابط العامة لعمارة المساجد، والثاني للعناصر المعمارية للمسجد، والثالث لقضايا شرعية عامة للمساجد، وفيما يلي وصف لأقسام الدراسة:

أولاً: ضوابط عامة لعمارة المساجد: وضعت الدراسة ستة ضوابط عامة لعمارة المساجد منها التخطيطية ومنها المعمارية، على النحو الآتي:

1. اختيار موقع المسجد في قلب التجمع العمراني للمدينة،
2. اختيار الموقع المناسب للمسجد من الحي السكني،
3. مراعاة اليسر والاعتدال وعدم التكلف في تصميم وبناء المساجد،
4. مراعاة التوجيهات النبوية في التصميم المعماري للمساجد (مستطيل لإطالة الصف الأول، المداخل لا تقطعه صلاة المصلين، تقليل الأعمدة التي تقطع الصف،
5. مراعاة بعد المسجد عن أماكن الأذى والقذر والضرر والروائح الكريهة،
6. مراعاة حقوق الحوار في التصميم الهندسي والمعماري للمسجد.

ثانياً: العناصر المعمارية للمسجد، واشتملت على أحد عشر عنصراً هي: المنبر، المحراب، القبة، رحبة المسجد، الرواق، المئذنة أو المنارة، السواري، الشرفات، المقاصير، المرافق الصحية والمطاهر (الميضأة)، الأبواب.

ثالثاً: قضايا شرعية مرتبطة بعمارة المساجد، وتناولت أربعة مواضيع هي:

1. وقف المسجد والوقف عليه لمصلحته،
2. نقل المسجد إذا خرب،
3. تسمية المسجد باسم شخص معين،
4. زخرفة المساجد.

وقد لوحظ أن العناصر السابقة متداخلة في الدراسة المذكورة، وغير مقسمة بعناوين واضحة، حيث تتجه في بعض أجزائها للسرد، كما لوحظ أن ملخص الدراسة الذي ورد في أولها



يختلف عن متنها، وكلاهما يختلف عن النتائج التي توصلت إليها، الأمر الذي تطلب إعادة تحليلها، ووضع عناوين أساسية وفرعية لتوضيح هيكلها.

الدراسة ن2: أحكام بناء المساجد في الشريعة الإسلامية. إبراهيم بن صالح الخضير³

وهي مثل الدراسة السابقة، يغلب عليها السرد، كما أن الملخص الوارد في أولها أشار إلى أربعة فصول هي: بناء المسجد، أجزاء المسجد، ملكية المسجد، تنظيم المسجد، في حين أن الدراسة نفسها كانت من فصلين فقط هما: بناء المسجد، وأجزاء المسجد، ودخل فصل تنظيم المسجد، وفصل ملكية المسجد تحت فصل بناء المسجد.

وفيما يلي استعراض لما تضمنته الدراسة:

أولاً: بناء المسجد، واشتمل على تسعة عناوين هي:

1. حكم بناء المسجد وفضله،
2. هل بناء المسجد عبادة أم عادة،
3. تنظيم الجهات المختصة لبناء المساجد،
4. زخرفة المساجد والتباهي بها،
5. المسجد المتنقل،
6. حكم بناء المساجد على القبور،
7. حكمة التشريع في منع اتخاذ القبور مساجد،
8. بناء المساجد بالدوائر والعمارات الشاهقة،
9. بناء المساجد في الطريق.

³ أصل هذه الدراسة كتاب من جزئين بعنوان: أحكام المساجد في الشريعة الإسلامية، للمؤلف، وقد أفرد فصلاً لأحكام بناء المسجد، وهو الموجود في أبحاث ندوة المساجد.



ثانياً: أجزاء المسجد، وتضمن سبعة أجزاء هي: المحراب، رحة المسجد، سطح المسجد وخلوته، منارة المسجد، المنبر، أجزاء ملحقة بالمسجد، المصليات، وقد أفردت في آخر الدراسة دون الإشارة إليها في الملخص، وكان الأولى دمجها مع الفصل الأول بعد فقرتي: بناء المساجد بالدوائر والعمارات الشاهقة. وبناء المساجد في الطريق؛ وقد تناول ثلاثة أنواع من المصليات هي: مصلى البيت، ومصلى العيد، ومصلى الجنائز.

وكما لوحظ في الدراسة السابقة، فإن هذه الدراسة أيضاً فيها تداخل في العناوين، وعدم ترابط بين الملخص، والمتمن، والخلاصة.

الدراسة ن3: المسجد في الإسلام: حدوده وتاريخه، أبرز الضوابط الشرعية المتعلقة بعمارته، منصور بن عبدالعزيز الجديد

اشتملت الدراسة على قسمين، القسم الأول: تعريف بالمسجد وحدوده الشرعية، ولحة تاريخية عن المسجد وفضل عمارته، والأحكام المتعلقة به، والقسم الثاني: تضمن خمسة ضوابط شرعية عامة لعمارة المساجد هي:

1. الإخلاص،
2. الالتزام بالمنهج، وتضمن: عدم بناء مسجد الضرار، عدم الإضرار بالجيران، ومراعاة اتجاه القبلة،
3. الاختلاف في الهيئة، وتضمن: النهي عن البناء على القبور، والإضرار بالجيران، ومراعاة اتجاه القبلة، والنهي عن الزخرفة،
4. الإتقان في العمل، وتضمن: صلاحية الموقع، والعناية بالصفوف، والعناية بتصميم مصليات النساء، والعناية بتصميم دورات المياه والعناية بالنظافة والتشغيل،
5. الاقتصاد في البناء، وتضمن: عدم المبالغة في المآذن، وعدم التوسع في بحور المسجد، وعدم الإسراف في استخدام الطاقة.

إن الضوابط الخمسة الواردة في الدراسة عامة، وهي عبارة عن خطوط إرشادية لعمارة المساجد، تتيح للمعماري والمخطط الحرية في الإبداع ولكن ضمن نطاقها.



الدراسة ن4: عمارة المسجد في ضوء الأحكام الفقهية: دراسة تطبيقية أثرية. محمد عبد الستار عثمان، عوض عوض محمد الإمام

قسمت الدراسة المساجد إلى: المساجد الجامعة، ومساجد القبائل (للصلوات الخمس)، ومساجد الدور، ومساجد الأسواق. ومن ثم تناولت الموضوعات الآتية:

1. تمويل بناء المساجد،
2. موقع وموضع المسجد،
3. علاقة المسجد الجامع بتخطيط المدن،
4. الضوابط الشرعية لتخطيط المسجد⁴.

أولاً⁵: تخطيط المسجد وعناصره. وقد استقيت من مسجد الرسول ﷺ اشتملت على العناصر الآتية: مساحة الصلاة، ظلة الفقراء، الصحن، البناء بالمواد المتوفرة في البيئة، قابلية التوسع، مجاورة بيت الإمام للمسجد، المنبر، تمييز بناء المحراب وتجويفه، تسهيل الدخول والخروج، المقصورة، المنبر، قاعة الخطابة، المئذنة.

ثانياً: ملحقات المسجد، والامتداد المعماري الرأسي للمسجد. وقسمت الدراسة الملحقات إلى:

1. داخلية: كالميضأة والبئر، وهل تلحق الميضأة بالمسجد أو تكون منفصلة عنه، ويكون مأوها جارياً، وتكون المسافة بين المتوضئين كافية، ويكون تصريف المراحيض مناسباً، وتضمن مستحماً لرفع الجنابة،
2. خارجية: كسكن العاملين أو الأيتام، والفناء الخارجي للمسجد (وليس الصحن الداخلي)، والكتّاب، والسبل.

⁴ يعبر غير المتخصصين في العمارة أحياناً بكلمة التخطيط ويراد بها التصميم

⁵ تم إضافة هذه التقسيمات لأنها لم تكن موجودة في البحث الأساسي، وإنما كانت على شكل سرد متداخل.



ثالثا: الضوابط الشرعية في مجال الإنشاء، وقد تناول الموضوعات الآتية:

1. أن تكون الأرض والمال حلالا، ومواد البناء غير نجسة،
2. الصلاة بين الأعمدة،
3. زخرفة المسجد،
4. أثاث المسجد: المنبر، كرسي القارئ أو كرسي المصحف أو كرسي الجوامعي، دكة المؤذن أو المبلغ، فرش المسجد، القناديل،
5. صيانة المسجد.

من مجمل الاستعراض السابق لهذه الدراسة يتضح أنها غير مستوعبة لموضوع الأحكام الفقهية لعمارة المساجد، وإنما هي أشبه بمقال تعريفى، ناقش بعض هذه الأحكام، ولم يتبع أسلوبا محددًا لترتيبها، أو عنوانها.

الدراسة ن5: عوامل تحقيق رسالة المسجد في الإسلام دراسة ميدانية لمساجد مدينة الرياض وجوامعها، صالح بن عبد الله الدبل

وبرغم ان هذه الدراسة أدرجت في المجلد الثامن من مجلدات الندوة، والذي هو بعنوان: الضوابط الشرعية لعمارة المساجد، إلا أنها لم تتناول الضوابط الشرعية لعمارة المساجد، إنما هي دراسة ميدانية لعينة من مساجد الرياض للوقوف على مستوى تطبيق العينة للنواحي التعليمية والدعوية والاجتماعية، وعلى مستوى الأئمة والمؤذنين، ولذلك فليس لها ارتباط بموضوع هذه الدراسة.

الدراسة ن6: مصليات النساء والمخالفات الشرعية في استحداث عزلها عن المساجد، جاهد مقصود تارم

تناولت الدراسة في مقدمتها أحكاما شرعية لصلاة النساء في المساجد، ومن ثم استعراضا تاريخيا لمئة مسجد من مساجد العالم الإسلامي، أكدت فرضية الباحث بعدم تخصيص مصليات للنساء في هذه المساجد؛ ومن ثم تطرقت للمخالفات الشرعية في استحداث مصلى للنساء ومنها: قطع اتصال الصفوف، وبالتالي قطع الجماعة، مخالفة السنة حيث لم يُفصل النساء في عهد النبي ﷺ. في الختام أكدت النتائج عدم الفصل التام لمصلى النساء عن مصلى الرجال مع تخصيص باب لهن.



الدراسة ن7: متضمنات برنامج إنشاء مسجد جديد على تصميم المساجد كمراكز لتنمية الأحياء، محمد تاج الدين رسدي

وهي مشابهة للدراسة ن5، حيث لم تتطرق لمعايير شرعية للبناء، إنما ناقشت التجربة الماليزية للتطوير الروحي للمسلم، وحددت ثلاثة أهداف للمسجد من أجل تطوير مجتمع إسلامي، وهي: النواحي الذهنية، والنواحي الفيزيائية، وتقوية الروابط الأخوية.

الثاني: الدراسات الواردة في المؤتمر العالمي الأول لعمارة المساجد

اشتمل سجل المؤتمر العالمي الأول لعمارة المساجد على ثلاث وعشرين دراسة باللغة العربية وثمانية عشرة دراسة باللغة الإنجليزية، ليس منها ما تناول بشكل مباشر الضوابط الشرعية لبناء المساجد، إلا أن هناك خمس دراسات باللغة العربية، وثلاث دراسات باللغة الإنجليزية تناولت جزئية من الضوابط الشرعية لعمارة المسجد إما فيزيائية، أو روحية واجتماعية. والدراسات هي:

الدراسة م1: مسجد المستقبل: التصميم للروحانية والخضوع بين الأصالة والخيال والابتكار، جلال محمد عبده

وناقشت الدراسة ثلاثة محاور:

1. فرضية أن أساس تصميم المساجد هو المسجد النبوي الأول، والذي يتكون من تسعة عناصر: المدخل، الميضأة، الصحن، المصلى، المحراب، المنبر، المئذنة، الفتحات، الأسطح،
2. أهم المتغيرات في التصميم للروحانية والخشوع في التوجهات المستقبلية لعمارة المسجد، وتتمثل في ثمانية عناصر هي: القبلة، المنبر، قاعة الصلاة، المئذنة، الميضأة، الصحن، القباب، السطوح الخارجية،
3. التوجهات المستقبلية لتصميم المسجد للروحانية والخشوع، وتضمن خمسة توجهات هي: التجريد والبساطة والرمزية، الصياغات التخيلية للعناصر التقليدية، الطروحات المفاهيمية، التفكيك وإعادة التركيب، الأشكال التجديدية.



ويمكن تلخيص هذه الدراسة في عبارة أوردها المؤلف لأركون: ”العناصر الرمزية للمسجد مثل المئذنة والمنبر والفناء والوضوء، تكمن أهميتها في مضمونها كرموز وعلامات وليس لها أي قداسة، وبالتالي قد تكون قابلة للتغيير عبر الزمن“.

وبالتالي يمكن القول بناء على هذه الدراسة بعدم وجود ضوابط شرعية لبناء المساجد.

الدراسة م2: دراسة تحليلية لساحة المسجد كامتداد لدوره المادي والروحاني، أسماء عثمان

هدفت الدراسة إلى تأكيد دور ساحة المسجد كعنصر انتقالي من العالم المادي إلى الروحاني، وقارنت بين ساحتي: الجامع الجديد، وجامع نور عثمانية في إسطنبول.

تكمن أهمية هذه الدراسة في التأكيد على أهمية الساحة للتهيئة الروحية للمصلي، وبالتالي يمكن اعتبارها ضابطاً فكرياً.

الدراسة م3: خصائص التفكير في تصميم الحيز الداخلي للمسجد، نوبي محمد حسن

وهذه الدراسة تختلف تماماً عن الدراستين السابقتين، فقد نصت على أن: ”تصميم الحيز الداخلي للمسجد عملية مقيدة بضوابط، وغير متروكة لانطلاقات الفكر المعماري“. وحددت أربعة ضوابط، وتحت كل ضابط عناصر فرعية، والضوابط هي: التقييد لا الإطلاق، البساطة لا التعقيد (المسقط، الموقع، المدخل، النوافذ)، الوظيفة لا الشكل (البرنامج، الهيئة، التشكيل)، التوافق لا التعارض (ظروف الموقع، التقنيات).

وهذه الضوابط الخمسة تعتبر ضوابط فكرية محددة لعمارة المساجد.

الدراسة م4: دراسة تحليلية لدور المسجد في بناء رابطة الجوار الاجتماعي في المدينة الإسلامية، خالد السيد محمد الحجلة

عملت الدراسة على تحليل دور المسجد في تكوين الإحساس بالانتماء للمكان من خلال أربعة محاور: العضوية (التداخل مع المحيط)، التأثير (تأثير المسجد على المجتمع المحيط)، التكامل وتحقيق الاحتياجات، الروابط العاطفية المشتركة.



لم تناقش أو تضع الدراسة ضوابط شرعية لعمارة المسجد، ولكنها تخلص إلى أن تغيير شكل المسجد عبر العصور عن تصميم مسجد الرسول صلى الله عليه وسلم، أفقده دوره في بناء رابطة الحوار الاجتماعي في المدينة الإسلامية، وبالتالي يدعو للعودة إلى المسجد الأول دون إحداث إضافات عليه.

الدراسة م5: المسجد المعاصر بين الشكل والمضمون: تحليل مقارنة للتجربة الإيطالية، محمد جلال استانبولي، محمد عبد الموجود الحفناوي

حصرت الدراسة الضوابط الشرعية لعمارة المساجد في أربعة عناصر هي:

- أ- أن يصمم على هيئة مستطيل يكون محوره الرئيسي موازيا لاتجاه امتداد جدار القبلة،
- ب- توزيع مداخل المسجد في أماكن محددة بحيث تحقق عدم المرور من أمام المصلي،
- ج- لا تكون الأعمدة عاملاً على قطع صفوف المصلين،
- د- عدم الإسراف في البناء.

وهذه الضوابط الأربعة وردت تماماً (مع ضوابط) أخرى في دراسة (ن1، صالح السدلان).

من أهم عناصر المسجد المعمارية: حيز الصلاة، رحبة المسجد، الظلّات والأروقة، المنبر، المئذنة، المحراب، المقصورة، الميضأة ودورات المياه، مصلى النساء، المداخل، المكتبة، تأثيث المسجد (السجاد)، النوافذ.

ومن أهم عناصر المسجد الانشائية: مواد البناء، الأرضية، الحوائط والاساسات - الأعمدة والركائز، السقف، القائمون بعملية البناء، قوة البنيان المادي للمسجد.

يمكن تلخيص نتائج الدراسة بالآتي:

- لا ينبغي ان يتخلف المسجد في عمارته ومنشآته عما اتخذه المسلمون في بيوتهم ومنازلهم من مواد بناء وفنون اقامتها، وجمال هندستها، ووفائها بمهامها، واستحداث ما استحدثت من انواع الفرش دون اسراف او ترف،
- المسجد مبنى له خصوصية دينية ووظيفة تعبدية ادت الى توحيد برنامجه وعناصره المعمارية،
- المضمون في عمارة المسجد ارتبط بالثوابت اما الشكل فهو المتغير.



الدراسة م6: نهج اجتماعي إيكولوجي تكاملي لتصميم المساجد، مصطفى جبر، رانيا عبد الجليل

وهذه الدراسة أيضا لم تناقش أو تضع ضوابط شرعية لبناء المسجد، ولكنها تخلص إلى أن المسجد مكان للعبادة، وللأنشطة الاجتماعية التي تلبي احتياجات المجتمع الحيوية سواء الملموسة أو غير الملموسة (الروحية والاجتماعية)، مع التأكيد على توفير بيئة مناسبة لتحقيق هذه الممارسات من خلال الحلول التكنولوجية الحديثة.

الدراسة م7: المحافظة على القيم الدينية والتقليدية للمسلمين مع بنية مسجد بدون قباب: دراسة لمسجد شاه فيصل في إسلام آباد، ربحان جميل

انطلقت الدراسة من اعتبار أن العمارة الإسلامية تتميز بثلاثة أشياء هي: القباب، الأقواس، المآذن، وحاولت إثبات أن مسجد شاه فيصل في إسلام آباد قد بني بدون قبة وبرغم ذلك لا زال هو القلب النابض لإسلام آباد.

ويبدو أن الباحث أبعد النجعة، سواء في حصر معالم العمارة الإسلامية في ثلاثة عناصر، أو في اختيار نموذج لمسجد واحد فقط للاستدلال.

الدراسة م8: التغير في مدلولات المسجد المعاصر من الديني إلى السلطوي، عبير حسام الدين اللحام

انطلقت الدراسة من أساس أن هناك بعد عن التوجه الديني في العصور التالية لعصر النبوة، انعكس حتى على المباني وأفقدتها شكلها الخاص، مما أدى ببعض المساجد إلى المبالغة في الرمزية الدينية لتحويلها إلى مبان تعبر عن القوة السلطوية في المكان. ولم تناقش موضوع الضوابط الشرعية بشكل مباشر، وإنما استعرضت بشكل فلسفي تاريخي مجموعة من المساجد التي تحمل أسماء حكام في فترات مختلفة، وبالتالي بنيت بشكل غير ملتزم بالضوابط الأساسية لعمارة المساجد.

الثالث: الدراسات السابقة في مجال عمارة المساجد بشكل عام

تنوعت الدراسات في مجال الضوابط الشرعية للمساجد بشكل عام، وجلها كان يتحدث عن ضوابط وآداب شرعية عامة، وقليل منها ما تخصص في مجال الضوابط الشرعية المحددة لعمارة المساجد، وهذه الدراسات على النحو الآتي:



الدراسة خ1: المسجد كمؤسسة إسلامية بين الثوابت والمتغيرات، علي محمد عبد الله الصاوي

تناولت الدراسة الملامح الرئيسية لمسجد النبي ﷺ كمؤسسة من حيث: الجانب التعبدي، والجانب المجتمعي، والجانب السياسي التشريعي، وما اعتري هذه الوظائف من تغير حتى فقد المسجد في القرن التاسع عشر (من وجهة نظر صاحب الدراسة) دوره المؤسسي، وهذه الدراسة شبيهة في نتائجها بالدراسة السابقة: (م4، خالد الحجلة).

الدراسة خ2: عمارة المساجد وتوجهاتها المعاصرة، نعيمة بن قاري

ناقشت الدراسة تطور المسجد والعوامل التي ساهمت في تحديد مقوماته والمكانة الأساسية التي حظي بها ضمن العمارة الإسلامية. وركزت على مصطلح القداسة في عمارة المساجد وأنه يجب الفصل بين المسجد كمبنى، وكمكان للصلاة والتعبد، وأن بدء عمارة المساجد كان تكليفا دينيا، وليس مبادرة مدنية، ومع ذلك لم يقيد الباري جل وعلا الناس بالشكل والمكونات والمواد.

وقد درس الباحث خمسين مسجد من مساجد جائزة الأغا خان، وقسم أنماطها المعمارية إلى خمسة هي: النمط المحلي أو العامي، النمط التاريخي، الطابع الإسلامي الموحد، الطابع المجدد، الطابع الحداثي. وأكد في الختام على ضرورة وجود علاقة بين عمارة المسجد والمجتمع المسلم؛ مع بيئته العمرانية والاجتماعية.

وهذه الدراسة شبيهة في نتائجها بالدراسة السابقة: (م1، جلال عبده)، من حيث عدم تقييد عمارة المسجد بضوابط محددة.

الدراسة خ3: كتاب المساجد، حسين مؤنس

يقع الكتاب في 361 صفحة، وخصصت الصفحات من 61 وحتى صفحة 81 للعناصر الرئيسية في عمارة المسجد، والضوابط الشرعية لعمارته، وهي: بيت الصلاة، الصحن، القبلة، المحراب، المنبر، الميضأة، المقصورة.



الدراسة خ4: كتاب نهج الواحد في عمارة المساجد، طارق والي

يتكون الكتاب من ثلاثة أقسام هي:

القسم الأول: المدخل إلى نهج الواحد في عمارة المساجد؛ ويضم: معايير "أحكام المساجد"، عمارة المسجد في علاقته بالمجتمع، عمارة المسجد في حد ذاته، عمارة مسجد اليوم، المنظومة الهندسية لعمارة مسجد في البحرين.

القسم الثاني: نحو المنظومة الفكرية لنهج الواحد في عمارة المسجد؛ ويضم: الصيغة الطليقة لعمارة المساجد، البيئة المغربية، البيئة الإفريقية المدارية، البيئة المصرية، البيئة الشرقية، البيئة التركية، البيئة الفارسية، البيئة الهندية، البيئة الشرق آسيوية.

القسم الثالث: نحو المنظومة الرمزية لنهج الواحد في عمارة المساجد؛ ويضم: الفراغ والتشكيل المعماري، المحراب، المئذنة، القبة، الصحن، الشرافات، المقصورة، الفوارة والميضأة، السدة، المنبر، الرواق، الزخرفة وملمس السطح، الفتحات الخارجية والداخلية، المدخل.

الدراسة خ5: كتاب العمران والبنيان في منظور الإسلام، يحيى وزيري

وقد جعل المؤلف كتابه في ثلاثة فصول، والفصل الثالث منها بعنوان: تأثير المنهج الإسلامي على تصميم المباني، وهو مكون من ثلاثة مباحث؛ خصص المبحث الأول منها لضوابط عمارة المساجد، واحتوى المبحث على أحد عشر نقطة هي: أسس اختيار موضع المسجد، تأثير توجيه القبلة على شكل المسجد، أسلوب تصميم حائط القبلة، كراهية المناير الطويلة، أفضلية وجود فراغ معماري واحد بدون أعمدة، كراهية الزخارف والكتابة على حوائط المسجد، حكم المقاصير والقواطع، المآذن، غرس الأشجار وإقامة البرك المائية في صحن المسجد، الميضأة ودورات المياه، معايير وتفصيل أخرى متنوعة.

الدراسة خ6: كتاب أحكام المساجد، عبدالرحمن بن علي العسكر

وقد جعل المؤلف كتابه في أربعة أقسام:

الأول: أحكام المسجد، من حيث معناه، وما يدخل تحت مسماه، وأحكام بنائه، وما ورد في ذلك من فضل، وما يلحق بها من أحكام وقفيته وكيفية بنائه.



1. أحكام ما يشتمل عليه المسجد من مرافق، وما يندرج تحتها من نظافة ومتعلقات،
2. أحكام ما يُفعل في المسجد من عبادات وأعمال برّ، وما يحرم فعله فيه أو يُكره،
3. أحكام تتعلق بالقائمين على المسجد، من إمام ومؤذن وقِيَم، وكذلك المأموم.

ومن الموضوعات التي تعرض لها: مصلى النساء، القبة والمنارة، الأبواب، تسمية المساجد، فرش المسجد، الأجهزة الكهربائية في المسجد، مكبر الصوت، أجهزة تضخيم الصوت والصدى، المصاحف في المسجد، تعليق اللوحات والإعلانات في المساجد، الكراسي والساعات والمساند، نظافة المسجد، وقت نظافة المسجد، تطيب المسجد وتبخيره، الأحذية في المسجد، المناديل وسلة القمامة، وضع الماء في المسجد وسقايته للشرب، الشجر والبئر والحمام في المسجد. استدبار المصاحف في المساجد. وموضوع المناديل وسلال القمامة، وعن الشجر إذا غرست في المسجد.

الدراسة خ7: المعايير التصميمية لأماكن الوضوء في المساجد وقاعات الصلاة، أحمد مختار

وقد خصصت لأماكن الوضوء من حيث تعريف الوضوء الشرعي، ومواقع مكان الوضوء، وتصميم وحدات الوضوء، وتقدير عدد وحدات الوضوء، وتصميم مكونات مكان الوضوء، واللوحات التوجيهية.

تحليل الدراسات السابقة

الدراسات السابقة سواء الواردة في سجلات الندوة أو المؤتمر أو الدراسات الأخرى، والبالغ عددها اثنان وعشرون دراسة يمكن تحليلها من منظورين:

- الأول: التحليل العام للدراسات من حيث توجهاتها، وشموليّتها، ونتائجها،
- الثاني: التحليل التفصيلي من خلال تطوير مصفوفة شاملة لعناصر المسجد العمرانية البنائية، وللضوابط العامة، لتحديد التكرارات المتنوعة لهذه الدراسات، واستخراج مواطن التركيز والنقص في كل منها. وفيما يلي تفصل لهُذين التحليلين.



التحليل العام

تم تقسيم الدراسات من هذا المنظور إلى خمسة أقسام من حيث توجهاتها العامة؛ فيما يلي وصفها وما اندرج تحتها من دراسات:

دراسات اشتملت على ضوابط تفصيلية للعناصر العمرانية البنائية للمسجد

وقد اندرج تحت هذا التصنيف ثمان دراسات، اشتركت في أنها ترى وجوب ضبط عمارة المسجد بضوابط شرعية، وقدمت تفصيلاً لها، وهذه الدراسات هي: (ن1، السدلان)، (ن2، الخضيرى)، (ن4، الإمام)، (م5، استانبولي والحفناوي)، (خ3، مؤنس)، (خ4، والي)، (خ5، وزيرى)، (خ6، العسكر). وامتازت دراسة السدلان بتخصصها المباشر في مجال العمران.

دراسات اشتملت على ضوابط مخصصة لعنصر أو مجموعة عناصر محددة من عناصر المسجد العمرانية البنائية

وقد اندرج تحت هذا التصنيف أربع دراسات، كل منها اهتم بعنصر أو عناصر محددة، وأفردتها بالدراسة، وهي: (ن6، تارم) وقد أفردت بشكل خاص لمصلى النساء، والمخالفات الشرعية في استحداث عزلها عن المساجد، أما الدراسة (م2، عثمان) فقد تناولت ساحة المسجد تحديداً، وركزت دراسة (م7، جميل) على ثلاثة عناصر فقط من العناصر البنائية للمسجد وهي: القباب والأقواس والمآذن، وأفردت دراسة (خ7، مختار) دورات المياه ببحث مستفيض ومفصل.

دراسات اشتملت على ضوابط فكرية

وقد اندرج تحت هذا التصنيف خمس دراسات، جميعها ترى أن الجوانب العمرانية للمساجد غير مقيدة بضوابط تفصيلية، إنما هناك ضوابط وأطر فكرية عامة تحددها، ويمكن بعد ذلك الاجتهاد والابداع ضمن نطاقها، وهذه الدراسات هي: (ن3، الجديد) واشتملت على خمس ضوابط عامة، أما دراسة (م3، عبده) فقد وضعت أيضاً خمس ضوابط لكنها ركزت فيها على تحقيق جانب الروحانية والخشوع، وهي تختلف عن الضوابط في دراسة (الجديد) السابقة. وركزت الدراسة (م8، اللحام) على جانب فكري واحد وهو أن المساجد تغيرت دلالتها عبر الزمن من الديني للسلطوي تبعاً للتقلبات الجهات الحاكمة عبر العصور، وكأن في الدراسة



إشارة إلى أن المساجد الإسلامية عبر الزمن لم تلتزم بضوابط محددة، إنما تغيرت في كل عصر بحسب معطياته، وتتفق الدراسات (م4، الحجلة)، و (خ1، الصاوي) في تناول دور المسجد.

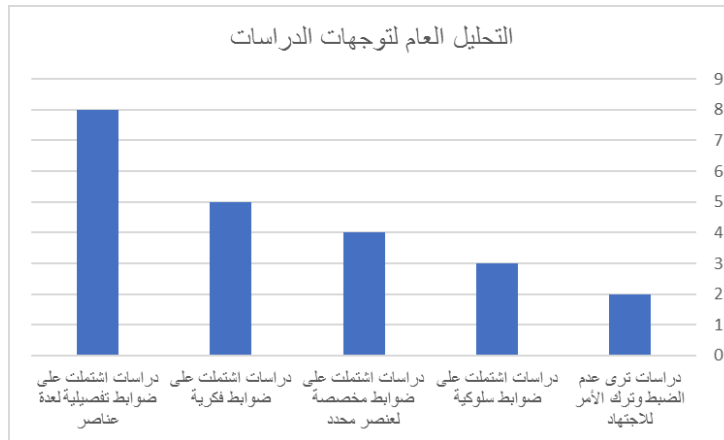
دراسات اشتملت على ضوابط سلوكية وليست عمرانية

اندرج تحت هذا التصنيف ثلاث دراسات، اتفقت على أن الضابط الرئيس لعمارة المسجد هو تحقيق دوره الاجتماعي، والدراسات هي: (ن5، الدبل)، و (ن7، رسدي)، و (م6، جبر وعبدالجليل).

دراسات ترى عدم وجود ضوابط شرعية لعمارة المساجد، وأنها متروكة للاجتهاد

وعلى خلاف العشرين دراسة السابقة، والتي تراوحت بين دراسات ترى الضبط الشرعي التفصيل لعمارة المساجد، أو الضبط الفكري العام أو الوظيفي، كانت هاتان الدراسات: (م1، عبده)، و (خ2، قاري) مغايرتين، حيث تنحيان إلى عدم تقييد عمارة المساجد بضوابط، وأن المسجد كغيره من المباني يخضع للتغيير، ويقبل الإبداع والابتكار والخيال. بل إن دراسة (م1، عبده)، تكاد تكون معاكسة ومخالفة لدراسة (ن3، الجديد).

و(شكل 2) الآتي يوضح نسب عناية الدراسات بالمجالات الخمسة المختلفة:



شكل 2

التحليل العام لتوجهات الدراسات المعنية بالضوابط الشرعية لعمارة المساجد.



من الشكل السابق نجد أن القدر الأكبر من الدراسات وعددها ثمانية نحت في اتجاه وضع ضوابط تفصيلية لعناصر المسجد البنائية، وفي المقابل دراستان فقط كانتا تميلان إلا أن عمارة المساجد اجتهادية وليس لها ضوابط محددة.

التحليل التفصيلي

يهدف التحليل التفصيلي إلى تحديد مدى عناية كل دراسة بالضوابط الشرعية لعمارة المسجد، وفي المقابل إلى تحديد أي عناصر المسجد كان الأكثر عناية من قبل الباحثين لوضع ضوابط له.

لأجل ذلك تم حصر جميع عناصر المسجد العمرانية البنائية، والفكرية، ومن ثم تحليل محتوى الدراسات السابقة في مجال الضوابط الشرعية للمساجد بناء على هذه العناصر.

استفيد هذا الحصر من دراستين سابقتين محكمتين هما: تطور العناصر الداخلية للمسجد المعاصر، مقارنة بمسجد رسول الله صلى الله عليه وسلم، وأثرها على مرحلة التصميم: مدينة الرياض كحالة دراسية، ودراسة منهجية مقترحة لوضع معايير تصميمية شاملة للمساجد، مع إضافة ما استجد من خلال الدراسات الواردة آنفا.

وفيما يلي (جدول 1) الشامل للتحليل والتكرارات المتنوعة، بحيث يوضع رقم 1 في حال تناولت الدراسة العنصر، ورقم 0 في حال لم تتطرق له، دون التفصيل في مدى عمق تناول الدراسة للعنصر المحدد:



جدول 1

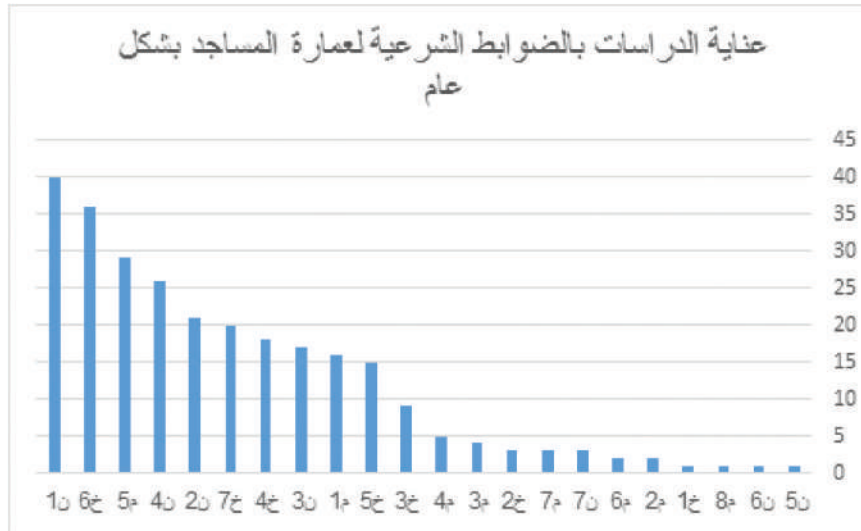
مصنوفة عناصر المسجد العمرانية البنائية؛ والفكرية، وتكرارات عناية الدراسات بها.

م	عناصر رئيسية	عناصر فرعية أولية	عناصر فرعية ثانوية	الدراسات																								تكرار																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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شكل 3

مؤشر التوجه العام للدراسات للعناية بالضوابط الشرعية للمساجد.

وقد احتوى الجدول على معلومات يمكن تصنيفها في المحاور الثلاثة الآتية:

1. عناصر عمرانية بنائية لم تتناولها الدراسات بالضوابط،
2. عناصر عمرانية بنائية تناولتها الدراسات بالضوابط،
3. ضوابط عامة.

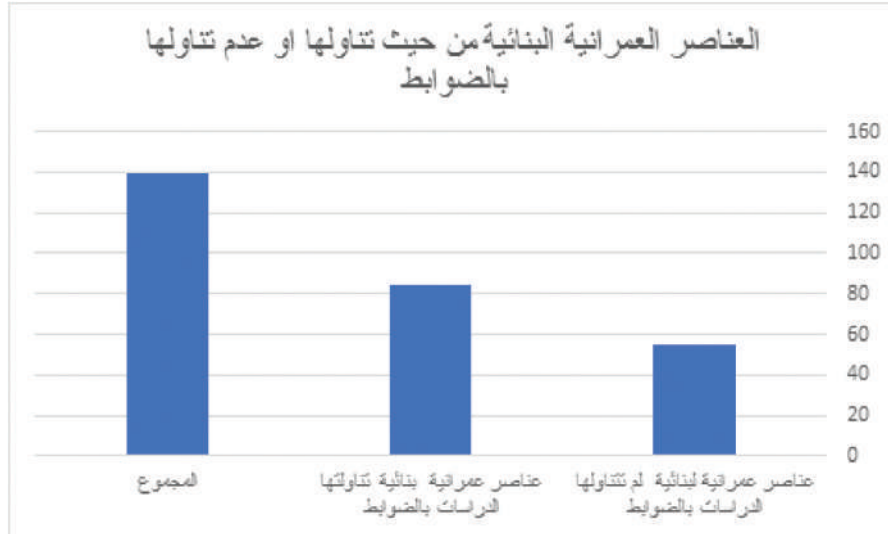
وتفصيلها على النحو الآتي:

أولاً: عناصر عمرانية بنائية لم تتناولها الدراسات بالضوابط.

بالنظر (للجدول 2) وجد أن هناك 55 عنصراً عمرانياً بنائياً من أصل 139 عنصراً لم تتناولها أي من الدراسات المتخصصة في الضوابط الشرعية لعمارة المساجد إطلاقاً، وهذه العناصر هي: فتحة الإضاءة العلوية، المقعد بجوار رف الأحذية، مدخل الإمام، المحراب المتحرك، مجلس الإمام، دورة المياه في المقدمة، غرفة انتظار الجنازات للصلاة، غرفة الصوتيات والتحكم، غرفة إدارة المسجد والحلقات، المسند الأرضي، حامل أوراق في المنبر، دولا ب كراسي الجلوس المطوية، دولا ب الكتب والمطويات، دولا ب للسجادات الصغيرة، التقويم الورقي، رف كتب ومطويات، الساتر الفاصل للنساء، فاصل ترشيد التكييف، السقالة أو السلم، السبورة، منضدة التمر، السترة، مكتب المحاضر، ستارة هوائية على الباب، منقي الجو، مفتاح



الإضاءة، مفتاح التكيف، كاميرا المراقبة، مرشد استهلاك الكهرباء، الشاشة الداخلية، المكينة، خلايا الطاقة الشمسية، كشف الطوارئ، الإضاءة الطبيعية من السقف، مقر الحلقات، المخزن، علاقة ملابس، ركن غيار الطفل، صاعق الحشرات، سخان المياه، حامل وعاء الصابون السائل، جهاز التجفيف، الخلو، المستودع، غرفة مولد كهرباء احتياطي، دار التحفيظ النسائية، مبنى استثماري (سكن، مستودع، محل)، القاعة متعددة الاستخدامات، روضة الأطفال، حديقة وألعاب أطفال، الأرضية، المظلات، لوحات الإعلانات الخارجية، سلال النفايات الخارجية، الملعب الخارجي. و(الشكل 4) يوضح نسبة العناصر العمرانية البنائية التي تناولتها الدراسات بالضوابط في مقابل العناصر الأخرى التي لم تناولها.



شكل 4

نسبة العناصر العمرانية البنائية التي لم تناولها الدراسات بالضوابط إلى التي تم تناولها.

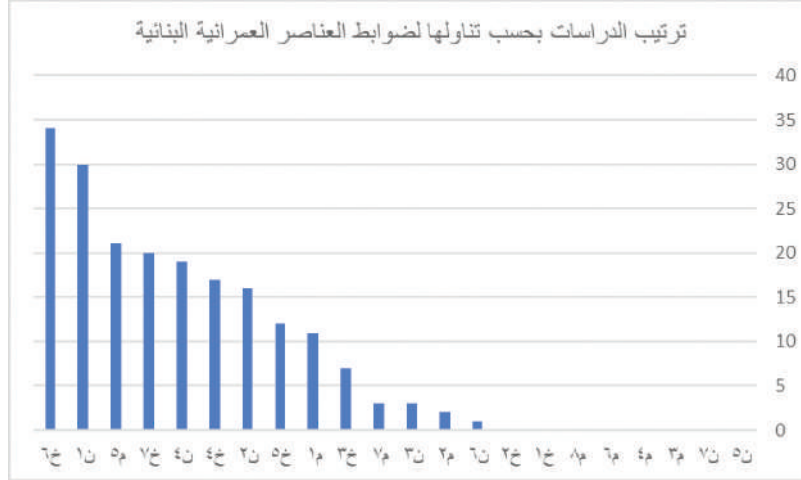
من الشكل يتضح أن العناصر التي لم تناولها الدراسات المعنية بالضوابط تشكل ما نسبته 40% من مجموع العناصر العمرانية البنائية، مما يوضح حجم الفجوة في طرح الدراسات للموضع، وشموليتها لعناصر المسجد.

ثانياً: عناصر عمرانية بنائية تناولتها الدراسات بالضوابط.

بتفريغ الجدول من العناصر العمرانية البنائية التي لم تناولها الدراسات بالضبط، ومن الضوابط التخطيطية والفكرية العامة، يمكن الوصول للنتيجة في (الشكل 5) البياني والذي يوضح أن



أكثر دراسة تناولت موضوع الضوابط الشرعية لعمارة المساجد في جانب العناصر العمرانية البنائية هي خ6، تليها دراسة ن1، في حين لم تتناول الدراسات ن5، ن7، م3، م4، م6، م8، خ1، خ2، أيًا من الضوابط العمرانية البنائية.



شكل 5

ترتيب الدراسات بحسب تناولها لضوابط العناصر العمرانية البنائية.

أما من حيث أكثر العناصر التي اعتنت الدراسات بضوابطها فيوضحها (الجدول 2) الآتي مرتبة بحسب تكررها في الدراسات:

جدول 2

تكرار عناية الدراسات بوضع ضوابط للعناصر العمرانية البنائية للمسجد.

التكرار	العناصر العمرانية البنائية
10	قاعة الصلاة للنساء، دورات المياه والمواضي بشكل عام
9	قاعة الصلاة للرجال، المنارة أو المئذنة
8	المنبر، المحراب الثابت، الباحات الخارجية (رحبة أو سرحة أو صحن)
7	المقصورة أو المكبرية، الباب العادي أو للمعاقين
5	العمود أو السارية، القبة

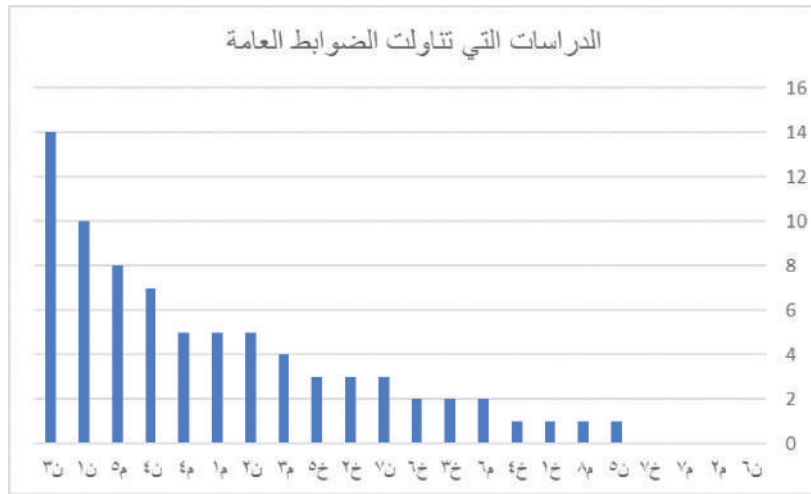


التكرار	العناصر العمرانية البنائية
4	الإضاءة الطبيعية من النوافذ، الصحن أو الساحة الداخلية
3	الفرش بالسجاد، كرسي ودولاب المصاحف، الكتابة، الحلية، الزخرفة، الرواق والأقواس، الظلة أو الصفة، سطح المسجد
2	الشرافات والميزانين، الممر، الصف بين الأعمدة، الجدار، دولاب الأحذية، كرسي الجلوس للصلاة، كرسي المنبر، المصحف، التشجير الداخلي، السماعة، لاقط الصوت، حامل لاقط الصوت، جهاز تكبير الصوت، الموضي العام جلوسا، موضي كبار السن، السكن: (إمام، مؤذن، محفظ)، المكتبة الخارجية، التشجير والحدايق الخارجية، الكتابة والحلية والزخرفة
1	دكة المؤذن أو المبلغ، الأساسات، السقف العام، الخوخة، غرفة الإمام أو قاعة الخطابة، مسند الجلوس الركائز، لوحة الإعلانات، الساعة، عادية، المناديل، النافورة والبركة المائية، سلة النفايات الداخلية، المبخرة، معطر الجو، مشرب المياه، بئر، كرسي المحاضر، المكيف، الدفاية، المروحة، نظام كشف وإطفاء الحريق، برادة الماء، الساعة الرقمية، الإضاءة الصناعية، المدخل، الإضاءة، التهوية، الأرضية، الجدار، المرأة، الحمام، الباب، الكرسي الأرضي، الكرسي الأفرنجي، الشطاف، السيفون، الحنفية، الجدار، الخزان العلوي، الموضي العام وقوفاً، المناديل و حامل المناديل، موضي الكراسي المتحركة، مجرى مياه الوضوء، مغسلة الموتى، موقف السيارات، البيرة، الخزان أرضي.

والنتيجة منطقية إلى حد كبير، فالعناصر الأكثر تكراراً هي التي يدور حولها معظم الجدل عند الحديث عن الضوابط الشرعية لعمارة المساجد من قبيل قاعة الصلاة، ودورات المياه، والمئذنة.

ثالثاً: ضوابط عامة.

تناولت معظم الدراسات ضوابط عامة، وكان للدراسة ن3، ون1، أكبر نصيب من ذلك، في حين أن الدراسات ن6، وم2، وم7، وخ7 لم تتطرق للضوابط العامة كما في (شكل 6).



شكل 6

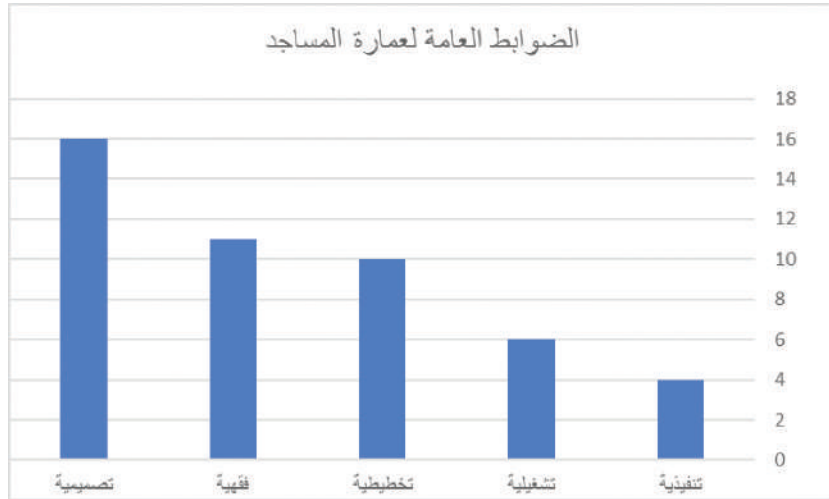
ترتيب الدراسات بحسب تناولها للضوابط العامة.

وقد وضعت الضوابط العامة في (جدول 1) بنصها الذي وردت به في الدراسات محل البحث، وبلغ عددها 47 ضابطاً، إلا أنها يمكن تجميعها بحسب تقارب مفهوميها في خمسة ضوابط أساسية تندرج تحتها جميع الضوابط الواردة في مختلف الدراسات، وهذه الضوابط العامة هي:

1. **فقهية، وتشمل:** الإخلاص، الالتزام بالمنهج، التقييد لا الإطلاق، التوافق لا التعارض، وقف المسجد والوقف له، نقل المسجد إذا خرب، تسمية المسجد، زخرفة المسجد، تنقل المسجد، بناء المسجد على قبر، الفصل بين المسجد كمبنى وكمكان للصلاة والتعبد،
2. **تخطيطية، وتشمل:** الموقع في الحي، عدم الإضرار بالجيران، مراعاة اتجاه القبلة، عدم بناء مسجد الضرار (تقارب المساجد)، العضوية (التداخل مع المحيط)، التكامل وتحقيق الاحتياجات، البعد عن الأذى، المصليات في المباني، مصليات الطرق، وجود علاقة بين عمارة المسجد والمجتمع المسلم مع بيئته العمرانية والاجتماعية،
3. **تصميمية وتشمل:** الاختلاف في الهيئة، النواحي الذهنية، النواحي الفيزيائية، التجريد والبساطة والرمزية، الصياغات التخيلية للعناصر التقليدية، الطروحات المفاهيمية، التفكيك وإعادة التركيب، الأشكال التجديدية، البساطة لا التعقيد، الوظيفة لا الشكل، ثبات المضمون وتغيير الشكل، عدم التغيير في المدلول من الديني للسلطوي، استتالة الصف



- الأول موجهها لقبلة، استمرارية الصفوف، توزيع المداخل لضمان عدم قطع الصلاة بالمرور، قابلية التوسع،
4. **تنفيذية، وتشمل:** الإتقان في العمل، الاقتصاد في البناء والبناء بالمتوفر، عدم التكلفة، قوة البناء المادي،
5. **تشغيلية، وتشمل:** تقوية الروابط الأخوية التأثير (تأثير المسجد على المجتمع المحيط)، الروابط العاطفية المشتركة، النظافة والصيانة والتشغيل، تحقيق رسالة المسجد، تحقيق الجانب التعبدية والمجتمعي والسياسي التشريعي.
- و(شكل 7) الآتي يوضح أن عناية الدراسات بالضوابط التصميمية كان في المقدمة، في مقابل العناية الأقل بالضوابط أثناء التنفيذ.



شكل 7

ترتيب الضوابط العامة لعمارة المساجد بحسب تناول الدراسات لها.

برغم أهمية مرحلة التنفيذ إلا أنها الأقل من حيث العناية بها في الدراسات المعنية بالضوابط الشرعية لعمارة المساجد، في مقابل التركيز الأكبر على الضوابط في مرحلة التصميم، ولعل هذا يبرر ما نلمسه من البون الشاسع بين التصاميم المعتمدة للمساجد، وما ينفذ فعلياً على أرض الواقع.



النتائج

توصلت الدراسة إلى عدد من النتائج التفصيلية، والتي يمكن تلخيصها في الآتي:

1. هناك نقص في العناية بالدراسات العمرانية المتعلقة بالمساجد عموماً، وبالضوابط الشرعية لعمارتها على وجه الخصوص على مستويات:

- الأول: على المستوى العام، حيث لم يعقد خلال الفترة الماضية بهذا الصدد إلا ندوة عمارة المساجد عام 1419هـ، والمؤتمر العالمي الأول لعمارة المساجد عام 1438هـ، بفجوة زمنية بلغت 19 عاماً،

- الثاني: على مستوى دراسات الندوة والمؤتمر وعددها مجمعة 151 دراسة، فإن دراسات الندوة التي اعتنت بالضوابط الشرعية للمساجد بشكل متخصص عددها 6 دراسات فقط، (باستبعاد دراسة ن5، الدبل)، وباعتبار أن دراسات المؤتمر ليس منها ما تخصص بشكل مباشر في موضوع الضوابط، إنما تم اختيار 8 دراسات لتناولها جزئية محددة من الموضوع، فإن الدراسات المتخصصة في موضوع الضوابط الشرعية تشكل ما نسبته 4% فقط من مجمل دراسات الندوة والمؤتمر،

- الثالث: على مستوى محتوى الدراسات، فهناك 40% من العناصر العمرانية البنائية للمساجد لم تتناولها الدراسات المتخصصة بالضوابط إطلاقاً،

- الرابع: على مستوى الدراسات الأخرى غير الواردة في الندوة والمؤتمر، حيث لم يتم الوقوف إلا على 7 دراسات فقط خلال الخمسين سنة الماضية تخصصت في الضوابط الشرعية للمساجد.

2. من مجمل التحليلات العامة والتفصيلية وجد ما يلي:

- من حيث عناية الدراسات بالضوابط الشرعية لعمارة المساجد بشكل إجمالي وجد أن أكثر دراستين اعتنيتا بذلك هما: ن1 و ن6 على التوالي،

- من حيث عناية الدراسات بالضوابط الشرعية لعمارة المساجد فيما يخص العناصر العمرانية البنائية وجد أن أكثر دراستين اعتنيتا بذلك هما: ن6 و ن1 على التوالي،

- من حيث عناية الدراسات بالضوابط الشرعية لعمارة المساجد فيما يخص الضوابط العامة وجد أن أكثر دراستين اعتنيتا بذلك هما: ن3 و ن1 على التوالي.



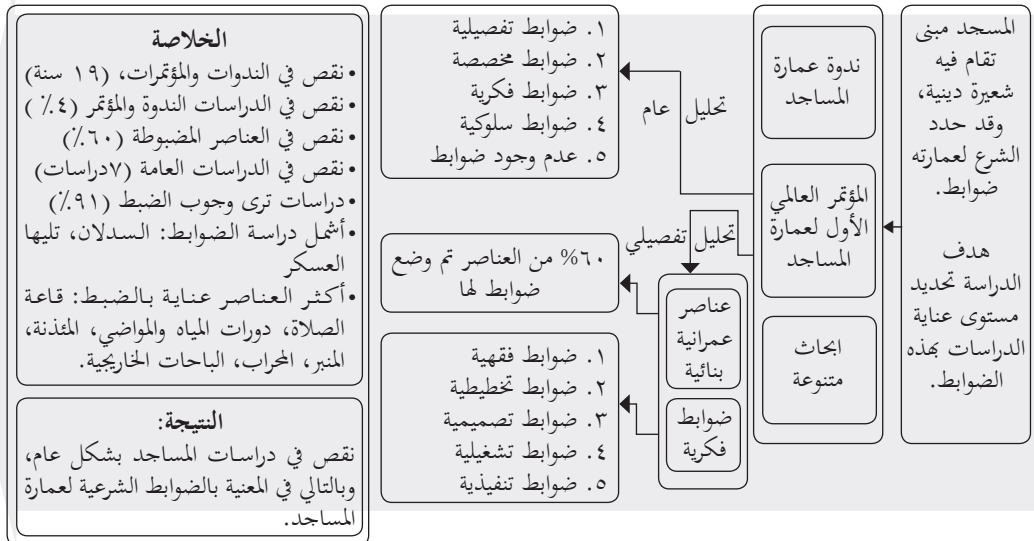
وعليه فإن دراسة ن1: الضوابط الشرعية لعمارة المساجد؛ صالح بن غانم السدلان. هي أشمل دراسة بين الدراسات ال 22 محل التحليل، تليها دراسة خ6: كتاب أحكام المساجد، عبدالرحمن بن علي العسكر.

1. من أصل 139 عنصرا عمرانيا بنائيا في المسجد حددتها المصنوفة؛ وجد أن أكثر العناصر التي اعتنت بها الدراسات بالضوابط على الترتيب هي: قاعة الصلاة، دورات المياه والمواضي، المئذنة، المنبر، المحراب، الباحات الخارجية،

2. من أصل 47 ضابطا عاما ورد في مجمل الدراسات بعبارات مختلفة أمكن جمعها تحت خمسة محاور أساسية هي: الفقهية، التخطيطية، التصميمية، التنفيذية، التشغيلية. واستأثرت الضوابط التصميمية بأعلى نسبة منها،

3. جميع الدراسات محل الدراسة وعددها 22 ترى وجوب وجود ضوابط لعمارة المساجد، إلا أن 20 منها والتي تشكل نسبة 91% وضعت ضوابط إما تفصيلية للعناصر العمرانية البنائية، أو ضوابط فكرية، أما الدراستين الأخريين وتشكلان نسبة 9% فتتجهان إلى وضع أطر عامة، ومن ثم إطلاق المجال للاجتهاد التصميمي.

و(شكل 8) الآتي يلخص الدراسة ونتائجها:



شكل 8

ملخص الدراسة.



وعليه فهناك نقص في الدراسات المتعلقة بالمساجد بشكل عام، وبالتالي في الدراسات المعنية بالضوابط الشرعية بالمساجد.⁶

التوصيات

توصي الدراسة بأن تتبنى جامعة الملك سعود ممتثلة في كلية العمارة والتخطيط عقد ندوة أخرى لعمارة المساجد، وتكون متخصصة في الضوابط الشرعية لعمارة المساجد.

تمت بحمد الله

وصلى الله على نبينا محمد وعلى آله وصحبه

⁶ في وقت إعداد هذه الدراسة يجري التحضير للمؤتمر العالمي الثاني لعمارة المساجد في متحف الفن الإسلامي في العاصمة الماليزية كوالالمبور خلال الفترة من 25-27 نوفمبر 2019. تحت رعاية صاحب السمو الملكي الأمير سلطان بن سلمان بن عبدالعزيز رئيس مجلس أمناء جائزة عبداللطيف الفوزان لعمارة المساجد والذي تنظمه الأمانة العامة للجائزة، وهي بادرة ممتازة لتغطية جانب النقص في الدراسات المتعلقة في المساجد.



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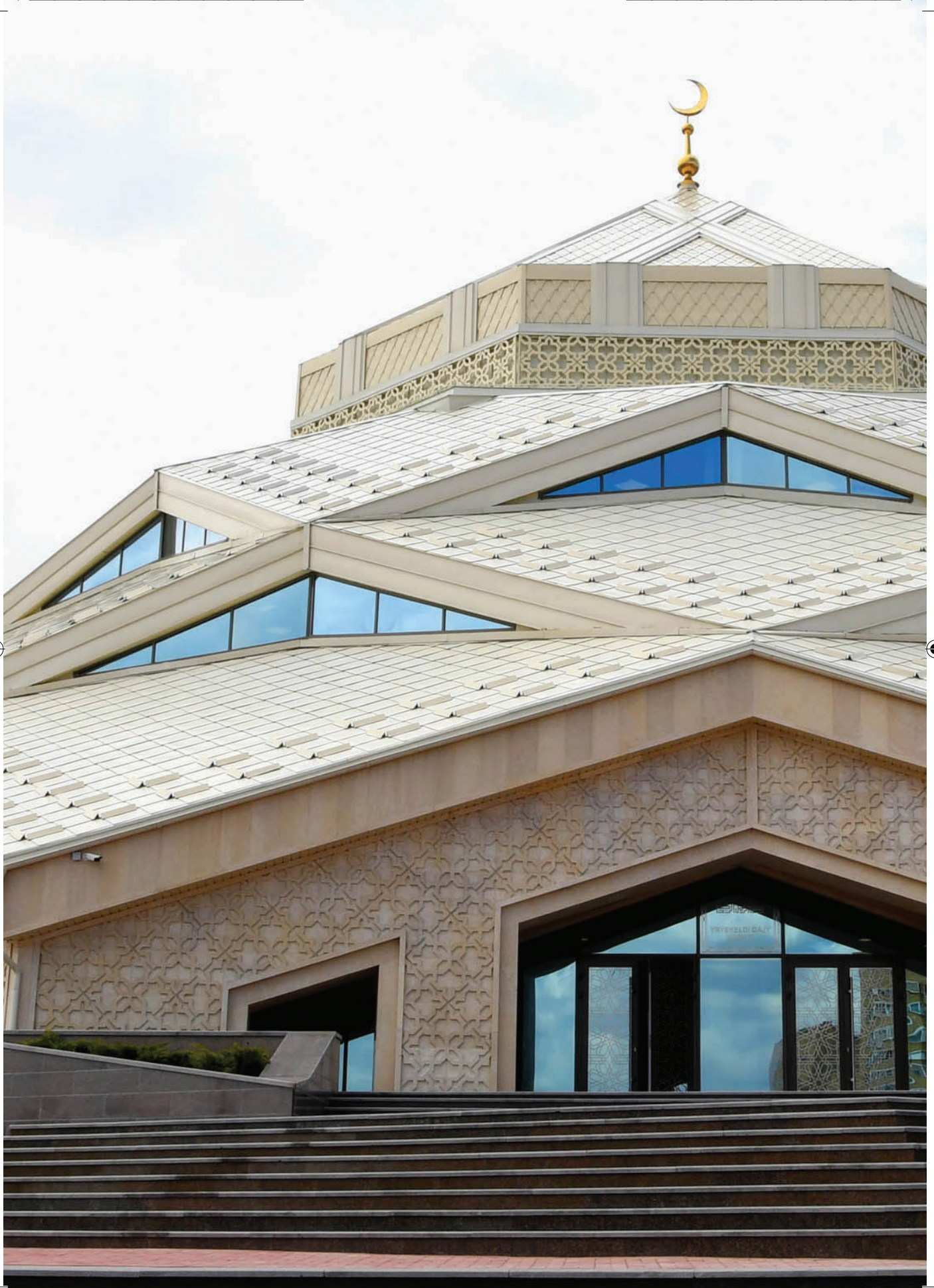
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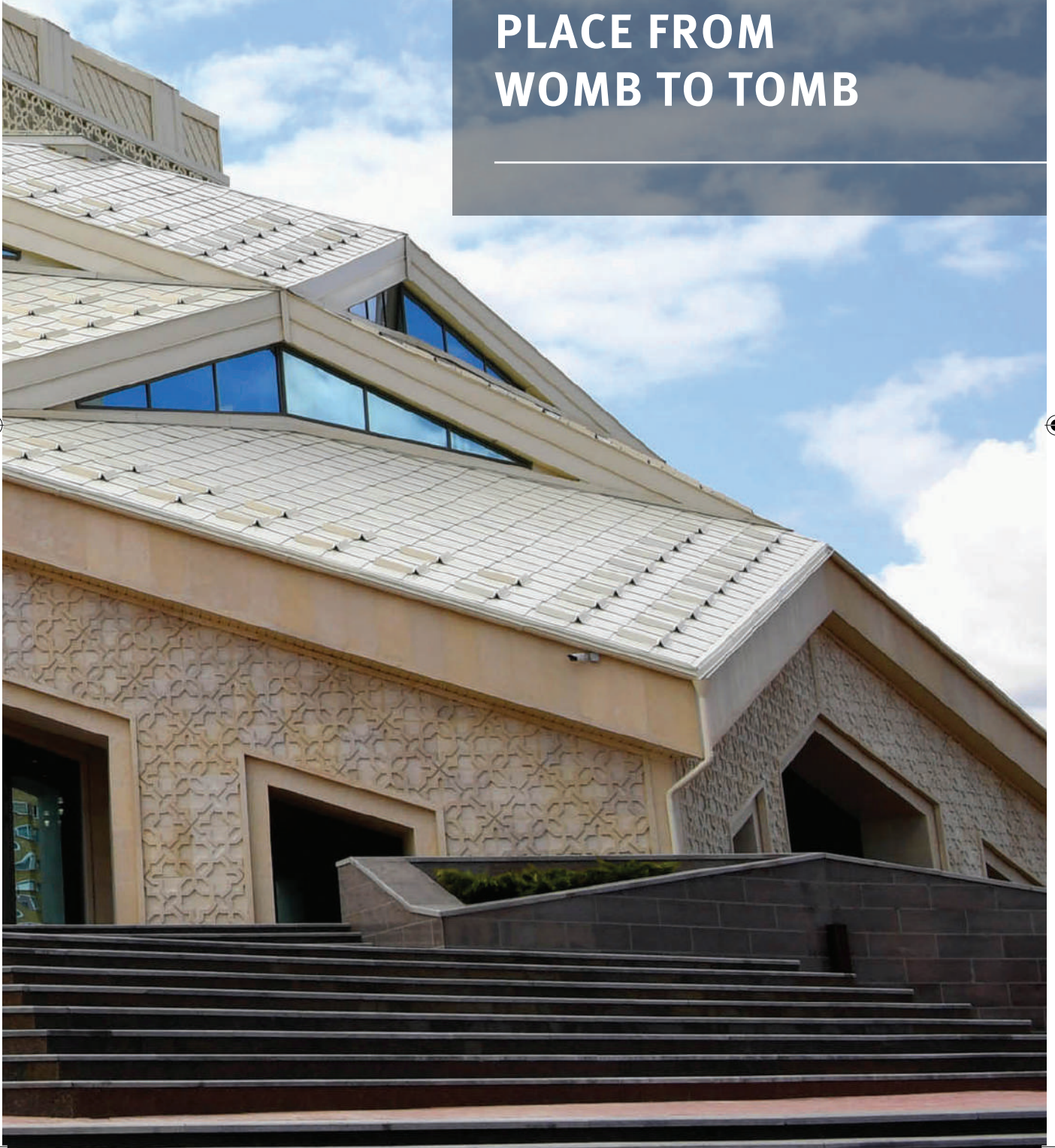
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MOSQUES AS A SOCIAL CULTURAL PLACE FROM WOMB TO TOMB







**THE CHANGING ROLES OF
THE FUTURE MOSQUES IN
THE CONTEXT OF THE MUSLIM
COMMUNITY IN MALAYSIA**

**Azim A. Aziz
Mohamad Haziq Zulkifli**

**GRAND MOSQUES
IN ISLAMIC HISTORY:
ARE THEY THE MODEL?**

Abeer Allahham







THE CHANGING ROLES OF THE FUTURE MOSQUES IN THE CONTEXT OF THE MUSLIM COMMUNITY IN MALAYSIA

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INTRODUCTION

MOSQUE or in its Arabic version, *masjid*, has traditionally been the gravitational centre of Muslim civilizations. Ever since the first mosque was laid by the Prophet Muhammad PBUH in Madinah in year 622, the mosque itself has evolved from being inseparable communal centre of a Muslim community to an institution of its own today¹. In the early days of Islam, the life of a believer cannot be imagined without the mosque institution which as a community centre. It should always occupy, as much as possible, the central and most strategic location in many villages, neighbourhoods, towns and cities². When Prophet Muhammad PBUH migrated to Yathrib (Madinah) from Makkah with his companions, or also known as *muhajirs* (migrants), the mosque was the first structure to be built by him with the assistance of the migrants and local people known as *Ansar*. The spaces allocated in mosque is not just the main praying hall. Small spaces for the migrants to rest before proceeding to their destination were also provided. The mosque also offers spaces for business of selling food, dry supply and clothing to cater the needs of the migrants and travelers. In modern day context, the mosque is however, regarded as a place of worship and teaching of Islam that focuses on regular “*ceramah*” or sermons.

Over the years, the mosque itself functioned as an institution that encompasses many aspects of the social community. Prophet Muhammad (PBUH) had positioned the Al-Masjid Al-Nabawi as the nucleus of the world’s first Islamic center of governance, the Madinah Al-Munawwarah. The typology of the Al-Masjid Al-Nabawi was never defined initially. The property was built on a parcel of land bought from orphans where a former sun-baked earthen barn was located. Apart from its primary function as the centre for religious activities, such as for the daily congregational prayers,





Friday prayers, reciting and studying the Qur'an, *dhikr* (remembering and glorifying God), *i'tikaf* (retreat in mosques during the last third of the holy month of Ramadan for worship), meditation (*tafakkur*), the mosque was also celebrated and make use for other educational, institutional, and social purposes. The Al-Masjid Al-Nabawi was also used as the seat for Prophet's government, a detention and rehabilitation centre, a place for medical treatment and nursing, and a place for some leisure activities³. The architecture of mosque in the earlier years was simpler than the ones we see today. Simpler form suggests the use for a sole function that is to worship the AlMighty. Dome, *minarets*, and Islamic patterns were then added on to shift from the function from merely a shelter into a grand building to celebrate the religion, but it is also held by the regional influences surrounding context. Main prayer hall is complemented with smaller section on the outer radius to cater for religious classes, meeting, and discussion point (*musyawarah*). These changes were carried out throughout the countries for over a thousand years. However, the role of mosque has changed significantly whereby discussion is still being held but the topic has shifted to issues of modernism, Muslims living in the contemporary lifestyle and public needs. A growing population, expectation and addressing the needs of modern-day expectation can however be incorporated Islamic teaching in a multiracial community to propagate value.

Conceptually, the mosque has also been known as Allah's home (*bayt al-Allah*), but during this time, it was also known as a Communal Home (*bayt al-jami'*) that had also been functioned as a communal discussion centre (akin to modern parliament), a courthouse, a meeting place for entrepreneurs and business activities, other than the main place of worship^{4, 5, 6}. It was never pre-designed but added on over the years as many of the ideas were required later. This practice of renovating and even demolishing existing mosque to enlarge it in order to suit additional functions happened regularly and at ad-hoc basis which at times altered the original design of the original mosque as the addition are often carried out by others and not the original architect.

In the past, the mosque had also been used as an army base during the Battle of Uhud, as the Al-Masjid Al-Nabawi became a stopover and launching pad for the Muslim fleet before they went to the battlefield, as if the mosque was a purposeful army base⁷.

Despite of the varying use of mosque functions during the Prophethood, it may not be well-translated into our modern society today. In Malaysia, the





mosque has traditionally been associated with merely a primary worship place. According to Mustari and Jasmi, in a survey done among a group of on-campus university students, even though the majority of the respondents were well-aware of the mosque functions beyond a place of worship, an overwhelming respondent did not resonate with the mosque purposes beyond worshipping activities. This was since the mosque in their locality was inactive and there is lack of activities for youngsters and for modern day family needs⁸. Over the years, the mosque functions have expanded to include other activities, but it also need to be further expanded over the years to include other needs. Throughout the many countries, the planning of mosques in Malaysia have slowly change to address these needs by providing, for example small sports complex, public hall, retails activities area and becoming more welcoming to other races and religions that exist in Malaysia.

Historically, the mosque in this region has been used for more than just a place of worship. During the Malay Malacca Sultanate period, mosques and *suraus* were built as worshipping area, Islamic learning, and propagation centre⁹. The mosque became a catalytic symbol that signifies the community sense of the place and belonging. It has become a place to go to for community activities for various ages to meet and congregate within a township or city. After 40 years of building mosque in Malaysia (1970–2019), the mosque building of the next generation needs to be relevant, otherwise we will repeat what have been done previously built architecturally.

Apart from its changing function of mosques in Malaysia over the last 30 years approximately from 1970 to present its architecture have largely employed with architectural expression borrowed from many Middle Eastern countries, Moorish, Persian, and Ottoman architecture. There are signs of some newly built mosque that have moved away from this direction which have experimented with contemporary Islamic Architecture, there are relevant to our context.

According to Nisreen Moustafa, in his book, *Divine Inspiration: Seven Principles of Islamic Architecture*, he cited seven principles which are *tawheed* (unity), *ihthiram* (respect), *ikhlas* (sincerity), *iqtisad* (moderation/humility), *haya'* (modesty), *ilm* (pursuit of knowledge), *dhikr* (remembrance) to reflect in the design of its architecture, being to reflect its Islamic characteristic. The above elements can be used as a guiding principle of any Islamic buildings of the future including mosque¹⁰.





Thus, the paper is intended to study and re-examine the purpose of mosque in the modern society of multiracial and multi religion in Malaysia from an architectural and its planning point of view with a reference to Islamic history and civilizations with its context. However, one cannot disregard the other communities as Malaysia is a multiracial country, respecting the rights of other race and religions. Approximately, 60% of 32 million population are Muslim. Several existing mosques have been selected as case studies in this paper, and a design for future mosques design has been proposed. Most importantly, in a multiracial country like Malaysia, is also important to demonstrate and promote the inclusivity of the mixed population to exist in harmony through harmonious living and conscious tolerance.

This paper is written as not to completely influence the architecture of the mosque but to create awareness with future architects, designers, and other stake holders on their architectural approach. It is hopeful that future architects/designers will attempt to move away from traditional approach of borrowed architectural language or to improve its form to suit its context and climate.

RESEARCH METHODOLOGIES

A qualitative approach has been primarily used in this research. Data and sources on the design features-built forms and other design parameters of selected mosques in Malaysia that were built in different time have been studied as part of the case studies. Several key persons have also been interviewed as a source of primary data. While the secondary data were obtained mostly from reports, articles, proceedings, books, newspapers, and journals. In order to understand the research better, comparative studies were made to strengthen the findings by the end of this paper.

To gauge a better understanding of the existing mosque conditions in Malaysia, two different but comparable types of mosque were studied, with one case study is presented as a proposed mosque design in the future. The first mosque is a principal mosque while another one is a township mosque, with the context of urban and semi-urban settings respectively.

Generally, the study is aimed to study and examine the modern mosque design and conditions, while proposing a way ahead of how a mosque can function, from both architectural and social perspectives.





BACKGROUND STUDIES AND FINDINGS

Mosque has always been the nucleus of the Muslim community in Malaysia ever since Islam arrived in this region as early as the 14th century¹¹. The mosque or in a smaller scale, known as *suraui*, is plentiful and can be found in many traditional settlements or *kampung*. It also can be found in small towns and big cities, with different functions and types. According to statistics by JAKIM, there are about 6,348 mosques and 18,338 *suraus* in all over Malaysia¹². These mosques have been identified and classified into six categories, namely the government mosque, state mosque, district mosque, sub-district/local mosque, Friday prayers *suraui*, and *suraui*¹³.

It is predicted that the building of mosques will double in numbers in the next 70–80 years until the end of this century. It is therefore an opportune time that the next generation mosque amounting to 4,000 to 6,000 mosques of various sizes will explore the possibility of building mosque that will be built to suit the needs of the future Muslim communities. Many Islamic communities throughout the world, including Malaysia can be at the forefront of mosque architecture to adopt this approach.

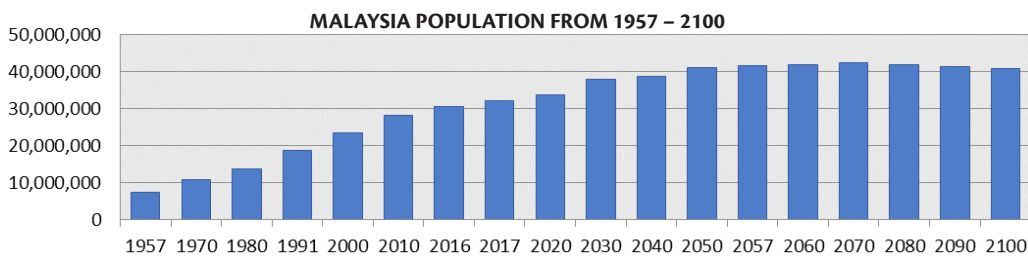


FIGURE 1

Population of Malaysia Graph for estimated years from 1957 to 2100.

However, these classifications are not coherent across the country, as the mosque administration in Malaysia is under the purview of each state government affairs. For instance, in the central state of Selangor, the mosques are further divided into the royal mosque, institutional mosque, upgraded mosque, and *musolla* (prayer room)¹⁴. In the planning guidelines of building of Islamic places of worship by the Department of Town and Country Planning, Malaysia, another type of mosque was identified, namely the National Mosque¹⁵.



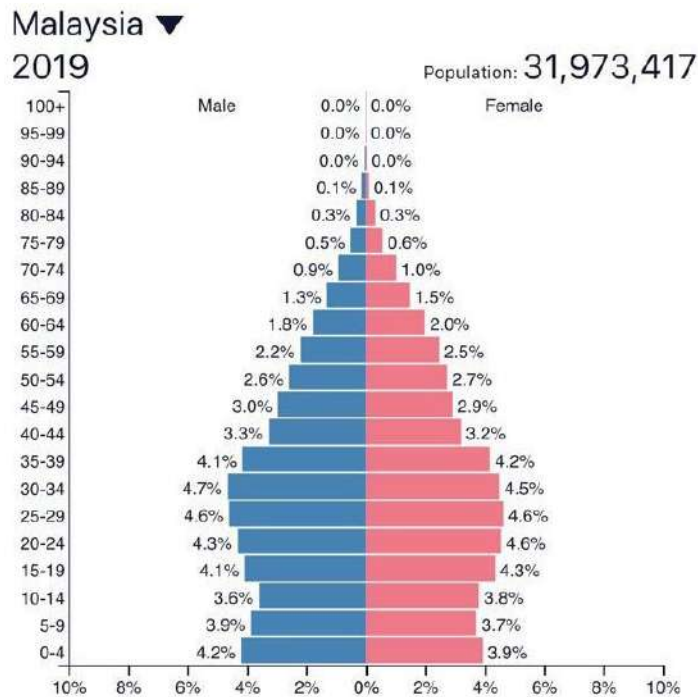


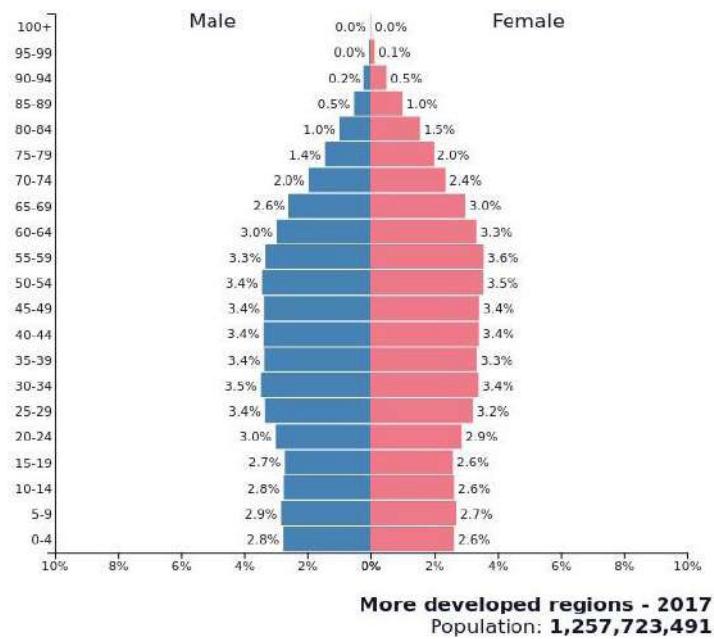
FIGURE 2

Population of Malaysia Graph for 2019.

(Source: Populationpyramid.net)

The population demographics is fast forming to reflect the population demographics of developed country. The graph is showing the early steps of population demographics of a country becoming more developed. It shows that our population are increasingly becoming older and aging.

In the early days, mosque served as the congregational centre of religious activities, as well as other communal activities, for traditional Malay settlement known as *kampung*. It was the centre of the community providing its need. Mosque can also be found in smaller towns and big cities, especially near the Muslim settlement districts. Royal mosque can also be found, which is intrinsically linked to the Malay Muslim Sultanate hierarchical ruling system. This royal mosque, normally grandeur in its size and has intricate detailing workmanship, is in the royal town and located near the sultan's palace and the royal mausoleum site, makes it the quintessential urban fabric of Malay royal towns in Malaysia. This is evidently seen in Kuala Kangsar (Perak's royal town) and Klang (Selangor's royal town).

**FIGURE 3**

Population of Developed Country Graph for 2017.

(Source: Populationpyramid.net)

**FIGURE 4**

Kampung Laut Mosque, the oldest living mosque in Malaysia, built in the 17th century.





As Malaysia is developing country that saw the construction of many new townships and cities to accommodate the growing population, mosques were developed in tandem with these developments, complemented as part of the key facilities, along with other public facilities, such as community halls, libraries, and sports and recreational facilities. This has resulted and embolden the main function of the mosque as a public place of worship.

As several areas in the country are struggling with land scarcity, coupled with higher development, land cost and construction costs, it is timely to study and propose mosque for a greater function more than just merely a public worshipping place. This will also further boost the building occupancy and utilization rate for various types of people in the community throughout the day and night. One must not underestimate the importance of such structure and its function as it can reduce social ills and assists family in balancing their worldly and secular responsibilities.

Two mosques in Greater Kuala Lumpur (Klang Valley) region were selected in this study. Two mosques represent the diverse type of mosques existed in Malaysia, with the first is a neighbourhood mosque, while the latter is a principal mosque in a big town. Much of the writings on both mosques in the following chapters are adapted from our previous work, *Masjid – Selected Mosques and Musollas in Malaysia*¹⁶.

At-Taqwa Mosque, Taman Tun Dr. Ismail, Kuala Lumpur

Nestled in a matured modern township area of Taman Tun Dr. Ismail (TTDI) in the outskirts of Kuala Lumpur city, the At-Taqwa Mosque has been serving as the main congregational mosque for the local Muslim residents since 1992. Designed by a Malaysian architect, Arkitek FAA, the mosque can accommodate up to 1,500 people at any given time.

The effort of building of a mosque in TTDI has begun as early as the 1980s, when the existing *musolla* was unable to cater for the ever-increasing number of worshippers, from either the new residential areas or from the nearby offices. Later, a mosque building fund drive was initiated and a site located approximately 1 kilometre (3,280 feet) away from the *musolla* was selected.



**FIGURE 5**

Site plan of At-Taqwa Mosque, TTDI, Kuala Lumpur.

The mosque is a testament of postmodern design approach or interpretation in Malaysian mosque designs, which saw the culmination of contemporary forms and traditional Islamic elements of Arabic influence. This approach of mosque design in Malaysia is very common in the 80's onwards. The mosque has a rectangular hypostyle layout, with the main prayer hall occupying the entire ground floor. The design of the mosque was carried out in such a manner to be identifiable to the religion as a whole. The use of domes, *minarets*, and arches were used to satisfy the general expectation of a mosque by the Muslim public. The enclosed main prayer hall is now air-conditioned with an overspill area on the side corridor areas and covered inner courtyard. The space allocated for a female prayer gallery and administrative spaces is located on the first floor.

**FIGURE 6**

At-Taqwa Mosque, TTDI, Kuala Lumpur.





The main building, double volume space, is topped with a high drum pointed-dome covered with green metal sheathing reminiscent of the Al-Masjid Al-Nabawi Mosque in Madinah, Saudi Arabia. Similar but smaller-scaled domes are placed near the entrance porch and the annexe building near the back lane. Unlike other mosques, the architect employed the use of a pair of *minarets* which allows for a symmetrical architectural image. It is located at the centre of the mosque, which separates the main prayer hall and the overspill prayer area. The mosque proper is angled towards the *qiblah*. The dome and minaret were built to merely depict the building as a mosque following the architecture of various mosques.

Over the years, the mosque has become an active community mosque, the mosque has initiated many economic efforts, including a two-storey detached shop office at the southwest edge of the mosque compound, which was built later. The shop lot building, formed in a V-shaped, provides an array of shops and facilities, with an open ground area in the middle. It also helps to provide useful income to the mosque from the rent money collected from these shops. The expansion and development of the mosque has been largely successful and becoming community mosque for the people in and around the township.

The main prayer hall is identified by a series of pointed arches highlighted with the use of brick framing. The pointed arch is also deployed on the framed doors and side aisle. A similar blind arch is also repeated on the front *qiblah* wall, in the form of calligraphic bands and at the *mihrab* wall.



FIGURE 7

The main prayer hall of At-Taqwa Mosque.





The main dome is highly elevated above on the modified squinches; a pair of clerestory windows is placed on each side, thus providing natural lighting. The *mihrab* area, which was initially a spot for the *imam*, marked by a smaller niche, has been replaced with a detached timber *mimbar* platform located at the *mihrab* wall. The mosque has been renovated twice since its completion in 1992. The first renovation is to accommodate the growing number of Muslims living in the surrounding area and adding facilities to serve the community.



FIGURE 5

Staircase to the new multipurpose hall on upper floor.

Recently, a new renovation was just completed in the year 2019 that saw the expansion of male prayer area, on the right side of the main prayer hall. The new extension area occupies the former compound area that consists of a two-storey building, with prayer hall and ablution area on the ground floor, and additional classrooms and a multipurpose hall on the first floor. This has increased the worshippers' capacity to at least another 550 people. The complete-list of mosque facilities as follows:

1. 10 units of shop lot;
2. ablution areas;
3. administrative office;
4. classrooms;
5. *eid* sacrificial area;
6. female prayer hall;
7. foodbank;
8. library;



9. main prayer hall;
10. meeting room;
11. mortuary;
12. multipurpose hall;
13. overspill prayer hall; and
14. toilets.

The mosque has always been busy with a lot of activities for its surrounding community. It is a very popular mosque and well used throughout the day. It is usually full for weekly Friday prayers. Other activities held at the mosque can be divided into the following categories:

1. religious activities: daily prayers, Friday prayers, *eid* prayers, burial prayers, special prayers and *Yaasin* & *doa selamat* recitations, *khatam* ceremonies;
2. non-formal learning activities: daily lectures after *Maghrib* prayers, morning lectures;
3. formal learning activities: English classes, Arabic classes, *tajweed* classes, matrimony courses, and *haji* courses;
4. communal activities: fast breaking ceremonies, *Eid-Fitr* celebrations, *Eid* sacrificial and *aqiqah* ceremonies, circumcision ceremonies, *Maal Hijrah* processions, mosque & youth carnivals, students' motivational camps, and other Islamic festivities;
5. other activities: marriage solemnisation services, funeral services, blood donation drives, and several others;
6. donation of collection outer mainly money and *zakat* collection during fasting month; and
7. informal Friday bazaar located just outside the gates of the mosque.

Apart from the on-site mosque activities, the mosque administrative has also offered services beyond the mosque compound such as prayer services, visiting services, and outreach programmes. The architecture of the second renovation has differ a bit and introduced contemporary design element but still within the overall language of the existing structure. Next to the mosque, an Islamic school was built in the early 2000 which had expanded the role of the religious centre. However, the mosque was not designed initially to cater for handicapped or barrier free. Efforts are being made to cater for the elderly. As the surrounding population is aging, the mosque is becoming more popular as a place with the elderly people living in the nearby township of TTDI.





Raja Haji Fi Sabilillah Mosque, Cyberjaya, Selangor

The Raja Haji Fi Sabilillah Mosque was built to cater to the growing population of Cyberjaya, which is expected to be 50% Muslims, who will use this mosque for religious activities.

Work on the design of the Cyberjaya Mosque began in early 2012, following the award of the commission to ATSA Architects. The mosque's design was inspired by the bespoke design of the Masjid Negara in Kuala Lumpur that was completed in 1965. The Cyberjaya Mosque has been completed in 2015, which was also coincided with the 50th anniversary of the opening of the iconic Masjid Negara in Kuala Lumpur.



FIGURE 9

Exterior view of Raja Haji Fi Sabilillah Mosque in Cyberjaya, Selangor.

With a capacity of about 8,300 people, the mosque is designed to be more than a place of worship, as it will also be used as a local centre for Islamic activities. It is situated adjacent a 100-acre site which will eventually become an integral part of the new Universiti Islam Malaysia (UIM) campus, whereas the layout concept was based on a *pending* or a royal belt buckle.

The design of the mosque is contemporary modern and incorporates traditional Islamic design elements. The goal of the design is to portray Islam as a progressive religion, as well as to reflect the simplicity and purity





of modern Malaysian mosque architecture. The mosque was designed in line with the vision of Cyberjaya being a green city of the future. The main emphasis of the design is towards a more modern approach rather than the conventional postmodern typology, emphasising the building's sustainability elements, but retaining the spiritual design essence of Islam. It was also designed to follow as much as possible the seven principles of Islamic architecture, which was elaborated earlier.

Awareness of the new direction of mosque building in Malaysia started after the introduction of Green Building Index Design (GBI) has six principles. GBI rating is used to rate a building accordingly to their level of sustainability. The aim is in the future all buildings including mosque will be carbon neutral.

1. Energy Efficiency
2. Materials & Resources (MR)
3. Water Efficiency (WE)
4. Indoor Environment Quality (EQ)
5. Sustainable site Planning & Management (SM)
6. Innovation (IN)

Naturally, the designers of the future mosque buildings are now been challenged to design mosque to incorporate these features to make mosque building more sustainable. The effort must of work together with all stakeholders Architects that tasked to employ the principles of Green Building Index which invariably has influenced the architecture of the mosque as can be seen in Raja Haji Fi Sabilillah Mosque in Cyberjaya.

The architecture typology of mosque design has shifted and moved away from identity mosque architecture. This move look well with the new direction in making the mosque to become of a building while retaining the elements of Islamic design to become a sustainable mosque to cater for the needs of the modern-day family living within a housing area both on religious, spiritual matters and nucleus, also secular matters, a center to gather, learning center, care center, and also business. However, in some states in Malaysia (as religion falls under the jurisdiction of state or its ruler) certain elements like the *minarets*, arches, and a dome, designer or architects will have to employ their approach to incorporate these elements in the future mosque, moving away from identity architecture.





FIGURE 10

Overall site plan of Raja Haji Fi Sabilillah Mosque.



FIGURE 11

Close-up site plan of Raja Haji Fi Sabilillah Mosque.





The ethos behind the mosque's design is to ensure that it will be a truly sustainable building and that it will ultimately become a model for the design and building of future mosques in Malaysia. As such, the design adheres to the highest rating level, namely the Platinum rating of the Green Building Index (GBI) standard, incorporating recyclable materials, and energy-efficient equipment to minimise energy usage so as to reduce its running costs.

The mosque's main prayer hall has been designed as part of the to be air-conditioned for two hours only during Friday prayers and during prayers of other special Islamic occasions. At other times, it is envisaged that fans and ventilators will be sufficient to sustain an average daytime temperature of 26°C within the mosque's main prayer hall. With a capacity for up to 1,200 worshippers, the main prayer hall stands at twice the height of the surrounding structures.

A large central courtyard with a tall signature *Bunga Tanjung* tree planter in a planter box before the main prayer hall, where the overspill prayer area is located, is also designed to facilitate both natural ventilation and natural lighting to the area. The area is also cooled with the use of natural ventilation and fans. The upper floor is accessible via a moving walkway or travelator, and a lift.

The mosque's unique dome is perhaps one of its most innovative elements. The single dome is situated over the enclosed main prayer hall and formed by the use of double glazed Low-E glass, providing both shade and a source of natural light. Retractable blinds will provide further shade when needed, to prevent direct sunlight in the main prayer hall. Above the glass dome, metal decorative panels act as a sun shading device were used to further shade and prevent heat gain of the praying hall below.

Natural cooling is also provided by the slightly elevated water feature surrounding the exterior of the walls facing the *qiblah*, which can be seen from inside the hall. A sloping feature wall behind the pool allows water to flow down gently, creating soothing, therapeutic sounds. The water here is use as a cooling agent to naturally cool the main prayer hall once the doors are open. While an arabesque pattern in glass-reinforced concrete (GRC) is used as its primary wall which acts as perforated ventilator blocks and sunscreen devices. This allows for natural wind to flow through the building and at the same time prevent direct sunlight from entering the building. It will also allow for the mosque to breath.



**FIGURE 12**

3D illustration of design proposal for Raja Haji Fi Sabilillah Mosque.

Much of the rooftop area will be covered with solar panels, which will both generate renewable energy and provide shade during occasions when the rooftop area is in use for prayers. It is finished with the use of artificial turf, has the potential to accommodate a further 1,800 worshippers, and will be developed once the mosque approaches its current capacity.

To supplement the mosque's natural lighting, LED light fittings and low-energy lighting are used during the evenings and at night. Light sensors have been installed throughout the building so that the artificial lighting can be controlled and switched off automatically when not in use. Meanwhile, a water harvesting system has been integrated into the building for its landscape irrigation and grey water usage.

The mosque is accessible via three entrances, including a dedicated VIP entrance to the southwest side, a "drop-off" area on the eastern side, and pedestrian entrance to the south side. In addition to the main building, the mosque also incorporates a multipurpose hall, a banquet hall with a seating capacity for 800 people, and an area designed for staff housing.

The mosque's multipurpose hall boasts a facility of a hotel standard. This hall venue is ideal for many wedding and various occasions. Finished with engineered laminated timber-like flooring, the space can also be used as courts for indoor games. While the staff housing comprises living areas for two *imams* in double-storey units and four single-storey units for the *bilals*. The design and planning of the staff quarters follow the concept of cluster living which promotes community living. It is centred around a courtyard with a *rambutan* fruit tree planted in the center of a raised platform.





Today's mosque holds deeper responsibility as is a symbol of economic growth that compliments the booming development of town or a city.

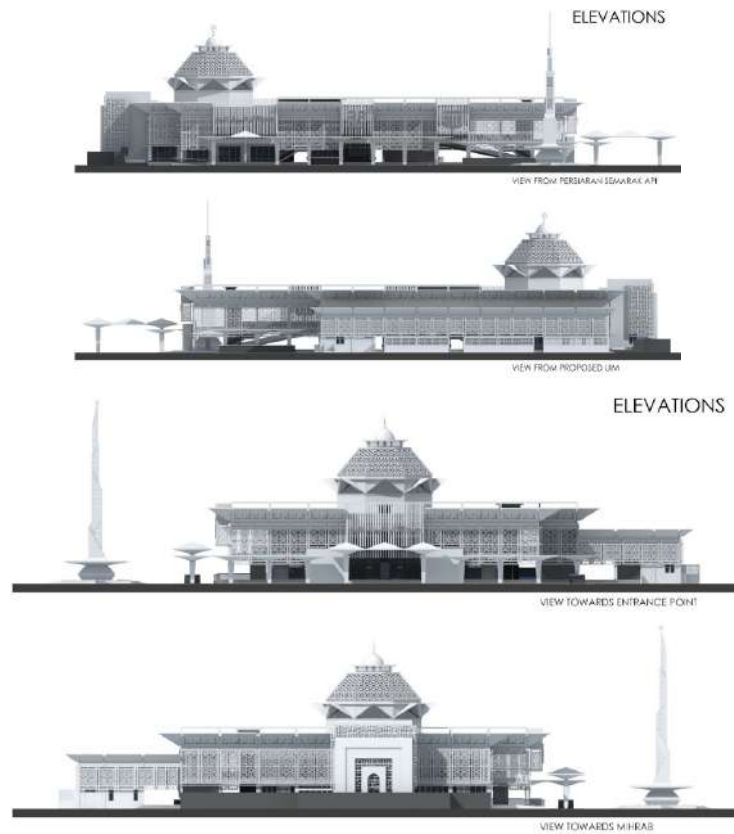


FIGURE 13

Front and rear elevation designs of Raja Haji Fi Sabilillah Mosque.

The mosque complex is designed to revolve around the main prayer hall. As the main feature, it is the most ornate part of the mosque, featuring an intricate façade with Islamic geometric motifs. With a capacity for up to 1,200 worshippers, it stands at twice the height of the surrounding structures and is enclosed to allow for air-conditioning whenever it is required.

A semi-enclosed, “overspill” prayer area is cooled with the use of natural ventilation and fans. The upper floor is accessible via a moving walkway or travelator, as well as staircases and a glass lift.

An iconic, five-tiered, slender minaret made of steel standing 27 metres (88 feet) high is situated at the front of the plaza, with an ablution area located below. The five tiers of the steel structure symbolise the five pillars of Islam.





As requested by His Highness Sultan of Selangor, the *mihrab* and *mimbar* incorporate elements of traditional Malay woodcarving carried out by local craftsmen. The *mihrab* is formed by a pointed arch with a wooden frame at the centre, flanked by a larger, square frame featuring geometric patterns and the names of Allah SWT and the Prophet (PBUH). A raised, wooden *mimbar* platform is placed to the right, surmounted by a dome with similar patterns to that of the mosque's building. The wooden elements symbolise Malaysia's heritage and pay homage to its traditional art and design.



FIGURE 14

Mihrab and mimbar designs of Raja Haji Fi Sabilillah Mosque.

The mosque was recently renamed as Raja Haji Fi Sabilillah Mosque. Raja Haji Fi Sabilillah Ibni Daeng Selak was a decorated local Muslim fighter and defender of Islam. He was a Bugis warrior and also the Yang Dipertuan Muda of the Johor-Riau Sultanate. He was the younger brother of Raja Lumu, who was then the Sultan Salehuddin Shah from the Selangor Sultanate. He was born in 1727 and died in 1784 at the age of 57 years old.

As the four years have passed on since its establishment, the mosque saw its full potential as the principal mosque of Cyberjaya. Even though a new and secondary mosque of Cyberjaya was opened in Cyber 10 last year, the Raja Haji Fi Sabilillah Mosque continues to draw many worshippers. In a nutshell, the mosque facilities can be listed as follows:

1. ablution areas;
2. administrative office;





3. bazaar;
4. classrooms;
5. multipurpose hall;
6. control room;
7. courtyard;
8. dining area;
9. *eid* sacrificial area;
10. female prayer hall;
11. foodbank;
12. information counter;
13. Internet connection;
14. Islamic garden;
15. kitchen;
16. main prayer hall;
17. meeting room;
18. mortuary;
19. overspill prayer hall;
20. rooftop area;
21. staff housings;
22. toilets; and
23. *zakat* counter.

Apart from the daily congregational prayers, the mosque also hosts a number of religious and social activities that can be classified as such:

1. religious activities: daily prayers, Friday prayers, *eid* prayers, burial prayers, special prayers, and *Yaasin* and *doa selamat* recitations;
2. non-formal learning activities: daily lectures after *Maghrib* prayers, morning lectures;
3. formal learning activities: *syariah* and *usuluddin* short courses, tuition classes;
4. communal activities: breaking of fast ceremonies, *Eid-Fitr* celebrations, *eid* sacrificial and *aqiqah* ceremonies, circumcision ceremonies, *Maal Hijrah* processions, sports carnivals, and other Islamic festivities; and
5. other activities: marriage solemnisation services, funeral services, and several others.





DISCUSSION OF FINDINGS

Based on the studies done of both mosques, both mosques can be categorised a modern urban mosque, despite serving to the different scales of neighbourhoods. For the comparison of the research purpose, the mosques can be studied in the following parameters:

1. site locality;
2. architecture and design;
3. facilities and functions; and
4. future expansion.

At the end of the chapter, based on the findings, a new mosque design proposal is presented of how a future community mosque can be further improved in terms of its functions and usages from the architectural and design perspectives.

For the purpose of comparison of case studies, the first mosque, At-Taqwa Mosque of TTDI, will be simply called as ATQMT, while the second case study mosque, the Raja Haji Fi Sabilillah Mosque will be coded as RHFSM.

Site Locality

ATQMT is located in a modern neighbourhood, Taman Tun Dr Ismail (TTDI) that was created in 1973. Named after the Second Deputy Prime Minister of Malaysia, this former rubber estate plantation now comprises modern housings with a wide range of communal facilities from schools, recreational parks, market, banks, medical institutions and place of worships, including the ATQMT. According to the site zonings, the mosque site measures approximately three acres is actually situated on former institutional zoning for a school building.

The current site was chosen due to the unsuitability of the allocated site on the northern side of TTDI. The former site was not suitable for any substructure based on the preliminary soil test done by the appointed architects and engineer. In addition, further site works will require a higher cost that resulted in exorbitant construction costs that will eventually exceed the estimated budget¹⁷. Therefore, the mosque committee had appealed to the current site owner, the Ministry of Education (MOE) for the approval to build a mosque structure on vacant land belonged to MOE. The application





was finally granted and the construction was soon begun, including the construction of a road bridge from the main road.

The RHFSM on the other hand, is a principal mosque of Cyberjaya, the IT hub of Malaysia. Established in 1997, Cyberjaya is also planned as a twin city and located adjacent to the Federal administrative centre of Putrajaya. Cyberjaya is now a thriving IT and knowledge-based tech centre with modern facilities and amenities, also equipped with residential, educational and recreational areas. RHFSM is located in Cyber 1, on the permanent campus site of Universiti Islam Malaysia (UIM) and neighbouring the Sepang Municipal Council (MPSepang) and Cyberjaya Lake Garden Club.

The site was selected due to unavailability of other sites within Cyberjaya. The developer had to ask the approval from the current landowner, the UIM, that proposed the mosque to be part and parcel of the future campus site of the university. Previously, many attempts were made to build a mosque in Cyberjaya since its inception, but it was never fruitful. The RHFSM was finally conceived with the acquired of 16 acres of the site and budget allocation by the Ministry of Finance (MOF) amounted RM 45 million¹⁸. The current site is found to be very suitable as it is located on land next to a proposed Islamic University, the local council office, an open field and a lake.

Architecture and Design

The architecture and design of ATQMT is primarily influenced by a widely known architectural style known as postmodernism, or specifically post-modern revivalism, as coined by Mohamad Rasdi¹⁹. He further conceived term postmodern as an approach that contradicts the principles and edicts of what was understood as the modern style. The term revivalism denotes one of the many ways which the postmodernist attempts to create architecture of meaning for the general public rather than for the elite few.

The enduring feature of the mosque would be the high drum pointed dome clad in green colour. The dome features an Arabian-style dome sits on a highly elevated above on the modified squinches, fringed by two identical minarets. The mosque is generally shaped in a modern and simple form, without excessive embellishments, with the exception of pointed arches across the mosque building façade.

The layout plan is very straightforward composed in a linear style, where the points of access are plentiful and easily identified, except on the





northeast side, where there is only one pedestrian access linked to the upper floor and mosque administrative office. The mosque compound area is commonly filled with car park bays with some landscape elements as it is no longer a standalone singular functioning space. The former vacant plot of land on the northwestern side has been taken up for the recent construction of annexe facilities.

The architecture of RHFSM is a semblance of progressive Islamic and mosque architecture in the 21st century. Commonly referred to as the modern contemporary style, the design advocates sustainability as its design and construction principle. This further translated into its building form, where the Islamic geometrical pattern and *Kufi* calligraphic art adorned the façade and ornamentation within the mosque area. Modern twist to the design creates a new crowd of Islamic art enthusiast where it does not limit to just Muslims. Through design itself, the mosque opens its expected crowd to another whole new dimension that provoke eagerness by other religion or races in the country to unite to appreciate the design thus creating a healthy strong community relationship.

Clad in whitewash colour, RHFSM is easily identified with the main octagonal glass dome, finished with geometrical grille which act as sun screen with a tapering slender 5-tiered sculpture-like minaret. The progressive architectural image of the mosque portrays the advancement of construction technology imbued with the sustainable and green approach. The main mosque building is detached from the multipurpose hall and staff quarters. The rest of the facilities are located on the northern side of the mosque, with the rest of the mosque compound area has been fully allocated with car park bays and landscaping elements.

Facilities and Functions

Both mosques, ATQMT and RHFSM are primarily functioned as the place of worship, mirrored by its religious and social activities. Like any other mosques in Malaysia, the administrative and management affairs of mosques and *musollas* (small mosques) are under the purview of the respective state Islamic religious departments. As ATQMT is located in Kuala Lumpur, it is placed under the Department of Federal Territory Islamic Affairs (JAWI), while the Selangor's RHFSM is under the Islamic Affairs Department of Selangor (JAIS).





With reference to the Guidelines on the Use of Mosques and Suraus in the State of Selangor by JAIS, the mosque shall only be functioned to accommodate Islamic or religious activities, Islamic outreach and propagation Centre and also as a learning and Information Centre. It shall not be used for political activities and lodging or any entertainment-related activities²⁰.

The function of the mosque is no longer solely a place for prayers or sermons. It has been adapted to suit the changing population demographic that embrace the mosque for a place for community activities, to require assistance and guidance. The mosque is increasingly seen as a reliable place to seek solace and spiritual enlightenment from the AlMighty amongst both young and the elderly.

These functions were further explained that mosque as a one-stop centre for Muslim and community-related activities, including as a social and community reference centre, learning and knowledge hub, socioeconomic centre, Islamic outreach and propagation centre and also as a tourist attraction. A mosque can be used for solemnization of a wedding, holding reception, mortuary to clean a body before burial and many other. It can also be used as a place to learn Islamic art classes, a library and others.

Nevertheless, based on the author's observation, some of these guided functions were not fully realized and implemented in the selected mosques. As a social and community reference centre, the mosque ought to be a centre for social development, encompassing Muslim family affairs, welfare services for the needy and poor, providing health and medical facilities, and creating a public complaint bureau. Both mosques were lacking such functions, except welfare services for the needy and poor by establishing a food bank.

Future Expansion

Based on the case studies' findings, there were no apparent physical expansion plannings for both mosques in the near future. Both mosques have been fully developed to its potential use with the site areas are fully used and utilized with mosque building components and facilities. The recent extension at ATQMT with the addition of the annexe building for multipurpose hall and classrooms.

Future expansion may be needed in the future as the ATQMT has become more popular with the growing Muslim population within the townships,





although there are several mosques within 5 or 10km. However, the land area of RHFSM is ample and the future addition and expansion is possible. New or other facilities can be easily added to serve the community in the future.

Hopefully, the future expansion is an expansion of believer of Islam. The number of daily visitors will increase significantly especially for RHFSM as for the state of art design draws more tourist both locally and international. With a good design, it will attract more faithful to the building.

ANALYSIS OF FINDINGS

Based on the findings and observation of the case studies, the architecture planning of mosque in Malaysia can be further improved by making multifunctional to accommodate immediate users and neighbouring communities. By referring to the usage of mosques during the Prophet Muhammad's (PBUH) era, several functions can be matched and tailored to the current needs and trends. The primary functions and design of the future mosque can be determined from these attributes:

1. proper teaching of Islam and the need to be a moderate Muslim;
2. children-friendly mosque/child care centre;
3. mosque for elderly people;
4. mosque to be a place of worship and community;
5. mosque to cater for family needs to ease the daily struggles in managing time to satisfy work and family responsibilities; and
6. mosque to become a safe area.

Children-Friendly Mosque

As a public place of worship, mosque should be catered to all walks of life, regardless of age and gender. Furthermore, there is a potential to expand the role of the mosque as the centre of community and provide the community at large a safe space for today's lifestyle. Attending mosque would create more opportunity of social interactions, learning one's religion and gaining spirituality which leads to attachment to the mosque and generating sustainable community²¹. Despite children may not be the participants of many mosque activities, more and more children are coming to the mosque, more often they will accompany their parents during special prayers, such as *taraweeh*, especially the younger children. For older children, such as the





school children, they'd like to come in groups with their peers to attend the Friday prayers.

A dedicated play area and game court can be provided. It can be incorporated in the courtyard area or any enclosed hall or rooms. It can also be attached to a reading room or activity area, especially for younger children. These facilities can be placed near the overspill prayer area or other common facilities.

Provision for building schools, kindergarten, and day-care centre within walking distance to the mosque will further utilize compound area. The higher frequencies of parents and students coming to the mosque will translate to better social engagement and functions of the mosque building. The students can also use the shared common facilities of the mosque, such as a library, reading area, classrooms, play area and toilets, thus further reducing the construction and maintenance costs. Parents can feel safe if the mosque can be used as a safe zone, if they have to temporarily leave their children there while they are at work or doing their chores

Mosque for Elderly People

Elderly people or senior citizen is by far the largest group of users in any mosque in Malaysia. Mohd Marsin *et al.* further reiterates that the fewer number of young people attending the mosque, which can be translated that the majority are adults and elderly people²². This is also in tandem with the growing elderly population in the country, as the total number of the elderly population in Malaysia is expected to increase from 1.73 million (6.6%) in 2005 to 3.8 million (11.3%) in 2020 (Social Welfare Department, 2007). Just like any other developing nation, Malaysia will soon be experiencing the ageing population by the year 2020, when 7% of the population are aged 65 years and above²³. Abdul Rahim and Abd. Samad also concur that the elderly and disabled are increasing and the built environment, especially mosque where most elderly would like to spend their retirement free time with learning and reciting the Qur'an, performing *sunat* prayers or understanding Islamic revealed knowledge²⁴. Furthermore, the mosque can also be a meeting point for the elderly population and organize themselves to network or even continue their productivity by serving the population. It can be a catalyst for training and to continue their usefulness by offering services commercially or for a fee.





The provision for elderly people is comparable to the need of people with disabilities (PwD), with certain type of facilities and spaces can be provided in the mosque. Therefore, a mosque should be universally designed to cater to all kinds of users, including the Persons with Disabilities (PwDs), the elderly and children²⁵. Abdul Rahim and Abd. Samad further emphasise that the mosque should focus on providing accessible parking area, entrance, and toilets and ablution areas as part of the universal design application. The dedicated parking bay should be placed near the main entrance with ramp access and legible to the elderly people with proper signages. While the toilets and ablution areas should be located on the ground floor with access to the main prayer hall via ramps or lifts. Other services that can be provided is by providing mini buses that can be offered to the *qariah*, for transportation to and fro to their houses.

Other than visiting the mosque for religious activities, these elderly people can visit the mosque after the praying hours by attending classes or any special activities held at the mosque. This can be done in any classrooms or activity areas in the mosque building. A dedicated old folks' centre or home is something that can be implemented as part of mosque facilities, to be served as a daily activity centre or temporary accommodation for the needy ones. Clinics and elderly care centre with proper staff can offer day care centre for working family to unburden some of their responsibilities. Even a hospital or a clinic can be set up nearby to cater for the needs of the community.

The facilities for children and elderly people can be built in the future mosque design via the modular mosque design concept that can be easily expanded when it is needed. Abdul Aziz reports that the materials used can be easily disassembled down and refixed again on a different site. This could be a successful construction method for a new mosque, as some design components can be pre-design to meet various needs, fabricated in the factories and easily installed on to a particular site²⁶.

Mosque beyond Place of Worship

It timely to explore on how the future mosque can be served more than just a public place of worship that confines to most mosques in Malaysia today. As mentioned earlier in this paper about how the mosque was used during Prophet Muhammad (PBUH), the same idea can be applied to suit the current lifestyle and needs. However, based on the case studies elaborated earlier, mosques in Malaysia are largely regulated by the religious authorities, thus, has curbed its definitions and purposes.





Nevertheless, as more mounting issues are faced by our society today, especially the increasing elderly population in the country, it is timely to rethink the mosque purposes of how it can be leveraged to meet and serve the growing number of senior citizens in Malaysia, beyond the traditional old folks' homes that are increasingly in demands since no new government welfare homes will be built soon ²⁷. In additions, the privately-run old folks' homes are seemed to be expensive for many middle-income group earners in Malaysia²⁸. By 2030, 15% of the population will be over 60 years old and half of the aging population will be Muslim.

The facilities for children and elderly people can be built in a safe environment in the future mosque design via the modular mosque design concept that can be easily expanded when it is needed. Abdul Aziz reports that the materials used can be easily disassembled down and fix again on a different site. This could be a successful construction method for a new mosque, as some design components can be pre-design to meet various needs, fabricated in the factories and easily will installed on to a particular site once the ground work is completed²⁹.

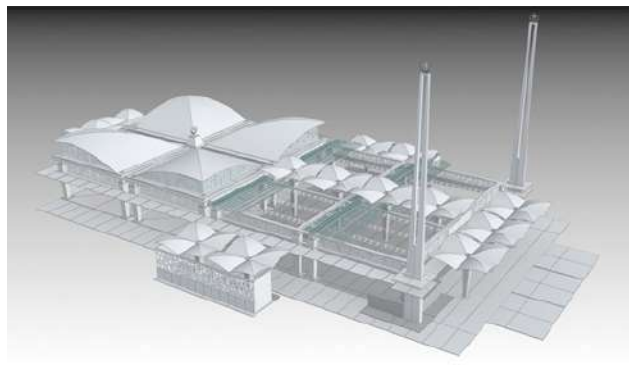


FIGURE 15

Configuration of the modular mosque.

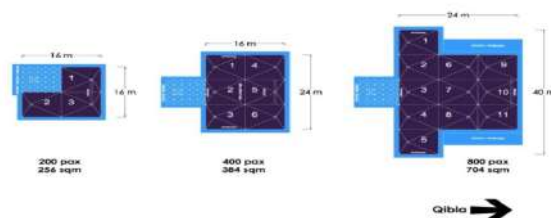
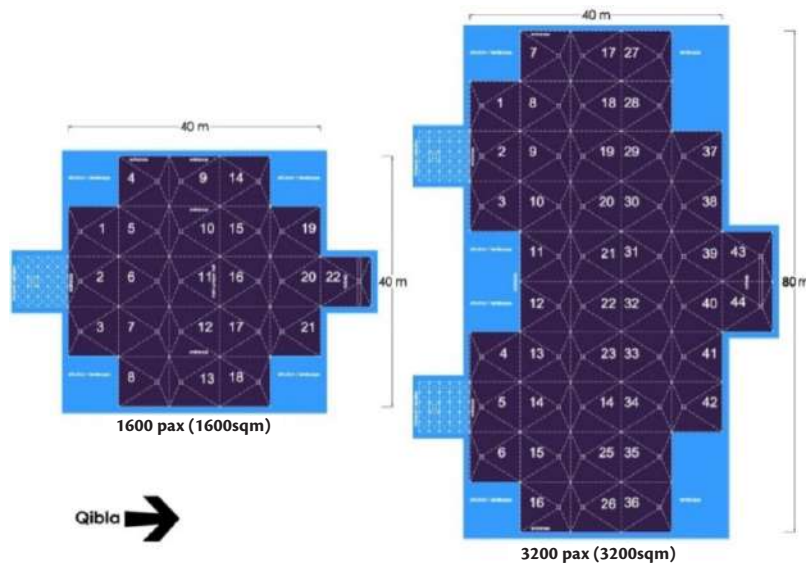


FIGURE 16

The 3, 6, and 11 panels of modular mosque for 200, 400, and 800 worshippers respectively.



**FIGURE 17**

The 22 and 44 panels of modular mosque for 1,600 and 3,200 worshippers respectively.

To become a multipurpose one-stop centre for all communal needs, mosque must serve more than just a public place of worship. It can be a true one-stop centre from cradle to grave used for muslims, catering the needs of all hierarchal walks of life from infants, children, teenagers, adults and elderly Muslims. Some of the proposed functions and facilities of the future mosque can be outlined as follows:

1. activity room for children;
2. camping ground/park;
3. cemetery;
4. children's day-care centre;
5. clinic and healthcare facilities;
6. hotel or hostel;
7. kindergarten;
8. library;
9. multipurpose hall;
10. old folks' day care centre;
11. play area and game court;
12. public complaint bureau;



13. public transport;
14. school;
15. shops and bazaar;
16. staff quarters for teachers; and
17. welfare centre.

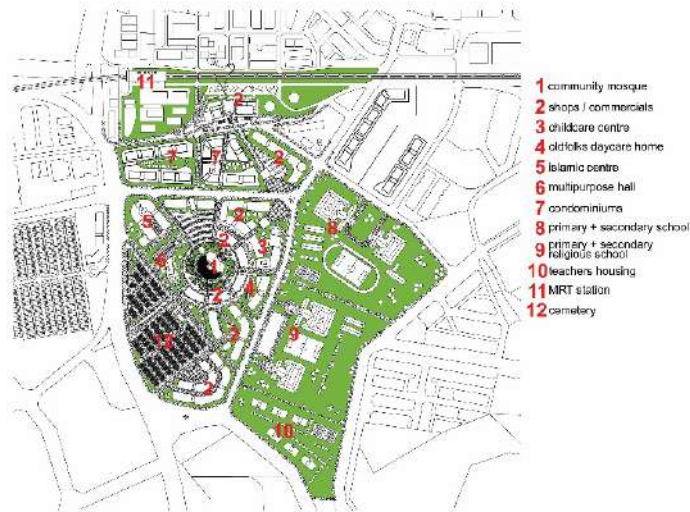


FIGURE 18

Proposed future mosque site plan with adjoining facilities.

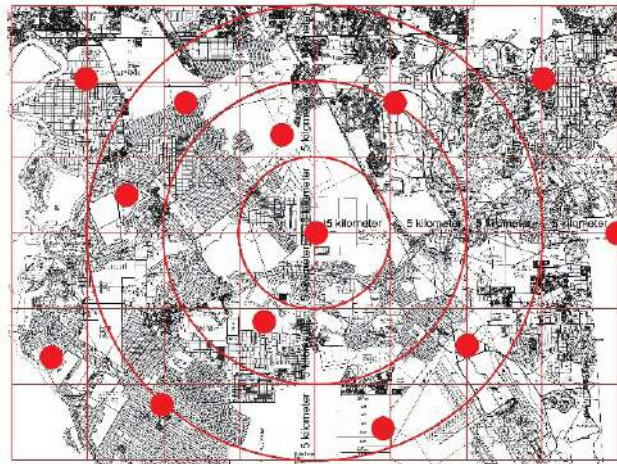


FIGURE 19

Proposed site layout radius within township areas in Malaysia 10km apart. *Suraus* can be located at 5km apart. *Suraus* can be built in numbers within the 10km radius.



The future mosque design as above sits on a measuring 5km by 5km site or it can be located within a distant of 5km from one mosque to another purposely design to create a safe community living that will consists:

1. hospital;
2. minimarket;
3. urban transformation centre;
4. primary school;
5. secondary school;
6. tertiary school;
7. religious centre;
8. housing;
9. police; and
10. security centre.

The mosque buildings can be in a modular form whereby the additional facilities can be added as an attached or detached building, to be linked via pavements or covered walkway. The annex buildings are also connected via multiple entrances for easy access across the site.

The adjoining area can be integrated with the mosque core building as the new urban centre for a modern township, of where essential facilities for daily Muslim lifestyle can be found within walking distance, thus reducing unnecessary carbon emission. It is also safe and secured compound, thus eliminating worries, especially for parents who will send their children for school and daycare throughout the day. Within the distance of 5km x 5km, there will be other *suraus*, a smaller praying area which could be 1km apart

The sustainable approach of the mosque advocates the use of green building compliant terms of six key criterias, which are the Energy Efficiency, Indoor Environment Quality, Sustainable Site Planning and Management, Material and Resources, Water Efficiency and Innovation that further translates into the Green Building Index (GBI) certification²⁹.

The introduction of modular mosque is also timely as the mosque can be expanded easily and when it is exceeded in today's context, large township mosque is built offer the population of the township have reached a certain number. The use of modular mosque can cater for small population first, while the population is small and expected to grow over time.

Today's construction method is slow and will take more than 2 years to





build, with modular mosque, it can be built in a shorter timeframe using IBS (Industrialized Building System) which is manufactured in the factories then assemble on site with shorter construction time. All construction details can be decided during the fabrication stage. It will shorten the construction time and reduce the number of workers needed to construct the mosque.

CONCLUSION AND RECOMMENDATIONS

Mosque, as the public worshipping place, is the core of any Muslim community in Malaysia and the Muslim world. To re-enliven the true function mosque as one-stop centre for the Muslim community, as well as the gravitational centre of Islamic civilisations, it is timely to re-invent and uplift the existing purposes of mosque to serve more than just a public place of Islamic worship. A future mosque is a place where all walks of life and groups of people can utilise to meet their daily lifestyle, especially the elderly population, more than just religious activities, as what had been done earlier by Prophet Muhammad (PBUH) at Al-Masjid Al-Nabawi in Madinah around 1,400 years ago. The next step is to make the whole area inclusive to accommodate the other races which may make up 40% of the nation population. Most importantly, the mosque can be the centre point to garner community support on top of family support and in line with the teaching of Islam.

ACKNOWLEDGEMENTS

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GRAND MOSQUES IN ISLAMIC HISTORY: ARE THEY THE MODEL?

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INTRODUCTION

MOSQUES today constitute a symbol of Islam; they are the vessel of our Islamic identity. Many governments, institutions, and scholars in the Islamic world pay significant attention to their symbolic role, character, and architecture (Allahham, 2019). Different approaches exist today attempting to establish the identity of the contemporary mosque whether by advocating continuity with its architecture through maintaining its historical architectural style associated with people's collective memory, or contemporizing/"futurizing" its architecture to fit with the spirit of the globalization age. However, regardless of their end-product, both approaches share the same standpoint from which they stem; that is mosque architecture as existed in Islamic history, primarily grand mosques built by caliphs, sultans, or governors such as Al-Azhar Mosque, Sultan Hassan Mosque in Cairo, Samarra Mosque (Iraq), Al-Mahdiya Mosque (Tunis), and alike.

Mosques, as presented in various manuscripts on history of Islamic architecture (e.g. Creswell, 1989; Hoag, 1975; Hillenbrand, 1994), are the most representative of Islamic architecture. However, mosques were not consistent in their status and architecture throughout Islamic history. They did not have a pan-Islamic style or universal visual criteria; they adopted varied styles according to their geographical, historical, and political mode of the Islamic ruling regime, a matter that led a few scholars to question the existence of the notion of "Islamic Architecture" all together. Oleg Grabar in his article "Symbols and Signs in Islamic Architecture" (1980) argued that there is no unified "system of visual symbols" in Islamic culture, consequently it is difficult to hold that an





Islamic architecture exists in the visual sense. That is, it is difficult to tell through experiencing a building aesthetically, such as a mosque, what kind of building it is. Grabar depicts the universalistic approach to Islamic Architecture as “new modernism”, “[m]ost strikingly expressed in the concept of “typology”..., it implies a universality in understanding or explaining anything architectural” (Grabar, 2002).

During the last three decades, further debates emerged aiming at scrutinizing the orientalist well-accepted notion of a single “Islamic art and architecture,” whether advocating or negating it, such as the studies of Gulzar Haidar (2002), Bair and Bloom (2003; 2008), Al-Jasmi and Mitias (2004), Bartsch (2005), Rabbat (2012), Khan (2012), and Falahat (2014). Blair and Bloom (2003) argues that the West “persists in seeing Islam and Islamic civilization as a monolith despite that the Alhambra has little if anything to do with the Taj Mahal or that the eighth century in Syria was very different indeed from the eighteenth century in Iran”. These scholars stem in their conception of Islamic art and architecture from a static (physical) approach, as referred to by Allahham (2004). They are looking for intrinsic physical characteristics that distinguish Islamic architecture and make it universally recognizable.

Moreover, even with the emphasis of the “dynamic approach” (as opposed to the orientalist “static approach”) that occurred in the early 1980s on relating Islam to architecture (Allahham, 2004), some recent scholarship calls into question the pertinence of Islam as a religion to “Islamic architecture” (if exists) (Blair and Bloom, 2003; Al-Shawa, 2010). The main question raised was what is Islamic about “Islamic Architecture”? They proposed solutions to define the architecture that occurred throughout Islamic history based on its region, dynasty, type and alike (Blair and Bloom, 2003). Insisting that the notion of “Islamic architecture” has little meaning, most of these latter studies ended up approving the existence of Islamic architecture, however, advanced a new account of it that relates architecture to Islam, not as a religion, but as a civilization (Blair and Bloom, 2003), life style, cultural and spiritual mode (Spahic, 2008) value system (Bartsch, 2005), or as an epistemological and socio-cultural makeup (Rabbat, 2012). Grabar, for example, contends that “it may, therefore, be possible to propose that traditional Islamic architecture identified itself through means other than visual: the sounds of the city, the call to prayer, the word of the Revelation but not its forms, the memories of men and events” (Grabar, 1980).





The current paper attempts to contribute to the debate on the notion of “Islamic architecture,” however, it will stem in building its argument from a non-orientalist standpoint, i.e. from a “dynamic” perspective, with a special focus on mosque architecture. That is, despite the above arguments and debates, grand mosques that occurred in Islamic history with varied architectural styles became the archetypal for establishing the architectural identity of the contemporary mosque. The paper attempts to problematize and contextualize mosque architecture as emerged throughout Islamic history from a critical analytical perspective. It will adopt a non-empirical qualitative methodology based on the Islamic legal politics (*As-Siyasah Ash-Shar‘iyah*) and Ibn Khaldoun’s writings in relating the political ruling system to the transformations that occurred in Mosque status and architecture throughout Islamic history.

WHAT IS ISLAMIC ABOUT “ISLAMIC ARCHITECTURE”?

To start with, we will ask the same question raised in recent debates about Islamic architecture: What is Islamic about “Islamic Architecture”? In opposition to the above mentioned conclusion of many related (mainly western) studies, the current paper puts forward the following argument: Islam as a religion is the prime determinant of what should be considered as “Islamic architecture”, otherwise, “Islamic architecture” as defined by the Western-based art history (presented in the books of history of Islamic art and architecture) and the orientalist with reference to its physical, static characteristics is not “Islamic”. It is not qualified to be labelled as “Islamic”.

To elucidate this argument, the paper adopts the definition of Islamic architecture as developed by Akbar (1988, 1992) as follows: Islamic architecture is the architecture produced by Muslims throughout history, following the Islamic mechanisms of production as set by *Shari‘a*. Islamic architecture is thus “Islamic” because it is related to the “Islamic” production mechanisms and not because it possess certain visual characteristics or produced within the Islamic civilization, historically and geographically.

Islamic societies are centered in their organization, including the production of their built environments, on a *Shari‘a*-derived system of rights that bestows rights to individuals, groups, institutions and the state according to maps of rights. The rights of each party are clearly determined according to its position in society and the built environment. The state





in Islam is considered a party as the individual and the group, which is granted rights by the Islamic law (*Shari'a*) and does not grant rights. It does not have the authority to grant or deprive individuals of their rights granted by the Islamic law. The role of the state in Islam is to maintain the rights of its people. Accordingly, the structure of rights in Islamic societies can be portrayed as non-hierarchical. The individual is regarded as a group, such as the community and the state, whose rights are derived from *Shari'a*, thus not subject to the power of the state unlawfully. Perhaps the incident of Abbas bin Abd al-Muttalib when the Caliph Omar ibn Al-Khattab (RA) could not appropriate his house to expand the Holy Mosque in Medina except with his approval establishes a good example of the inability of the state to interfere in the rights of the individuals and the acquisition of their properties under the name of the public interest (Allahham, 2008). Abu Yusuf states that “it is not for the imam to remove anything from the hand of anyone except with a well-known right” (Ibn Abidin, Vol. 6, pp. 296).

Congruently, the production of the built environment in Islamic societies was determined by decentralized mechanism with bottom-up decision making process governed by certain maps of rights granted to all parties, each according to its position and status in the built environment. They are self-applied mechanisms that do not require any external intervention from the higher authorities (except in cases of dispute between the concerned parties). Most territories in Islamic cities were owned and controlled by the people themselves, thus any party has the right to act freely in his/her property without harming others, socially and/or spatially (Allahham, 2005).

Rights act as a self-regulatory mechanism in Islamic built environments. The emerging cases are dealt with by the concerned parties from within the site, without any interference from third parties such as the state or its representative. Those mechanisms of decision-making opened the doors of enablement to inhabitants and granted them the necessary power, derived from their rights, to decision-making (without harming others), thus freeing them to generate appropriate solutions from within their sites. As a result, Islamic cities did not have a fixed pre-set spatial forms, but were responsive to the perpetual changing situations, historically and geographically.

Restricting the role of the state and limiting its powers in the built environments restrains the possibility of increasing the state's authority





and intervention in the affairs of private properties, which emphasizes the autonomy of private property in the Islamic built environments.

POLITICS AND THE PRODUCTION OF THE BUILT ENVIRONMENT

Having rights distributed among various parties in Islamic societies in a non-hierarchical structure according to rights maps derived from *Shari'a* was limited to the Caliphate ruling mode. According to Ibn Khaldoun in his "*Al-Muqadimah*" (translated as "*The Introduction*", n.d.), politics prevailing throughout Islamic history were of two types: religion-based or sacred politics (*Siyasah deeniyah*), and rational (secular) politics (*Siyasah 'aqliyah*). Islamic political history has passed through several phases associated with the prevailing type of political rule and politics employed. Ibn Khaldoun classified these phases into three: the "Caliphate mode", "Political Monarchy mode", and the "Natural Political Monarchy mode". The Political Monarchy mode, according to Ibn Khaldoun, transpired during the reign of Abd-al-Malik bin Marwan's sons in the Umayyad dynasty and of Al-Rashid's sons in the Abbasid dynasty. During the Caliphate mode, the Islamic state tended to embrace the sacred principles derived from *Shari'a*, however, starting from the Umayyad dynasty which turned into a "Political Monarchy mode", it adopted a mixture of sacred-rational politics. Gradually, the rational (secular) tendency dominated over the sacred, turning the ruling system into a "Natural political Monarchy". This change in the political ruling mode obviously had its effect on the production mechanisms of the built environment.

Relating Ibn Khaldoun's model to the history of Islamic legal politics (*Siyasah Shar'iyah*), the emergence of the Political Monarchy mode was accompanied by an expansion in the power of the ruler. As mentioned above, Islam has set a map of rights in which the rights of each party are well delineated. Such rights performed as enabling rights that generate power to act for its party. Starting from the Umayyad dynasty, stemming from his position as a caliph and employing a sacred-rational politics, the caliph turned the rights granted to the state by *Shari'a* into a form of "power over" or domination. This was clearly reflected on the built environment and its production mechanisms. This political transformations led to changing the map of rights as derived from *Shari'a*. It became a hierarchical map with the ruler at its very top. The expansion of the state authority led to transforming its role from supporting the process of community empowerment as defined by the Islamic law into an exercise of power outside the legitimate rights system. But how did such transformations occur?





Islam has two main sources of legislation, *Qur'an* and *Hadith* (sayings, customs and practices of Prophet Muhammad (PBUH)), however, a few more sources were employed by the different Islamic rites that emerged since the second century AH (8th c. CE., late Umayyad dynasty). In an attempt to organize the process of deriving rules, Al-Shafi'i (767–820) at the beginning of the third century AH (9th c. CE.) codified the basic principles of Islamic jurisprudence, setting what came to be known as the “Principles of Islamic Jurisprudence” (*Usul al-fiqh*). The four roots of law, according to Al-Shafi'i school are *Qur'an*, *Sunnah*, *ijma'* or the consensus of scholars, and *qiyas* (analogy). Al-Shafi'i rejected the *istihsan* (juristic preference) and *istislah* (public interest) that were accepted by other major schools as sources of law. These latter jurisprudence principles acknowledged religious laws that had no textual basis in either the *Qur'an* or *Hadiths*, but were based on the opinions of Islamic scholars as promoting what they interpreted as the covert interest of Islam. Basic principles of Islamic jurisprudence (of Al-Shafi'i), as adopted by later jurists, were claimed to constitute hindrance to deriving rules that fit with the emerging incidents. Consequently, rulers (caliphs and governors), exercising their authoritative self-granted power, and to maintain a religious cover for their rational-based decisions (under the political Natural Monarchy mode (in the second Abbasid dynasty)), referred to *istihsan* and *istislah* to derive rules.

During the 5th century AH (11th c. CE) the notion of “Legal Politics” (*As-Siyasah Ash-Shar'iyah*) emerged, granting rulers more rights thus power to decision making process based on their perception of the public interest, using principles of analogy, *istihsan* and *istislah*. This heralded the split between politics and religion which Ibn Khaldoun refers to as the “Natural Monarchy mode”. Several books were written on the subject, directed to the rulers to inform them of their authorities, methods and sources of rule derivation, such as “*Al-Ahkam Al-Sultaniyah*” (the sovereign's rulings) of Al-Mawardi, and “*Suluk Al-Malik fi Tadbir Al-Mamalik*” of Ibn Abi Arrabi”. Legal politics as such changed the rights structure prevailed during the early Islamic history (Caliphate mode) into a power-based structure where the ruler was bestowed legislative authorities and control over Muslim societies. Ibn Taimiya (d. 728AH, 1328 AD) described this era saying “as to the interests [*istislah*] a great disturbance occurred in the religion” (Al-Jarrar, 1998). This of course had its effect on the built environment. Two types of built environments existed as a result of these political transformations: first, popular built environments produced by the people themselves using *Shari'a*





based mechanisms; second, the authoritarian built environments produced by the different political modes prevailed during Islamic history. The latter type did not adhere to the Islamic mechanisms of built environment production as derived from *Shari'a*, but was governed by secular/rational rules dictated by the power holders (the caliphate, governors, and royals).

Powerful leaders and ruling regimes have used the built environment as an expressive form of power and authority. They built monumental buildings such as mosques (Cordoba Mosque, Samarra Mosque) and palaces (desert palaces), as well as new cities (Wasit, Samarra) to perpetuate their patron's name. Apparently, this latter type is the one orientalist referred to as "Islamic architecture" and is displayed in most books of history of Islamic architecture as emblematic of the "Islamic architecture". It is actually an authoritarian non-Islamic architecture, produced through non-Islamic mechanisms, and following rational power structure instead of the rights structure derived from *Shari'a*. We will turn next to elucidating the effect of these political transformations on mosque architecture, as the most representative of Islamic architecture.

GRAND MOSQUES ARCHITECTURE

During the Umayyad "Political Monarchy mode" the effect of the expansion of the caliph's power was clearly evident in the built environment. Caliphs paid great attention to architecture, starting from Abd Al-Malik bin Marwan who built the Dome of the Rock, paying for it from the Muslims Treasure House. Construction cost was reportedly seven times the yearly tax income of Egypt (Jacob, 2006). How did Abd Al-Malik obtain the right to spend on this building from the Treasure House? And what type of mechanisms and decision making process were employed in the production of the Dome of the Rock?

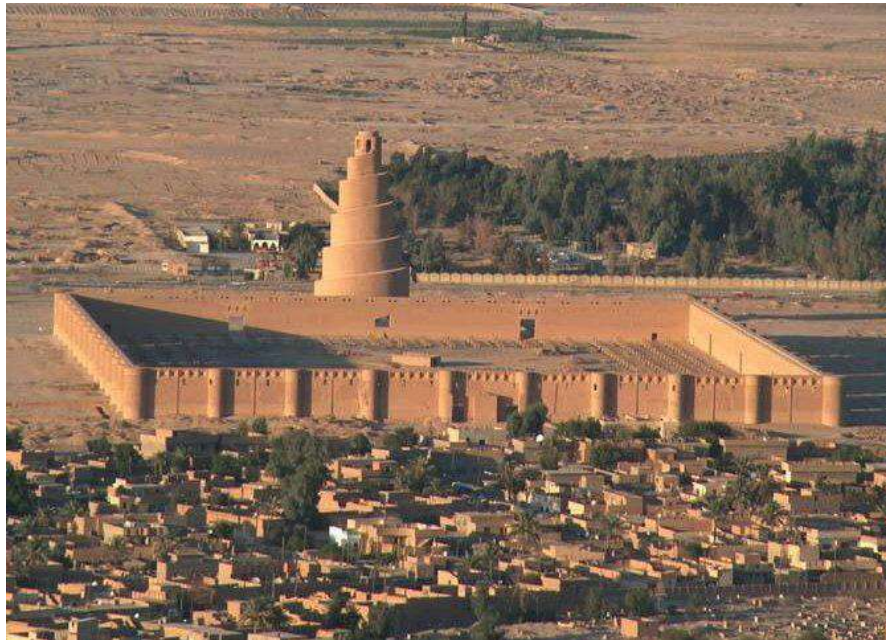
Expressing their power gained from the adoption of the Political Monarchy system, a phenomenon of establishing royal cities associated with the names of their rulers occurred during the late Umayyad dynasty and continued throughout the Abbasid dynasty. Example of such cities are Wasit city of Al-Hajjaj, Ar-Ramleh of Suleiman bin Abdul Malik, Samarra of Al-Mu'tasim, and Al-Mutawakiliyyah of Al-Mutawakkil. Such a phenomena affected the mosque status and architecture, leading to the emergence of a new type of mosques. To clarify this, we will refer to the city of Samarra as an example.





Samarra was a capital city established by the Abbasid caliph Al-Mu'tasim in Iraq in 211AH/836AD after he left Baghdad due to conflicts between his Turkish soldiers and the people of Baghdad. Al-Mu'tasim built Samarra to be a city for himself and for his soldiers, thus he wanted it to be unique so that history recalls its greatness. He established Samarra with an unprecedented architecture and urban planning, characterized by representations of power and authority. For security reasons, Al-Mu'tasim isolated himself and his soldiers in a private "royal" zone, where he built his palace and mosque. The city of Samarra was a royal city associated with its builder (Al-Mu'tasim) thus deteriorated with the decline of his power. Al-Mutawakkil caliph, after the death of Al-Mu'tasim built his own royal city called Al-Mutawakiliyah to the northern of Samarra with its own mosque (Abu Al-Duluf Mosque) (Figure 1). It is reported that Abu Alduluf mosque was one of the largest mosque in the Islamic world. The mosque consists of a rectangular building measuring 239m x 156m with an area of 38,000m² and a remarkable 55m high spiral minaret that stood outside the mosque's wall. A total of 80,000 Muslims could worship there at the same time. The courtyard's fountain was domed and elaborately decorated with mosaics and marble paneling (Archnet website). Samarra (and Al-Mutawakiliyah) continued for nearly half a century until the Abbasid caliph Al-Mu'tamid left Samarra for Baghdad, then the city of Samarra collapsed. Samarra and Abu Al-Duluf mosques were exclusively used by the caliph and his soldiers. They were rather fort mosques that belong to the ruler and not to the public who had their own mosques, i.e. they were mosques of the authorities, i.e. "royal mosques", thus were impressive in their architecture. Samarra, in terms of its architecture, planning, and urban mechanisms constitutes a disruption in the continuity of the production of the "Islamic" urban built environment. It is an individual, authoritarian product that deviated from the Islamic norms and mechanisms of the built environment production.



**FIGURE 1**

Abu-Al Duluf mosque in Al Mutawakiliya City, Iraq (848–51AD).

(Source: Wikimapia. Available at <http://samarra.wikimapia.org/en/photos/>
Accessed on 6 February, 2019)

Such “royal” mosques were distinguished from the popular mosques in that while the former tends to incline more towards the secular/rational mechanisms of production, the latter adopted the Islamic mechanisms of production as derived from *Shari’a*. It can be said that popular mosques formed a continuation of mosque architecture through Islamic history whereas the architecture of the authoritarian “royal” mosques constitutes a break and transformation in mosque architecture.

With the decline of the phenomenon of establishing new royal cities since the Fatimid dynasty, a new phenomenon began to occur in the authoritarian architecture. Rulers (in the Fatimid and Mamluk dynasties) started to build “Sultani” mosques that are associated with their names such as Al-Hakim, Al-Azhar, and Sultan Hassan mosques. Sultani mosques turned to be a prominent phenomenon; the area of Al-Mu’izz li Din Allah Al-Fatimi Street in Cairo witnessed the construction of many mosques of that type (Figure 2). But, did Al-Qahira and its population at that time require that number of mosques in one area?





MOSQUE ARCHITECTURE: PRESENT ISSUES AND FUTURE IDEAS

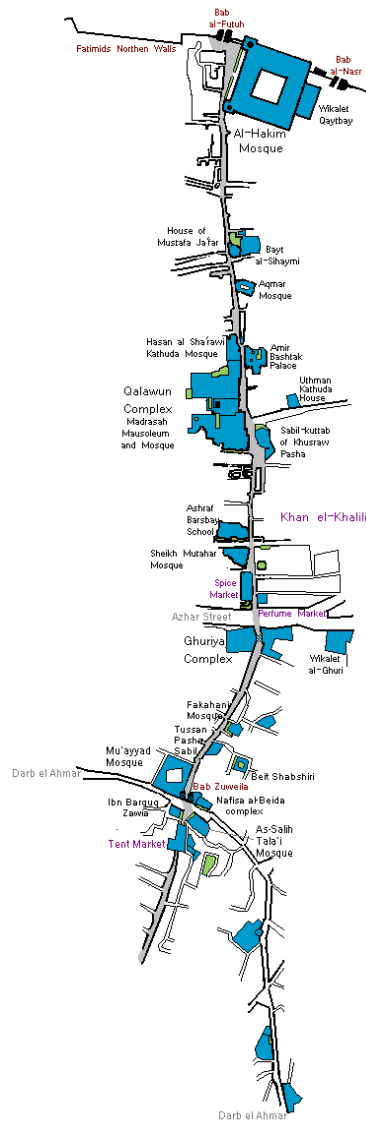


FIGURE 2

Northern Part of Al-Mu'izz li Din Allah Al-Fatimi Street
showing its main historic mosques and sites.

(Source: The Arab League, 2008. Available at Wikipedia. Accessed from https://en.wikipedia.org/wiki/Muizz_Street#/media/File:Muizz_Street. GIF on 12 September, 2019)

Mosques were used since the Fatimid era, especially in the capital city of Cairo, as a political tool; either as an Islamic symbol that reflects the Islamic faith of the ruling system so as to stimulate people's loyalty, or as





a community-related center to promote the Islamic rite of the ruling system (the Sunni rite in the Ayyubid era). Since the Ayyubid era, mosques were mostly directed to the general public and not to the rulers; they were located in the public areas and used by the public. However, being associated with their names, rulers were preoccupied with their architecture; they used lavish materials and built them with remarkable architecture and details. This was very much apparent in most Mamluki sultans' mosques. Al-Maqrizi mentioned that the cost of building Sultan Hassan mosque from the Muslim Treasury House was 40 thousand Dirham per day for seven years (Al-Maqrizi, n.d.) (Figure. 3). This phenomenon continued throughout the Ottoman era as in Sultanahmet mosque and Al-Sulaimaniya mosque in Istanbul. However, although these mosques retained their social dimension and cohesion with the public, the question is: does the intention justify rulers' deviation from the Islamic mechanisms of built environment production? Even if we accept it that the cause justifies the end product, why did such mosque architecture continue throughout the Mamluki era although the Sunni rite was restored? Such mosques are but a part of the authoritarian architecture produced by the power holders following their own secular mechanisms. These mosques established a new secular model of mosque architecture in terms of their splendor architecture and deep implicit connotations and societal codes (Allahham, 2019).

**FIGURE 3**

Sultan Hassan Mosque, Cairo.

(Source: Wikipedia. Available at [https://en.wikipedia.org/wiki/Mosque-Madrassa_of_Sultan_Hassan#/media/File:Flickr_-_archer10_\(Dennis\)_-_Egypt-13A-061.jpg](https://en.wikipedia.org/wiki/Mosque-Madrassa_of_Sultan_Hassan#/media/File:Flickr_-_archer10_(Dennis)_-_Egypt-13A-061.jpg). Accessed on 12 September 2019)





Such grand “authoritarian” mosques are registered today in the World Heritage list as part of our Islamic heritage. They are all included in books on Mosque architecture and in the books of history of Islamic architecture. How can such mosques that were built based on non-Islamic rational political mechanisms be labelled as “Islamic” and represent the Islamic Architecture? How can we today teach our students that such monumental mosques are the product of Muslim societies whereas they are in fact the product of their rulers? What is more is that these grand “royal” and “Sultani” authoritarian mosques set up today the model for the contemporary mosque. They are considered as the traditional mosque architype.

CONCLUSION

The paper attempted to problematize and contextualize the mosque architecture as existed throughout the Islamic history. It looked into the relationship between the political transformations that took place throughout the Islamic dynasties on the production of architecture, with specific focus on Mosque architecture. The paper concludes that the entire history of mosque architecture has to be reconsidered and reinterpreted, with particular reference to the political transformations throughout Islamic history.

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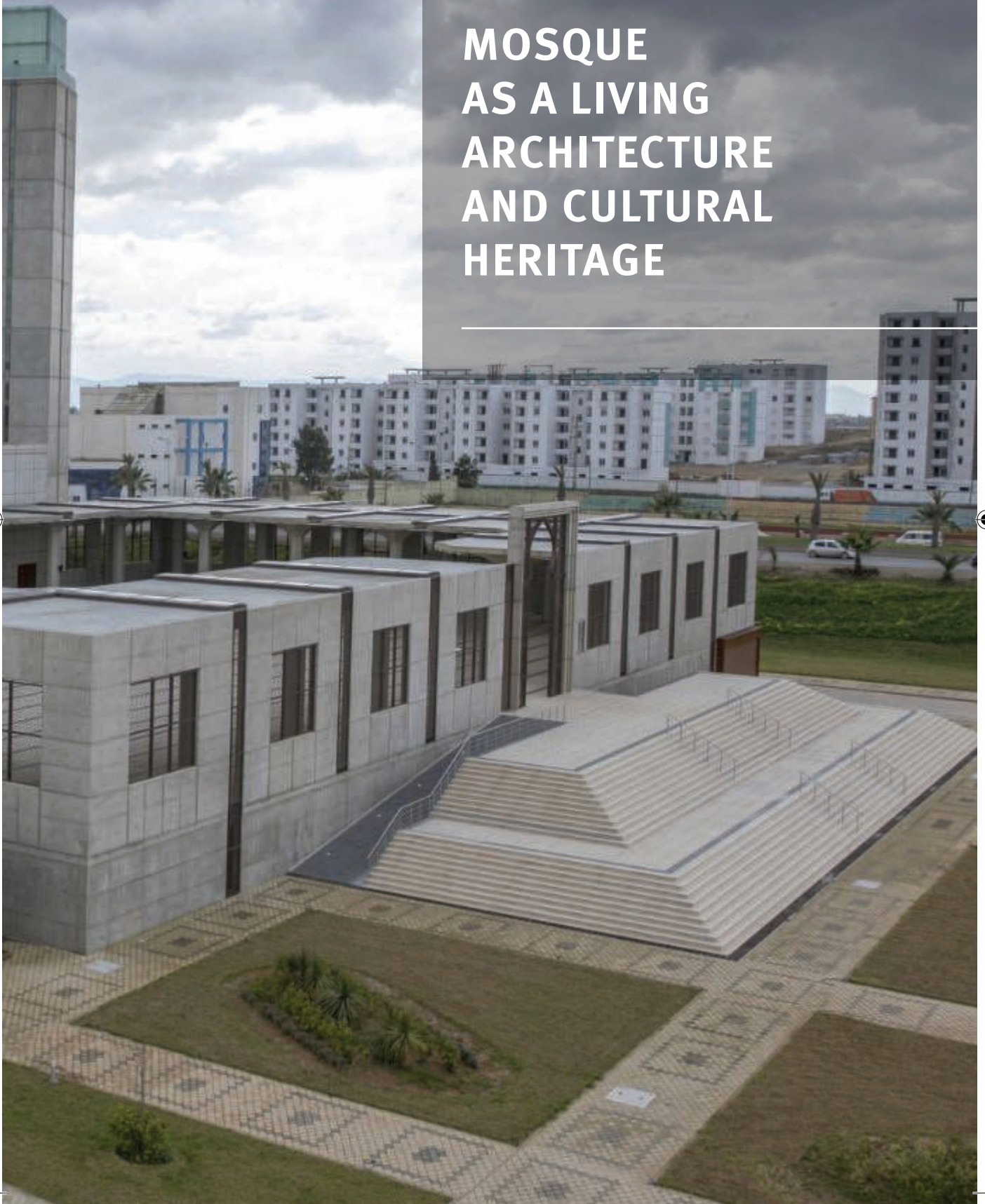


SOCIAL CULTURAL





MOSQUE AS A LIVING ARCHITECTURE AND CULTURAL HERITAGE







MOSQUE DESIGN BETWEEN ICONICITY AND RECEPTIVENESS

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MOSQUE AS “HOUSE OF GOD” AND AS “HOUSE OF COMMUNITY”: AN INQUIRY INTO ADAPTIVE REUSE OF AN ABANDONED MOSQUE IN PAKISTAN

**Syed Hamid Akbar
Koenraad Van Cleempoel**

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Abdul-Malik Abdul-Azeez Abiodun







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INTRODUCTION

THIS research suggests a new vision for iconic mosque that capable of standing alone against harsh factors starting from the surrounded context passing by functionality and ending by a durable design. It exhibits openness to merge new ideas and embraces parametric design. A futuristic vision in designing mosque especially in arid zones include responsiveness to context culturally, socially, and environmentally, that adds uniqueness to the place and puts mosque in its position to guide Muslims, improve their belonging and socialize with each other's. The following discussion clarifies the features of iconic mosque and how it's responsive to various elements or factors.

RESPONSIVENESS TO CONTEXT

Our life is surrounded by continually changing forces of environment¹. Responsive architecture is a design field that has grown up in recent decades at the intersection of architecture and computer science². The term "responsive architecture" was created by Nicholas Negroponte³, who first proposed it during the late nineteenth century (1970) when spatial design problems were being discovered by applying cybernetics to architecture. He claimed that responsive architecture is the normal product of the integration of computing power into built spaces and structures. That results in more rational buildings. These buildings are designed to respond easily to change during their lifetime³.

It needs three components: information, algorithms, and agents⁴. Its responsiveness is needed to follow the speed of unpredictability future





changes, therefore more responsive methods are required. Generating a myriad of valid alternatives can easily be created and evaluated that responds better to the needs⁵. In this paper the word “responsiveness” is discussed related to other factors before the design of the building starts. The way the building interacts with context, cultural heritage, and environment; results in a durable design which can be iconic and reveals the society identity.

“Receptiveness”⁶ is defined in dictionary as: the ability to receive things, new ideas or suggestions and prepared to consider them or accept them. From this point of view the research suggests a combination of new ideas that help in making mosque design able to hold or receive signs from different factors according to the surrounding context (social, economic, and environmental). Desert areas form the most challenging environment to produce an iconic design which compatible with the traditions, needs, culture, and present modern vision. Arid environments are extremely diverse in terms of their landforms, soils, fauna, flora, water balances, and human activities. Hot and arid climate architecture features include the following.

1. Domed roofs⁷ have an extreme effect on the reducing the building’s thermal loads. The form of domes presents two different benefits. During the day, always part of the dome is in shadow while at night full hemisphere sees the night sky. Thus, radiant heating is minimized while radiant cooling is maximized (Figure 1).

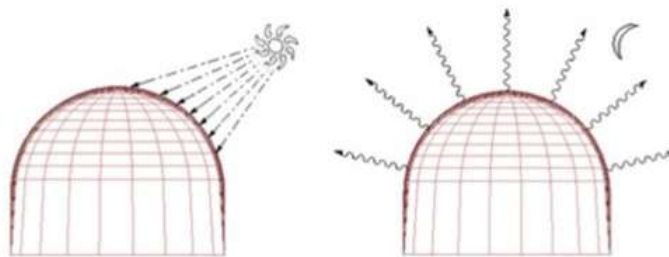


FIGURE 1

The act of domes form through day and night.

2. Walls⁸ emit the heat through transferring and radiation during night and their temperature remains in low and average degree during the day, thus, walls are one of the features that control comfort for residents.
3. Windows are small and located in the upper parts of walls just near the ceiling. Passing ventilation is done by these windows.



4. Windcatcher also helps in the internal ventilation. And it acts both by sucking and pulling air.

SUSTAINABLE SOLUTIONS

Sustainability aims at reducing negative impact on local and global environment as possible, while endures to provide suitable, comfortable, and safe buildings⁹. It deliberates three dimensions: environmental, economic, and social. Mosque is an iconic building in Islamic societies – visually and spiritually, so it signifies a perfect model to deliver energy conservation principles all over the society. Hereafter, efficient energy consumption is one of the challenges of designing a mosque. For instance, it is important to economically attain human thermal comfort throughout the day considering annual peak times. That certainly recalls responsiveness to climate and promotes efficient energy design.

Generally, the basic principles of sustainable development in building design are¹⁰: 1. maximizing the use of renewable and natural resources, 2. minimizing energy and water use in the building design, 3. ensuring processes to validate building system functions and abilities¹¹. Consequently, in order to develop mosque's design, the research takes those points into consideration and works on four indicators; climate change, emissions, reduction of resources, and water efficiency¹².

PARAMETRIC DESIGN

In history, architecture was exploited by the human being to protect from unsteady environmental conditions. In the past centuries, architecture was pioneer art which has special features such as simplicity, organization, clear style, precise decoration, material assemblage, and so on. However, modern buildings become complex products that have so many parts which have to achieve different functions. Thus, new computational ways and techniques have been developed to facilitate the design of modern complicated buildings and to create a convenient quantitative relationship between the environment and the envelope, putting in consideration the obstacles which influence on the building design. This has therefore formed the concept of parametric design in architecture, in order to deal with complex designs and gain more accurate results¹³.

In the conventional way of design, it is hard to attain various solutions in short time. Therefore, if the designer needs to change any parameter, the whole process must be repeated, which is quite money and time-consuming.

In contrast, the so-called parametric design employs certain software such as Grasshopper to efficiently amend and improve design by integrating and coordinating design components simultaneously. Therefore, any change of parameters like editing or emerging will be automatically and immediately updated in the model, which is like a “short cut” to the final model. A graphical assessment between the conventional approach and the parametric design is shown in Figure 2.

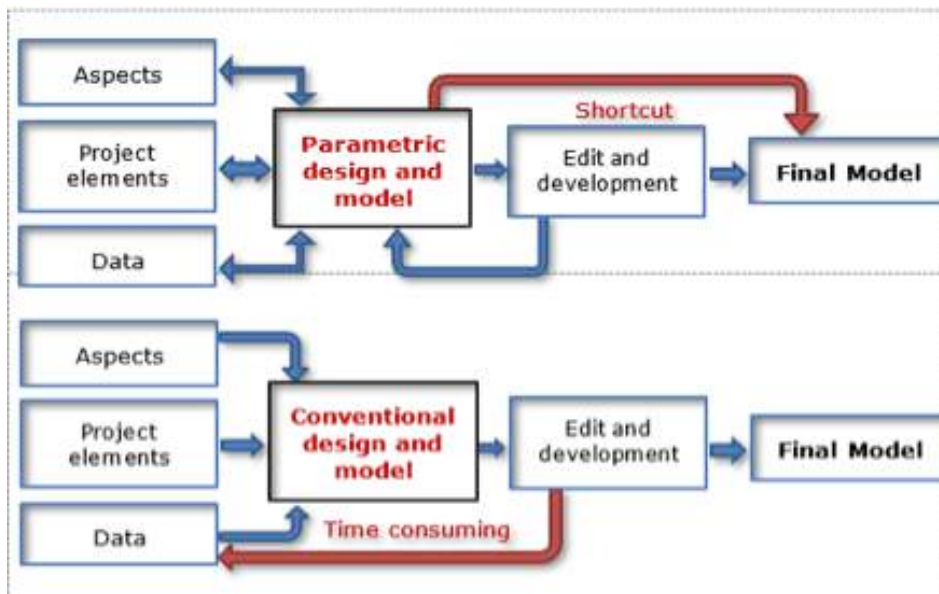


FIGURE 2

Comparison diagram between parametric design process, and conventional ones, showing the difference in time consuming¹³.

Modern architects claim that parametric design is the most creative way to understand the development and complexity of the new era of architectural trends¹⁴. Meanwhile, it is hard to deal with sophisticated parameters in buildings using our brains to imagine, or conventional ways to design¹⁵.

In addition, building technologies currently are integrated and containing many disciplines at the same time, and each discipline is dependent on the other disciplines in a very complex vast connection. Hence, they should be organized in a database container, and this container could be managed parametrically using parametric design as an advanced way to explore and understand these sophisticated relations¹⁶. Grasshopper is an excellent example of a parametric software which can deal accurately with several parameters, (Figure 3). This paper hence presents how can parametric



design influence on heritage buildings' design such as Islamic buildings, specifically the mosques, and simultaneously keeps its conventional design, within a contemporary approach.



FIGURE 3
Grasshopper interface.

Islamic Patterns in Mosques

For centuries, Islamic geometrical patterns have been used as ornamental elements on walls, ceilings, doors, domes, and minarets. Though, guidelines and codes of these patterns should be accurately engaged and executed in order to achieve its iconic shape. These patterns contain several parameters, scales, geometries, and ratios which are geometrically related to create these detailed elements.

There are distinctive examples of old mosques that use unique geometrical elements which specify the era and the heritage of the country. For instance, the great Mosque of Kairouan (Tunisia), the ornaments on this building are designed primarily with vegetal and floral motifs. Another example, the Mosque of Ibn-Tulun is considered a milestone in terms of its introduction of geometrical patterns to Islamic architecture, which represents the transformation from the naturalism of early Islamic ornaments to new levels of abstraction. Further example, the Al-Juyushi Mosque in Cairo, whose most significant element is the lavishly carved stucco of its *mihrab*, with floral and geometrical patterns. Al-Aqmar Mosque, in Cairo is elaborately filled with calligraphic, vegetal, and geometrical decorations¹⁷. All aforementioned examples reveal how the patterns and elements of each mosque can specify a unique era of its related territory (Figure 4).



FIGURE 4

Examples of conventional mosques design and elements¹⁸.

Unfortunately, the character of the mosques nowadays becomes dramatically indefinite, due to the contemporary trend of simplicity in global architecture. In addition to other limitations such as material cost, lack of skilled labor, and time consuming. These former aspects accordingly influenced on the mosques conventional design and shapes.

Parametric Approach with Islamic Architecture

Nowadays, parametric design is used in many fields, disciplines which consist of complex algorithmic relations, interdisciplinary work, creative forms, and multiprocessing treatments, which is literally revealed within the mosques' envelope. Recently, there is no luxurious of time and cost to operate these complex designs and elements in the mosques via using conformist tools or imagine them using our minds, so it is needed to use more advanced operating systems, parametric tools, and specific software. Due to this advancement in our life, we can find many successful implementations of parametric design in architecture, which can be applied in mosques.

DESIGN METHODOLOGY

Our proposal was concentrated to achieve several aspects simultaneously – tradition of the territory, lighting, ventilation, Islamic elements, climate changes, and the conceptual design of conventional mosques. It starts with a well-defined concept combines responsiveness to context, considering



sustainable solutions, and embracement of parametric design. The following discussion clarifies the whole design process as shown in the following diagram.

PROPOSED MOSQUE DESIGN

Concept

The proposed site is in UAE Creek Harbor. The iconic mosque concept is drifted from the nature surroundings, heritage, and the cultural essence of emirates. The dromedary is the symbol of patience and the desert reveals strength; they are features of Dubai's culture.

The design of Dubai Creek Mosque is inspired by dromedary footprint and Sand Dunes. The concept comprehends and reveals the desert context and the strong essence of the country.

Camel leaves a trait full of power, patience, pride, continuity, and aesthetics. Similarly, the mosque is a spiritual source which Muslims depend on. It leaves a considerable influence inside each Muslim. So, to ensure that impact, a camel footprint is used as an inspiration. Eventually, the building mass reveals trustworthiness, dependability, strength, and pride.



FIGURE 5
Concept evolution.

Plans

Therefore, the floor plan takes the shape of dromedary footprint as it is the most adequate shape to reveal the concept and suitable with site



constraints. The shape gives potentials for achieving functionality of the mosque and makes it iconic as well.

Qiblah is the main axis. The orientation of the plan serves to have the maximum number of worshippers as the longer edge is along the *qiblah* wall (Figure 6).



FIGURE 6
Plaza design.

Integration with Landscape

To integrate with the surroundings, the building has two main axes. The first one is visual and connected with the park of creek tower and the sanctuary park, and the second is related to *qiblah*. These axes form the building orientation and integrate the mosque mass with landscape context. The shown shots demonstrate the orientation of the building and landscape design: main plaza, entrances, and paths. Consequently, the plaza takes the shape of sand dunes and suitable for people gathering after prayers (Figure 7).

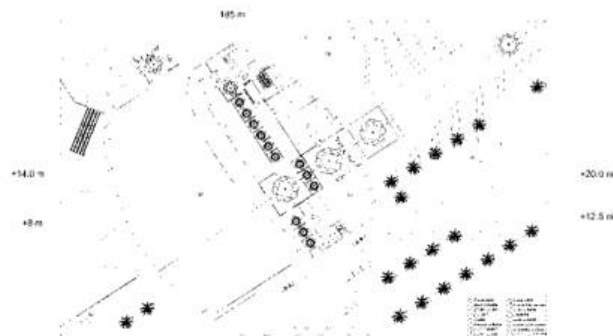


FIGURE 7
Plan for the proposed design.



Minaret

Minaret calls for prayer. As well, when we need Allah, we just raise our hands and call him. So, the shape of the proposed mosque's minaret expresses the hands' position when praying to Allah (Figure 8).

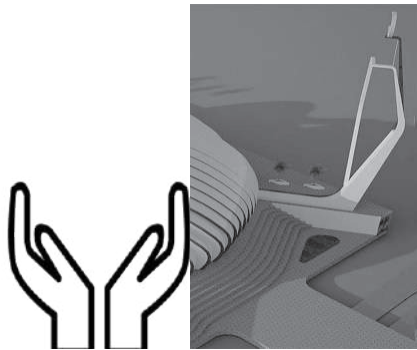


FIGURE 8

Design of minaret inspired by the pose of praying hands.

Mosque Design Sustainable Solutions

The proposed iconic mosque design sustainable solutions according to sustainability principals' areas follow:

Reducing Thermal Mass

Domic shape is used in the form of mosque to reduce the thermal mass on the building envelope, also, the dome consists of many linear strips which is organized in different levels to increase building self-shading (as shown in Figure 9).

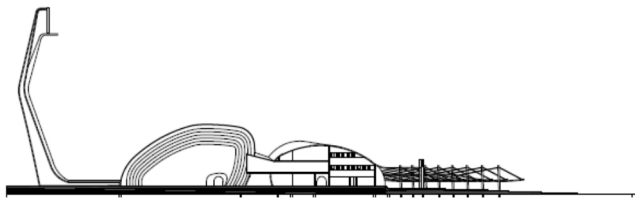


FIGURE 9

Section clarifies domic shape.



Roof Treatment

Furthermore, the opening on the roof of the mosque is taken from the windcatcher that used in arid zones as one of natural ventilation elements (Figure 10). They are similar in the function rather than the form. It also allows natural lighting to pass through.



FIGURE 10

Windcatcher in a modern way.

Emissions

For reducing the CO₂ emission, the proposed mosque design applied the following¹⁹:

Hvac

Since HVAC comprises 40 percent of all carbon emissions that building sector produce, using the most efficient heating, ventilation, and air conditioning systems is recommended. For less electricity, natural gas and CO₂ emission, the HVAC system has to be equipped a building with sensors can measure indoor air quality and determine how much ventilation is needed. Also, adjust the heating and cooling system schedule does not to be pre-determined hours because it let the system run hotter or cooler in off-hours, depending on the season.

MOSQUE INSULATION

The proposed mosque design is following ASHRAE 90.1 and the most recent International Code Council (ICC) which defines continuous insulation for





all structural members without thermal bridges other than fasteners and service openings.

Resources Usage Reduction

ENHANCING NATURAL LIGHTING

Differences between strips heights enhance natural lighting inside the mosque without glare and heat (Figure 11).



FIGURE 11

Section elucidates natural lighting.

ELECTROCHROMIC GLAZING

Electrochromic (EC) glass was chosen for our iconic mosque because of its significant function of light transmission control. Electrochromic glass consists of double glaze system, which has the significant property to tune from transparent to translucent state instantly by using the application of applied voltage, this transformation can be controlled automatically. Therefore, EC glass is used to improve the performance of daylight inside the mosque and save energy.

The amount of diffuse light provided by electrochromic window is controlled automatically based on the amount of needed illumination, which was assigned between 300 and 1000lx.

WATER EFFICIENCY

Saving water: using the latest technology in saving water in ablution area as shown in Figure 12. Grey water technology is used to reduce water consumption. The tanks are in the basement floor and working together to enhance water usage, that include:



1. Grey water tank is filtering and storing grey water which coming from ablution area and sinks to use it later.
2. Urine tank stores urine separately.
3. Mixing tank that mix 1 unit of urine with 10 units of grey water to use it in irrigation.
4. Irrigation pipes which supply gray water that full of nutrients to plants and project landscape.
5. Solar water tank is storing hot water to supply it for ablution and toilets.



FIGURE 12

Latest techniques in ablution areas to save water²⁰⁻²¹.

Renewable Energy Production

The building envelope is used for installing solar electric photovoltaic (PV) systems to reduce the demand for conventional and CO₂ emission.

Parametric Approach

The teamwork grasps all the previous parameters and merge it considering parametric design. The intersection of these parameters results in a durable, iconic, and responsive design (Figure 13). That's clear in the mosque mass, plans, architectural treatments, and the usage of vocabulary in a modern method. The cultural impact is crystal clear in the whole design starting from idea to the massing and landscape.

**FIGURE 13**

Iconic mosque proposal based on parametric design.

FINDINGS AND RESULTS

The proposed design reveals the compatibility of the selected parameters (responsiveness to context, sustainable solutions, and parametric design) and how the integration of them extricates a well-defined building that expresses the features and identity of the place. Moreover, it can be applied on any other mosque in areas like UAE (arid zones). The design integrates well with the context: **1. Socially** – by facilitating wide areas for prayers to gather after prayers and in other times as an open plaza. **2. Culturally** – by integrating with traditions and heritage through symbolizing camel footprint in design concept and the use of sand dunes, **3. Environmentally** – the architectural treatments that concern arid zones starting from the DOMOIC form passing by natural ventilation options which promote sustainability and enhance building efficiency. In addition to parametric design that embraces all these elements together to attain iconicity and make the mosque amenable.



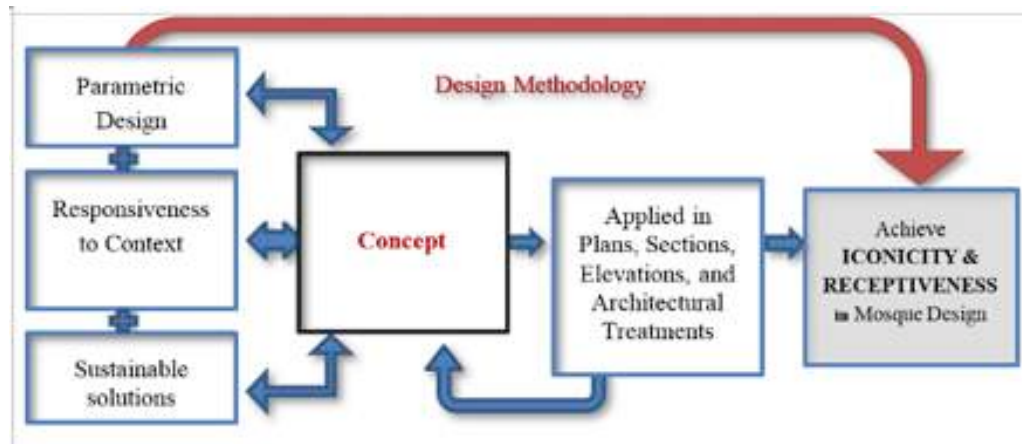


FIGURE 14
Design methodology process.

CONCLUSION

This paper divulges competence of parametric design in an example mosque, which has been designed as a competition proposal. The design process of the mosque has been parametrically tackled to match the contemporary architecture, and concurrently, tried to endure the conventional design of the mosques character. Receptiveness can be attained if we consider cultural heritage, social aspects, sustainable solutions, in addition to parametric design. Figure 15 wrap up the method of the design process as a whole and clarifies the correlations happened to attain the most appropriate design for mosques that exemplify iconicity. The proposed design methodology elucidates those points, add new vision to mosque design in arid zones and how it can ruminate the culture, be responsive to context, and indorse iconicity.

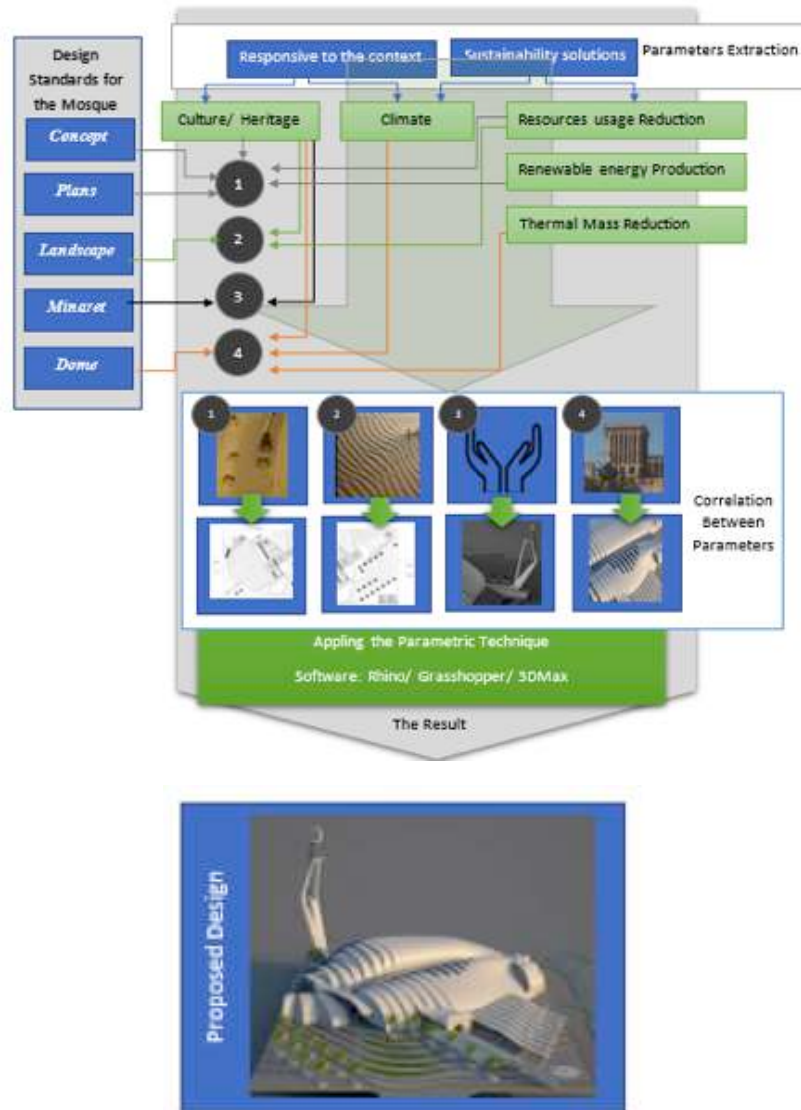


FIGURE 15
Method of the design process.

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ARCHITECTURE GALLERIES IN MUSEUMS: THE FUTURE

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CURATING A GALLERY OF ISLAMIC ARCHITECTURE: AN INTRODUCTION

UNLIKE most of the museums that are dedicated to the arts of Islam, the Islamic Arts Museum Malaysia (IAMM), Kuala Lumpur (“the museum”) has set itself apart in dedicating an entire gallery to the subject of architecture. While it is acknowledged that architectural design is vital in understanding the history of art – in this case, Islamic art – its scope has for long been neglected in the collection and display of purpose-built museums and galleries around the world.

To divert attention away from this problem, museums tend to use existing historical architectural edifices or commission world renowned architects to build new museums that reflect architectural elements important in the various Islamic bygone dynasties. Not a few of the major museums, have been established and built during premodern times, moved to adopt modern architectural elements as part of their refurbishment exercise. This is most obvious in the case of the Parisian Institution, Musée du Louvre, whose main entrance is now marked by a modern addition of glass and metal pyramids (built in 1989), designed by the Chinese-American architect, I.M. Pei (1917–2019). I.M. Pei also designed the Museum of Islamic Art in Doha, Qatar (completed in 2008), the inspiration for which he had derived from the traditional forms of architecture of the Gulf. Other art-cultural institutions have also sought to implement modern construction techniques to integrate traditional Islamic architectural elements as part of their overall design scheme. Such is evident in another cultural institution based in Paris, the Institut du Monde Arabe (Arab World Institute, built from 1981–1987), of which facade of its main





building incorporates the aesthetics of a traditional screen element, *mashrabiya*, yet reworked through mechanical means. As designed by the French architect, Jean Nouvel (b. 1945), the otherwise static apertures of the *mashrabiya* are imbedded with a photosensitive technology that responds and controls the amount of sunlight that penetrates into the building.

In curating architecture-themed galleries, the use of scale models of mosques and other types of architectural designs has been a common method, applied by a considerable number of art and cultural institution in Malaysia and around the world. Some key examples are the Kuala Lumpur City Gallery, which displays a model of the historical Sultan Abdul Samad Jamek Mosque (built in 1909) as part of its exhibit. Models also form an important component of travelling exhibitions, as in the case of the model of the *sebil* (fountain) of Sultan Ahmet III (1729) in Istanbul, Turkey, showcased as part of the 2019 exhibition, “The Treasures and the Tradition of *Lâle* in the Ottoman Empire”, at the National Art Center (Kokuritsu-Shin-Bijutsukan), Tokyo. Many other mosque models appeared as part of “little cities” displayed in parks for recreational purposes. A case in point is the “monument park” of the Taman Tamadun Islam (Islamic Civilisation Park) in Kuala Terengganu. Architectural models significantly help viewers to stimulate their understanding of space as applied in Islamic architectural designs.

The Islamic Arts Museum Malaysia’s Architecture Gallery (“the gallery”), which pivots the scope of this paper, is an educational tool for the specialised and general public alike, and is integral in understanding the histories, arts, and cultures of the Islamic world. This paper will therefore attempt to illustrate the importance of the Architecture Gallery mainly through the curation of different scale models of a diverse range of Islamic architectural edifices from around the world. There are two main objectives. Firstly, the curation is to stress the wide variety of plans and designs used and built in many Islamic cultures that are not limited to a certain uniformed style or form. Secondly, the gallery is also to present viewers with an architectural and spatial history that cuts across Islamic cultures, which have been diverse and multiple, so that an understanding and eagerness among the audience to welcome and accept new forms in designing future mosques can be attained.

Architectural artifacts displayed at architecture-themed galleries are not stand-alone objects, for they had once lined and formed part of the





architectural edifices and complexes built in the Islamic world. Tiles and columns, as well as stucco panels and marble revetments, are but an example of what is meant by “architectural artifacts”. Key spatial components of a mosque, such as the *mimbar* (pulpit) and *mihrab* (niche) are also exhibited and introduced as part of the architectural curation. Above all, scale models of buildings and information panels complete the curatorial experience, lending a broader yet closer view of the robust and diverse design vocabulary of Islamic architecture. Some museums have also taken a step further in utilising an advanced use of technology and media to bring an interactive glimpse of Islamic architecture as part of the museum space¹.

Architectural curation at museums and galleries in themselves can offer yet another interesting angle in “seeing” and experiencing Islamic architecture. The showcase that is the architecture gallery is a curation and display of architectural elements, be they models or artifacts, paired with texts in the form of captions and information panels. Through this multisensory experience (appreciating artifacts and reading), visitors are given a simple yet compact introductory experience of Islamic architecture.

THE ISLAMIC ARTS MUSEUM MALAYSIA ARCHITECTURE GALLERY: A BACKGROUND

Methods of Curating the Architecture Gallery

The galleries of the Islamic Arts Museum Malaysia are spacious and minimally adorned with clean lines and subtle detailing. Unlike most museums, which are made up of groups of rooms or corridors, the galleries of the IAMM are all connected as one vast space, with areas that flow throughout the museum’s different wings and levels. This elimination of precise divisions lends an uninterrupted movement from one area to the next, which reflects the Islamic spirit of continuity, a fundamental feature of Islamic art and architecture. Square-based, white pillars punctuate a subtle relief from what would otherwise be a monotonous stretch of space. The pillars also support the museum’s five tiled domes, whose intricate tilework, carving, and stuccowork were completed in 1998 with the touch of Uzbek and Iranian craftsmen.

¹ The use of QR codes and applications gives a chance to project a sense of architecture on museum walls and on personal applications. Among the known museums are the MIA in Cairo.

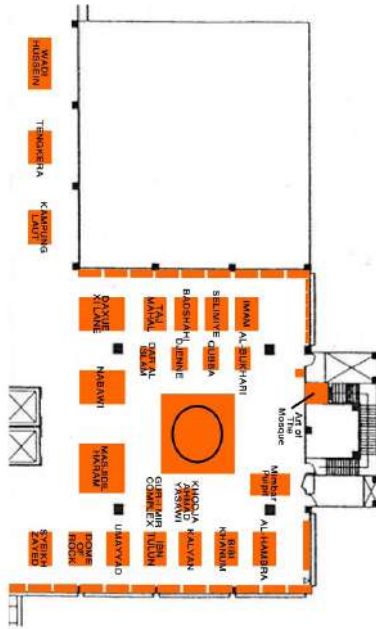




FIGURE 1(a)



The Architecture Gallery at the IAMM is first in the order of the museum's permanent galleries. It occupies a space of approximately 400 square feet, making it the museum's largest permanent gallery. The Architecture Gallery is enclosed on three sides, lending a "shaded" feel in some areas. This is contrasted to its "fourth wall", which is marked by a half plexiglas railing that offers the visitors a first floor view of the voluminous inverted dome area, awash in light. Beyond this the fan-dome of the National Mosque of Malaysia, completed in 1964, IAMM's immediate neighbour and a hallmark of tropical modernist architecture, can clearly be spotted. This uplifting spatial relationship enriches and deepens the visitor's experience of the Architecture Gallery at the IAMM, if not the dynamic aspect of Islamic architecture itself.



The plan of the Architecture Gallery at IAMM, aligned northwards, showing the positions and relationship of the architectural scale models. The elevators are shown towards the bottom-right part of the plan.

The Architecture Gallery report, prepared periodically by the curator of the gallery, records a display of 50 artifacts at the time of writing, placed in free standing cases as well as wall cases, with a few being on open display. The gallery showcases 23 architectural scale models — its central attraction. Complementing these is an alcove dedicated to a subtheme, the “art of the mosque”, featuring a 1:1 replica of the intricate stucco *mihrab* of Isfahan’s *Masjid-i Jāmi‘* (“Friday Mosque”, IAMM 1998.2.351), built in 1310 under the Il-Khan ruler, Öljeitü (r. 1306–1316). This *mihrab* replica is even oriented towards the *qiblah* [“direction” (of the Ka‘bah in Mecca)], lending justice to its function in as much as its aesthetics. Several artifacts are displayed around it: a glass Mamluk mosque lamp, a wooden *rehal* (Quran rest), a carpet, a wooden *mashrabiya* (screen) panel, and an inlaid brass Quran casket. On the wall panels adjacent to this alcove, meanwhile, different types of material that embellished Islamic architecture are introduced, such as ceramics, stone, glass, marble, ivory, and metal, through a display of architectural components, such as locks, wall panels, and columns.



FIGURE 3(a)

A view of the models and information panels on the western wall of the gallery (wall on the left hand side as one exits the elevators).



FIGURE 3(b)

The art of the mosque section, with some of the artifacts displayed adjacent to it at left hand side.

Curating Islamic Architecture through Scale Architectural Models

The curation of architectural scale models at the Architecture Gallery encompasses a wide range of Islamic architectural styles and typologies. The majority of which are mosques, followed by complexes of madrassa (schools), mausoleums or shrines, and palaces. The models represent examples of Islamic architecture from what is traditionally viewed as the Islamic world and beyond. Prominent among these models are those of the two important sites of Islam, which are the Sacred Mosque (*al-Masjid al-Haram*) in Mecca, which is the site of the Ka'bah, the *qiblah* of all Muslims, and the Mosque of the Prophet (*al-Masjid al-Nabawi*) in Medina. Both models, done at a scale of 1:175 and 1:200 respectively, represent the extent of the 1998 renovations of the two sites by the modern day Saudi Arabian government. Due to the strong historical linkage that these two

models represent, both are reasonably placed next to each other, greeting the visitors as they exit the elevators into the architecture gallery.

The procession of other scale models and their accompanying information panels then begins with a brief explanation on the mosque prototype and components. This section is marked by a 1:20 model of the recently-built Sheikh Zayed Mosque in Abu Dhabi, United Arab Emirates, of which design strives to incorporate Islamic architectural elements at a bigger scale. This is followed by a model of the Dome of the Rock, initially built in 691–692 by the fifth Umayyad Caliph, ‘Abd al-Malik ibn Marwan (r. 685–705), as part of the Noble Sanctuary (*al-Haram al-Sharif*) and al-Aqsa Mosque (“the Farthest Mosque”) complex in Jerusalem. The history of mosques and structures built under the rule of the early Umayyad and ‘Abbasid dynasties follow, told through the model of the Umayyad Mosque in Damascus (first built in 715) and the Ibn Tulun Mosque in Cairo (completed ca. 879).

Four consecutive models then speak of the Islamic architecture of the Turco-Persian cultures of the *Ma Wara’ al-Nahr* area (“what lies beyond the river”, or Transoxiana), often referred today as “Central Asia”. These are the Gur-i Mir tomb complex in Samarkand (completed in 1414); the mausoleum of Khoja Ahmad Yasawi, Turkistan (commissioned in 1389); the Po-i Kalyan Mosque Complex in Bukhara (from twelfth to sixteenth century); and the Bibi Khanum Mosque, Samarkand (built 1399–1405). A narration of the seven hundred year-long Islamic presence in Spain follows, and is represented by a model of the Court of the Lions, the heart of the Nasrid palace-fortress complex of Alhambra, built in the thirteenth century in Granada.



FIGURE 4

A 1:100 scale model of the Bibi Khanum Mosque Complex, Samarkand, commissioned by Timur (r. 1370–1405) and built from 1399 to 1405 (IAMM 1998.2.350). It prominently features turquoise-clad domes, minarets, courtyards, galleries, grand *iwans* (a portal element), the *pishtaq* (a decorated portal surface), and the cruciform plan, all essential elements of Islamic Persian architecture.



On the gallery's left wall, Islamic urbanism is given a brief introduction through the model of Isfahan's famed urban complex, the *maidan* (square) of *Naqsh-e Jahan* ("Half of the World") with the attached Imam Mosque (formerly Shah Mosque), constructed in 1528–1629 under Safavid rule in Persia. The Persian architectural vocabulary can also be seen in the model of the tomb of the compiler of hadith, Imam al-Bukhari (d. 870), who passed away in Samarkand. The architectural breakthroughs of the Ottoman Empire, meanwhile, are shown through the model of the Selimiye Mosque of Edirne (completed in 1575), designed by the celebrated Ottoman master architect, Mimar Sinan (1488/90–1588). This is immediately followed by an introduction to the Great Mughals, whose rule in the Indian subcontinent had left many architectural feats, represented in the models of the Taj Mahal of Agra (built 1632–1653), and the Badshahi Mosque of Lahore (completed 1673). A model of the Great Mosque of Djenné (dates to 1207), with its distinct construction of adobe and mud, alludes to the Islamic architectural language of Sub-Saharan Africa. Placed adjacent to it is a model of the mosque and madrasa of Dar al-Islam in Abiquiú, New Mexico, the United States of America (built in 1981), which reflects a similar sustainable approach under the "architecture for the poor" thesis by its designer, the Egyptian architect Hassan Fathy (1900–1989). The gallery proceeds with addressing Islam's long presence in China, which is alluded through a model of the Daxue Xi Lane Mosque (*Dàxuéxi Xiàng Qīngzhēnsì*) in Xi'an, built in 705 under the Tang Dynasty of China (618–907). From here, the curation moves to a culmination of three successive scale models that represent the unique aspects of the Islamic architecture of the Malay world: The Kampung Laut Mosque in Kelantan (first built circa the fifteenth century); the Tranquerah Mosque in Melaka (built in 1728); and the Telok Manok Mosque (built circa 1768), also known as Wadi Hussein Mosque, located in what is today the southern Thailand province of Narathiwat, near Patani.

CURATING THE GALLERY SPACE

Architecture, more than simply "building", is a wholesome art of making things ever-flourishing. In line with the Islamic tradition, any structure or building is to be erected in harmony with the needs of the users and community vis-à-vis the environment. Utility is also to be integrated with a consideration for locally-sourced building materials, climate, habitats of other creatures, and other site-specific and natural concerns. A good example of such a responsible approach of Islamic architecture is the Great Mosque of Djénne, of which design remains not only sensitive, but tied to the cultural roots of Sub-Saharan Africa.





In Arabic, the term for someone who professes the practice and theory and architecture is *mi'mar*, which is derived from the aspect of 'a-m-r, or "(to make) prosperous". An architect is therefore "someone who makes things prosper", an emphasis that bears an evident mark in the expressions of Islamic architecture. With this, Islamic architectural forms, while responding to the diversity and multiplicity of human cultures, are also ones that cradle the universality of Islamic principles. This explains the teeming diversity of Islamic designs across the world, unified (but not uniformed) with the core Islamic message. The Muslim act of building, correspondingly, does not end at the outer physicality alone. The basis of building the mosque, as prescribed in the Qur'an, is indeed a constructive act that emanates only from man's inner fountain of *taqwa* ("piety", "God-wariness", "good conduct", or "reverence"). The Prophet Muhammad (PBUH), during the event of the hijra, had first sought to build a mosque at Quba on the outskirts of Medina, before establishing the Mosque of the Prophet in the city itself. God refers to this act of *taqwa* in the Quran:

"[...] Truly a mosque founded upon reverence [*taqwa*] from the first day is worthier of thy standing therein [...]"

[*Surat at-Taubah* (9):108]

Such a spiritual compass is to be integrated in the Muslim artisan's imagination and creativity. What is otherwise perceived as a separation between crafts and architecture was never the case in traditional Islamic cultures, where the roles played by artisans in an architectural project were as integral during planning as much as it would during embellishing, as Necipoğlu points out. Not rarely that the descendants of the same artisans would continue the maintenance and repair of a building, as what can be seen with the marble and *pietra dura* specialists of the Taj Mahal. Unsurprisingly, a good number of the artifacts at the IAMM, curated at the Architecture Gallery and beyond, were in fact used to line and embellish the floors and walls of buildings, forming part of their interior furnishing. This includes elements of tensile architecture, such as tents, draping, and fabric panels, though these are not entirely the focus of this paper. With this in mind, the curation of IAMM's Architecture Gallery humbly serves as a threshold in grasping the breadth and depth of Islamic architecture as an aspect of Islamic art, contextualised in museums and galleries.





FIGURE 5

A 17th century Ottoman underglaze ceramic tile depicts a representation of the Ka'bah and the Sacred Mosque, with its seven minarets, kiosks, and other furnishings built and placed as part of the circumambulation area (*mataf*) at the time.

(IAMM 2012.26.37)

Museum Direction in Confronting Perceived Limitations and Taboos in Islamic Art and Architecture

“Must a mosque have a dome?” is a recurrent question posed by visitors at the Islamic Arts Museum Malaysia.

Despite the core principles that unify the practice of Islamic art and architecture, “false” or construed views on artistic restrictions and prohibitions continue to surface in many streams of Islamic cultures. These likely stem from misplaced views towards particular legal rulings, or the simple yet detrimental misinformation that stems in cultural norms. Such conditions might limit, sometimes severely, the artist and architect’s creativity and application towards Islamic architectural design, especially in the case of mosques. It is therefore argued that the curation, display, and guided tours of the diversity of Islamic architecture at the IAMM can help to furbish the way for a more equitable and enlightened approach towards Islamic architecture in the future.

It is crucial for 21st century museums to maneuver their mission statement towards engaging more closely with their audience and target groups. Therefore, part of the Architecture Gallery’s scheme is to ensure that the visitor’s experience in approaching and appreciating Islamic art and architecture remains multidimensional and multidirectional. As the visitor traverses the subject of Islamic architecture through the models,



artifacts, and info panels, a diverse range of ground plans and styles are being presented, adding depth to the simulation of scale, proportion, and materiality to the visitor. In doing so, the Architecture Gallery aims at capturing the idea that the forms of Islamic architecture are not just diverse but they continue to develop and change. Importantly, the diverse factors that had contributed to a good design, as those on display, had also been honoured by architectural patrons – be they monarchs, the wealthy, governments, and communities alike – across the Islamic world.

Among the taboos addressed in this gallery are the dismantling, refurbishing, and reconstruction of structures of Islamic holy sites. Indeed, the need to enlarge, renovate, and restore is inevitable in architectural complexes all over the world. Restrictions, however, arise where a building's sacred or holy status comes to be recurrently questioned. It is therefore important to first acknowledge the uncompromising status of Islamic holy sites everywhere, while, at the same time, understand that their corresponding physical structures are built to deliver their outer, functional message in as much as fulfilling their inner, spiritual meaning. A physical structure or form of a holy site, therefore, needs to be seen with respect to a particular time period that it was built in, and the restoration of such a structure is to be addressed in a scientific manner and heavily documented. The two models of the sites at Mecca and Medina at the gallery encapsulate this issue as they “capture” the structures in 1998 when they were commissioned. Both sites, especially the Sacred Mosque, undergo a constant flux of expansion and renovation up to the time of writing, and so the models at the Islamic Arts Museum Malaysia aims to “freeze”, in a way, the otherwise temporal structures of both holy sites in time and space.



FIGURE 6(a)

The model of 1998 extent of the Sacred Mosque in Mecca.



FIGURE 6(b)

The model of 1998 extent of the Mosque of the Prophet in Medina, placed opposite to the model of the Sacred Mosque.

Following the argument posed by Woollard², the focus of the educators at the museum must be clear and unified towards its purpose. The same message, accordingly, must be delivered by the museum to its audience properly and clearly. At the IAMM, an aim is to broaden the imagination of the visitor with the diverse types of materials that had been used and employed in Islamic art and architecture. To see the relationship between the environment and the design language of these mosques, and later when visiting other permanent galleries, is to also see the connections offered by material objects as used in architecture and building. The Great Mosque of Djenné³, for example, heavily utilised mud revetment, a widely available material in the area. The material also sparked rich cultural activities, as the mud cladding of the mosque gets to be renewed yearly in a special celebration – a cherished tradition that has been going on for centuries. In Ottoman Turkey, underglaze tiles painted in floral and geometric designs were preferred, which triggered the lifeline of many ateliers, producing tiles in large numbers that particularly lined the walls of Mimar Sinan's grand edifices. Among the Muslim communities of the Malay Archipelago, skills of treating, carving, and assembling wood – a lighter yet sturdy material – had been preferred and employed to construct mosques in villages and ports that dot the maritime area.

² Woollard (2006), pp.214.

³ <https://archnet.org/sites/6395>.



**FIGURE 7**

A 1:100 scale model of the Great Mosque of Djenné, Mali.

(IAMM 2014.9.1)

Curating Architectural Galleries for a Specialised Audience

The curation of the gallery for a specialised audience, meanwhile, is not limited to the chronological arrangement of the models nor is it felt through the selection of the models themselves. But this strongly lies in the historical content of the information panels that corresponds with each mosque model, narrating the architectural history tied to key dynasties of the Islamic world. The authorship and presentation of these selected texts on Islamic architectural history are vital to young and emerging architects as well as architecture historians. The gallery walls in this manner provide a glimpse of the development of architecture, none other to furnish the newer generation with the legacy of the past, to ignite their interest in continuing this legacy, and indeed, in building a new one. In the context of an Islamic art museum, this is especially important to balance out the conventional architectural education received by most architects through their architectural departments today – most of which remain highly reliant on the western school of thought, which either totally leaves Islamic architecture and its concepts and elements behind, or rarely addresses the topic in depth.

More nuanced aspects of Islamic architecture can be appreciated at IAMM's Architecture Gallery. Specific solutions at organising space, such as the “bent” positioning of the *Masjid-i Imam* or Imam Mosque (formerly





Masjid-i Shah) in Isfahan, is a good example. Certainly the prayer chamber of the mosque, like all mosques, had to be built to face the Ka'bah in Mecca. But this case, it had to be done without having to compromise the mosque's prominent position at the southern part of the grand and elongated Naqsh-i Jahan *Maidan* (Square). In having the mosque entrance "twisted" to a particular angle, the architects were able to address the *qiblah* requirement while still maintaining the mosque's visibility, particularly its bulbous turquoise-clad dome, when viewed from any spot within the square. Similar cases of *qiblah* realignments can also be traced in other examples, such as the Fatimid-era al-Aqmar Mosque in Cairo, but as for the case in Isfahan, the success of its solution is significant in it being implemented to a much larger space and structure. Through the 1:125 scale model of the Imam Mosque at the gallery, the visitor's bird-eye focus can be directed to the appreciate the mosque's distinct plan, with its bent entryway leading into the prayer chamber, as well as its relationship with its bigger context, which is the *maidan*.



FIGURE 8

A 1:250 scale model of the Imam Mosque at the Naqsh-i Jahan Square, Isfahan, featuring its prominent bent entryway. A smaller representation of the Naqsh-i Jahan Square vis-à-vis the mosque is also available towards top-left corner of the model platform.

(IAMM 2000.3.1)

"[...] "If you long for Paradise, oh, Sufi, you find Heaven in Hagia Sophia.
[...] What a dome, that vies in rank with the nine spheres of heaven! In this work, a perfect master displayed the whole of architectural science."

[Tursun Beg (1499), historian and secretary of the Ottoman divan, quoting Sultan Mehmed II (d. 1481) upon seeing Hagia Sophia]



The tie that binds arts and crafts and feats in the science of physics is also highlighted. Ottoman imperial mosques, with their magnificent domes, are in themselves achievements in architectural engineering. Many of which were designed by the celebrated imperial architect Mimar Sinan (d. 1588). Through the 1:50 model of the Selimiye Mosque, built between 1568 and 1575 in Edirne, visitors are able to see how technological breakthroughs in engineering are married to aesthetics in Islamic architecture. It had been Mimar Sinan's vision to build a dome that is as high and grand as the splendid dome of Hagia Sophia, the great Byzantine cathedral in Istanbul (then Constantinople), of which construction began around 532. In Selimiye Mosque, Sinan manifested his masterpiece. The weight of the mosque's tall and massive central dome is dispersed onto the smaller half and quarter-domes below it, lending a unified look of the mosque from outside. Within, eight large "elephant pillars" were erected to support the main dome, at the same time giving an "elevated" effect to the main prayer chamber. Fenestrations were added to lighten the otherwise heavy mass of the walls and domes; this also illuminates the main prayer chamber with the subtle control of light from above. According to Necipoğlu, the outer minarets are then arranged and constructed to "shoot" towards the sky; their "thrusting" effect brings balance to the visual verticality of the mosque.



FIGURE 9

The 1:50 model of the Selimiye Mosque, Edirne, helps to allude to the viewer. Its design attributes of weight, volume, and verticality, as aspired by Sinan.



According to Serageldin, the varied array of models and information on the history of Muslim architecture can lend the “space for freedom” to innovate and contribute towards the growth of a more sustainable approach towards Islamic architecture in the 21st century. The intention, Serageldin adds, is:

“[...] to create an intellectual space where imagination can soar and the pursuit of relevance and architectural excellence can proceed in myriad ways, transcending a single architectural style or school of thought. Within this space for freedom, scholars, intellectuals, practising architects and critics have committed themselves to a far-ranging quest for insight into the future built environment of Muslims.⁴”

Harnessing the Acceptance of the “New”

Having presented with the various components of Islamic design and material culture at the architecture gallery at its fullest, the audience are hoped to be ready to accept “newer” forms of Islamic art and architecture with less reservation. The role of museums today, as argued by Vicars-Haris, has also extended beyond engaging visitors and audience in its development to also focus on attracting them with issues and topics that will touch their lives. It is understood that most of our target audience are attracted to the visual models first before reading the labels and information panels. Having peace in mind, the visual aspect of delivering the message remains immense.

What Are the Other Islamic Art Museums and Galleries Missing?

The amount of information on Islamic architecture that is curated at IAMM’s architecture gallery shows the importance and seriousness of the task; an aspect not to be missed by IAMM’s curatorial practice in presenting Islamic art. Indeed, this had been an aspect that has gone missing from the collection of other museums, though until recently, this seems to have changed. Such can be seen in the case of the Metropolitan Museum of Art, for example, whose collection of Islamic art has been recently organised as the Galleries for the Art of the Arab Lands, Turkey, Iran, Central Asia, and Later South Asia. The American art museum’s commissioning of a newly-constructed arcade and courtyard, inaugurated as the Patty Cadby Birch Court, integrating thirteenth-century Nasrid columns with contemporary craftsmanship⁵, points to the importance of curating Islamic architectural

⁴ <https://archnet.org/sites/103/publications/13108>.

⁵ <https://www.metmuseum.org/art/collection/search/454636>.





elements as part of the curation of Islamic art in museums. Such a move is also echoed in the British Museum, whose new Albukhary Foundation Gallery of the Islamic World, inaugurated in 2018, innovatively integrates wooden screens (*roshan*, or *Mangour* screens) as designed by the Meccan-born artist and designer Ahmad Angawi (b. 1981) to reflect what had been produced in the traditional houses of Jeddah, western Saudi Arabia⁶. Five of these screens are then placed and highlighted in the Albukhary Gallery among the display of the minor arts that are associated with architecture of the Islamic world, such as stone panels, tiles, and doors⁷.

A Fuller Experience of an “Islamic Space”: The IAMM Damascus Room

In any case, the journey of “seeing” Islamic architecture at IAMM’s Architecture Gallery, besides the experience of scale models and artifacts, gets taken into another dimension. A fuller spatial “feel” or simulation is introduced through the curation of a whole historical room itself, reassembled in-situ as part of the gallery within an allotted space. The Damascus Room, which dates to 1820–1821 (officially named the “Standard Chartered Ottoman Room”, IAMM 1998.2.342), invaluable helps to stretch IAMM’s curation of Islamic architecture and space beyond the material.

The IAMM Damascus Room was originally built as part of nobleman’s house in Damascus, Syria. Syria itself was an important province under the long Ottoman rule (1516–1918) in Bilad al-Sham, a larger cultural region that encompasses the modern-day countries of Syria, Jordan, and Palestine. The room is otherwise known in Arabic as *qā’a* – literally, a “reception room” or a “hall” – that constitutes an important part of the house called *salamlik*, the space that is more public and accessible for outsiders and visitors. It thus stands at the exact opposite of the *haramlik*, the inner space reserved for private uses and close family members, particularly the women and children. Both terms find its origins in the Turkish language, while the term *salamlik* itself is translatable as “a place of greeting”, underpinning its spatial function in receiving, greeting, and entertaining guests. The full splendour of the room gleams particularly during social gatherings and special occasions that plot the Islamic calendar, like weddings, *mawlid* (the birthday of the Prophet or other important Islamic figures), and *eid*.

⁶ <http://www.factum-arte.com/pag/1287/Mangour-Screens-at-the-British-Museum>.

⁷ <https://islamicworld.britishmuseum.org/making-the-gallery/>





A fuller sense of how the Damascus Room was used in its original setting could be gauged in a first-hand experience of the room itself at the gallery. Beyond its physical attributes, which remain obvious, viewers are able to feel a degree of the room's original atmosphere and ambience. The spatial hierarchy of the Damascus Room can also be understood vis-à-vis the typology and floor plan of the Syrian traditional house, which is displayed next to the entrance of the room. In doing so, viewers can then familiarise themselves with ideas that surround the demarcation between the public and the private spaces in the Islamic cultures.



FIGURE 10(a)

The Islamic Arts Museum Malaysia Damascus Room.

(IAMM 1998.2.342)



FIGURE 10(b)

'Ajami decorations of the Damascus Room ceiling.

(IAMM 1998.2.342)





The viewer can also closely engage with the intricacy of the *‘ajamī* (“foreign”) craftsmanship in decorating the wooden panels of the room’s walls and ceiling. Known otherwise as *raqsh al-dimashqi* (“the style of Damascus”), the technique lends a relief or bevelled effect which is then painted over in brilliant colour pigments. The painting strokes, curves, and gilding of the decorations are also indicative of the flow of artistic styles in the territories of Ottoman Empire, which were largely influenced in the late nineteenth century by the waves of the Rococo style that hailed from France and Central Europe. This may partly explain the connotation of the term *‘ajamī*, which means “foreign”, to describe the technique. Moreover, the eyes of the viewer can also appreciate the craftsmanship of the *mushaqqaf* (mosaic) technique of the marble flooring, alongside the ubiquitous *ablaq* particolored stripes of stone, all of which in Bilad al-Sham remain as the preferred techniques of masonry.

Other displays of the Damascus Room can be seen in the collection of other major museums of the world, though with limited access. The Metropolitan Museum of Art in New York displays its Damascus Room, dated to 1707, as part of its Islamic art collection, which is displayed as the Galleries of the Art of the Arab Lands, Turkey, Iran, Central Asia, and Later South Asia⁸. Besides Kuala Lumpur, another Damascus Room that came to be reassembled and displayed in the Asia-Pacific region can be found in the Doris Duke’s Shangri La, part of the Honolulu Museum of Art in Hawaii⁹. Another notable Damascus Room is housed at the Museum für Völkerkunde Dresden, Germany, and is dated to 1810–11¹⁰.

CONCLUSION

The importance of analysing and understanding the scope of having and curating Islamic architecture galleries as part of Islamic art museums cannot be stressed any further. The following deductions are thus reached:

1. the curation at the architecture gallery, to the architect, provides a historical background of Islamic forms and decorative material;
2. it presents outstanding examples of architecture models that, upon analysing, are an invaluable architectural innovation and ingenious contribution to the development of architecture at large;

8 <https://www.wsj.com/articles/SB10001424053111904900904576554540499528386>.

9 <https://www.shangrilahawaii.org/islamic-art-collection/collection-highlights/late-ottoman-syrian-interiors-and-furnishings/Damascus-Room/>

10 <https://voelkerkunde-dresden.skd.museum/en/exhibitions/damaskuszimmer/>





3. it combats limitations and restrictions in designing future mosques and religious edifices;
4. it supplements visual models with texts to widen the scope of architectural knowledge;
5. it brings different types of Islamic architectural forms in one space to the visitor in an appealing manner;
6. it prepares the audience and the target groups to see the diversity and accept the diversity of Islamic cultures; and
7. it challenges the audience by showing the simplest to the most complex of monumentality in an equitable manner – representing the multiple tastes and preferences in architecture by societies of Islamic cultures.

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MOSQUE AS “HOUSE OF GOD” AND AS “HOUSE OF COMMUNITY”: AN INQUIRY INTO ADAPTIVE REUSE OF AN ABANDONED MOSQUE IN PAKISTAN

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INTRODUCTION

A MOSQUE is the building where Muslims go to worship Allah as mentioned in Quran, “*The mosques of Allah shall be visited and maintained by such as who believe in Allah and the Last Day, who establish regular prayers and pay the zakat and fear none but Allah. It is they who are on the true guidance*” [Surah at-Tawbah (9):18]. It is considered as “*Buyutullah*” meaning “House of God”, which is true as it is mentioned in Quran as “*In houses (mosques) which Allah has ordered to be raised, in them, His name is remembered. Therein glorify Allah in the mornings and in the afternoons or the evenings*” [Surah an-Nur (24):36]. The word *mosque* means “a place of worship for Muslims” (*Oxford Dictionary*), which is not entirely true as Jairazbhoy (2003) explains how the word “mosque” entered the English dictionary from the French *mosque’e* which is probably derived from the Italian *moschea*, which, in its turn is a variant from the Spanish *mezquita*. This was borrowed from the Arabic *masjid* meaning “place of worship or prostration in prayer”. The word *masjid* also originated from the Aramaic *masgedha* meaning “sajd” or “to prostrate”. *Masjid* is generally referred to, as any place of worship for any religion (*Encyclopedia of Islam, First Edition* (1913–1936) – Brill,” n.d.; Rasdi, 2014). And according to Abu Urwah (1869) in *Risalah Usrah*, the word *worship* is a loose translation of *ibadah*. As Maudoodi and Ahmad (1994) explains, *ibadah* does not mean just offering prayer five times a day in mosque, but also any other acts which bring goodness to mankind and pleases Allah. In the early days of Islam, the statement was true in every aspect of its meaning, when Prophet Muhammad (PBUH) migrated to Medina and ordered to construct a mosque.





The main purpose of the mosque was worship and prayer, but it was equally used as a place to congregate and perform different social, cultural, educational, political, and administrative services (Farahati, 2011; Movahed, n.d.). Thus, the Prophet Muhammad (PBUH) not only intended the mosque as “House of God” but also as “House of Community”. That’s why the Prophets’ mosque become the most important building and institute for rapid development in Medina in early days of Islam (Baharudin and Ismail, 2014; Hamid, 2012; Omer, 2014).

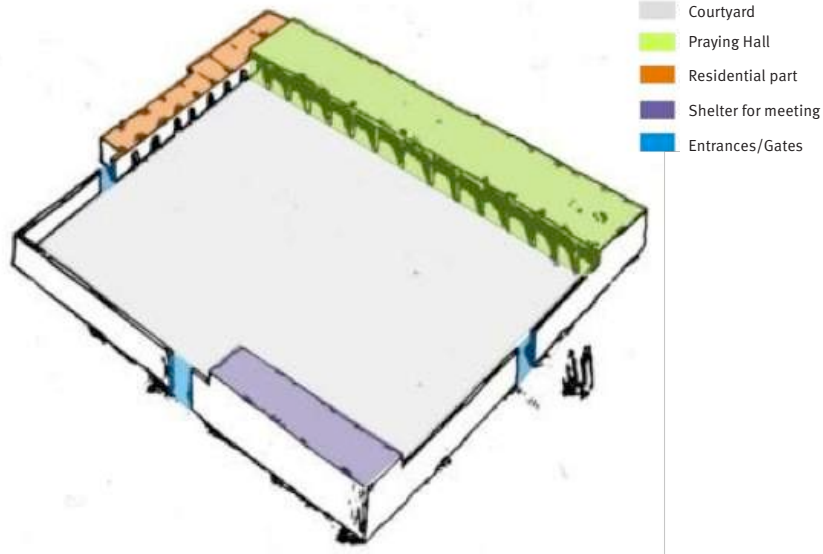
METHODOLOGY

Mastering the history of Islam and the history of the different functions of the mosque can be helpful for legitimate inspiration in finding a new program for an abandoned mosque in Pakistan. The site will be analyzed in its historical context as well as present condition. All the available data will be assessed. For meso and micro-level analysis, research questions will be asked to the local community of the selected site, to investigate about the mosque original usage, present use, why it is left abandoned and what is required by the local community for its rejuvenation. And finally, all findings will be put together for proposing a design strategy for introducing a new function in an abandoned mosque and reviving life in it.

STUDY OF PROPHET’S MOSQUE

When the Prophet Muhammad (PBUH) migrated to Medina in 622AD, he chose Abu Ayyub Ansari’s house. It was the place where the Prophet (PBUH) erected a building for offering daily prayers, which came to be known as Prophet’s (PBUH) mosque in history. Houses for the Prophet’s wives were also built attached to it (Rasdi, 2014). From the image (Figure 1) it can be seen that this small mosque complex was constructed as a big rectangular block, which consisted of a row of houses on one side, along with one side was a rectangular area, roofed with leaves of the palm tree, which was supported by timber columns. The main use of this space was for offering ritual prayers. On the other side was another roofed area for the companions of Prophet. In between these three covered spaces was a big open courtyard, with the whole mosque courtyard fronting the apartments was fenced by adobe brickwork. The fence was penetrated by three entrances at the sides (Farahati, 2011; Rasdi, 2014).



**FIGURE 1**

Prophet's (PBUH) Mosque, Medina, 622AD.

(Image courtesy of Arq. Pfunes blog; edited by the Author)

This whole mosque compound was used for several different functions during the Prophet's lifetime. The first and main purpose of the space was worship but it was also used as the education center where Muslims learn the Quran and the teachings of the Prophet (PBUH) (Rasdi, 2014).

Abu Said al-Khudri said: "I sat with the company of the poor members of the Emigrants (Ahlul Suffa, or those who stayed in the Prophet's mosque). Some of them were sitting together because of the lack of clothing while a reader was reciting to us. All of a sudden, the Prophet of Allah (PBUH) came along and stood beside us. When the apostle of Allah stood, the reader stopped and gave him a salutation". The Prophet asked: "What were you doing?" We said: "Allah's apostle! We had a reader who was reciting to us and we were listening to the Book of Allah the Exalted". The Prophet of Allah then said: "Praise be to Allah who has put among my people those with whom I have ordered to keep myself" and then he sat among us so as to be like one of us.

(*Sunan Abu Dawood*, Book No. 26, Hadith No. 3658, n.d.)

Besides these functions, space was also used for different social and cultural activities, as a sheltered place, temporary medical center, and even





as a space for amusement and sports activity for Muslim's. Children and women were also present (Farahati, 2011; Tajuddin, Rasdi, and Utaberta, 2010).

Bibi Aisha narrated that, some Abyssinians came and gave a demonstration of armed fight on the *Eid* Day in the mosque. The Prophet (PBUH) invited me to see the fight.

(Khattab, Hadith No. 1943, pp. 421)

Narrated Anas: "Some goods came to Allah's apostle from Bahrain. The Prophet (PBUH) ordered the people to spread them in the mosque, it was the biggest amount of goods that the Prophet had received. He left for prayers and did not even look at it. After the prayer, he sat by those goods and gave from those to everybody he saw".

(Khan, Vol. 1, Hadith No. 412, pp. 246)

The Prophet (PBUH) had also used the mosque as his daily administrative and political center, where he deals with the daily life issues and matters concerning the community. So, following the tradition of the Prophet, as he used mosque for the political matters, the election of the first Four Pious Caliphs occurred in this same mosque (Farahati, 2011). The following are a few hadiths related to this function:

"Anas bin Malik narrated that; Umar's delivered his second speech when he sat on the pulpit on the day following the death of the Prophet (PBUH). Umar recited the *Tashah-hud*, while Abu Bakr was silent and ... Anas said, I heard Umar saying to Abu Bakr on that day, "Get on the pulpit", and kept urging him till Abu Bakr ascended the pulpit and the people swore their allegiance to him."

(Khan, Vol. 9, Hadith No. 326, pp. 248)

From the very beginning this newly grown Muslim welfare state of Medina, the mosque played an important role in the development of the society in an individual and communal level. It became a symbol of Islam and Muslim's true characteristics. The changing roles of the mosque can be a key study point for deriving an effective new use for a mosque in the present time. And from the functions described above through hadith, it can be easily concluded that the Prophet's mosque was a place of sociopolitical and cultural activities contributing to the development of the local community.



Rajgan Mosque: Location, History, and Present Condition

The mosque building selected as the case is in the Khanpur City, which is part of administrative subdivision of the Haripur District of Khyber Pakhtunkhwa province in Pakistan. Khanpur City lies on the boundary of two provinces of Pakistan, also considered as the entering point to the northern region of Pakistan (Provincial Disaster Management Authority, NWFP, n.d.) The mosque is located in old Khanpur area on the tip of Khanpur dam (Figure 2).

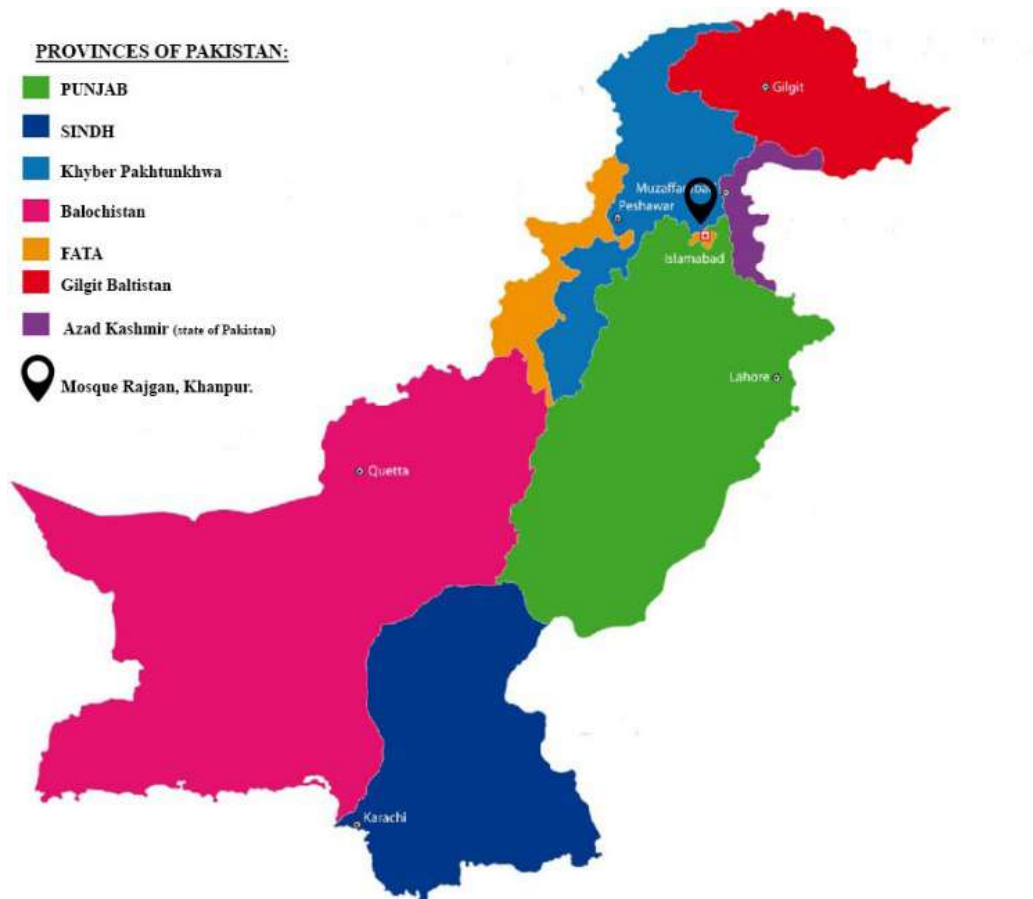


FIGURE 2

Map showing provinces and administrative areas of Pakistan, with location of Rajgan Mosque.

(Image courtesy of www.researchgate.net; edited by the First Author)



The mosque is not in use since 1970, when the residents of the old Khanpur village were moved to western part of the Khanpur Dam to construct the dam. Due to which people of the Khanpur moved to new Khanpur area and left the mosque behind to become the house for stray animals (Figure 3). Rajgan Mosque, famous for its name, has a history of 147 years; built-in 1872 by Sultan Jehandad Khan, the Assistant Commissioner of Punjab during the British rule. This partly explains why he was fond of Mughal architecture, which inspired him to invite masons from Delhi to design and construct the mosque in the village. Due to this relationship, the initial idea of the mosque design came from the Jamia Mosque Delhi, which was built by the Mughal emperor Shah Jehan in mid 17th century. That is the reason why three of the mosque arched entrances resembles those of Jamia Mosque Delhi, along with two large and two small minarets which also tries to depict the front elevation of Jamia Mosque Delhi (Newspaper, 2011; Tribune.com.pk, 2011) (Figure 4).



FIGURE 3

Map showing old and new Khanpur with location of Rajgan Mosque.

(Image courtesy of goole maps; edited by the First Author)



**FIGURE 4**

Showing inspirational relation between
Jamia Mosque Delhi (left) and Rajgan Mosque (right).

(Edited by the Author)

Bricks and black stone were mainly used as construction material, with main roof structure of the hall achieved by wooden logs. The same wood was also used for making the doors and cupboards, which is thought to be transported from Leepa Valley in the present day “Azad Kashmir”. According to some local people, boundary wall was made of chiseled black stone, but some people deny this fact and say the stone was from the old Taxila City, which creates a link between the Rajgan Mosque and Taxila. It is a mosque which was built to accommodate 1,000 people in its hall and courtyard for prayers (Moeen, 2017). Still standing 50 years alone without any caretaker or proper function with regular users, waiting to welcome a new function, to accept a new role for an old community.

Present Condition of the Mosque

Currently, the mosque is not in use, but it is still structurally in good condition. That is why the people who visit it pray inside the hall of the building and the local community also use the mosque twice a year on the occasions of Islamic events of *Idul-Fitr* and *Idul-Adzha* for offering the *eid* prayer. This gathering lasts not more than one and a half hour, which means the mosque building is properly used for just three hours in the year (Moeen, 2017). Below are the current images of the present condition of the mosque.





FIGURE 5

Rajgan Mosque, praying hall present condition images taken on February 11, 2018.

(Image courtesy of Atif Shakir)



FIGURE 6

Rajgan Mosque, exterior present condition images taken on February 11, 2018.

(Image courtesy of Atif Shakir)

Rajgan Mosque: Architectural Characteristics

To access the mosque courtyard there are twelve steps on the east side, while the north side entrance with only one step leads to mosque in lower level (Figure 7). As initial inspiration of the mosque is from Jamia Mosque Delhi, so it's been constructed with the resemblance to Eyvaan style mosque. So, looking to the plan of Rajgan Mosque one can easily see a rectangular shape hall which was the main praying space in the building





with an open to sky courtyard (Figure 8). A maximum of 200 worshipers can adjust in the hall at a time for prayer. The main hall space was not that much big with space of 222sqm, but the 7-meter-high roof of the main hall gives him a very calming space quality for praying. The main hall has an open to below space on the right side. This space was one level down from the main hall, with two openings from the north side, giving two addition entrances to building but without any link to the upper levels (Figure 9).



FIGURE 7

Rajgan Mosque, main entrance to mosque. Secondary entrance.

(Image courtesy of Atif Shakir)

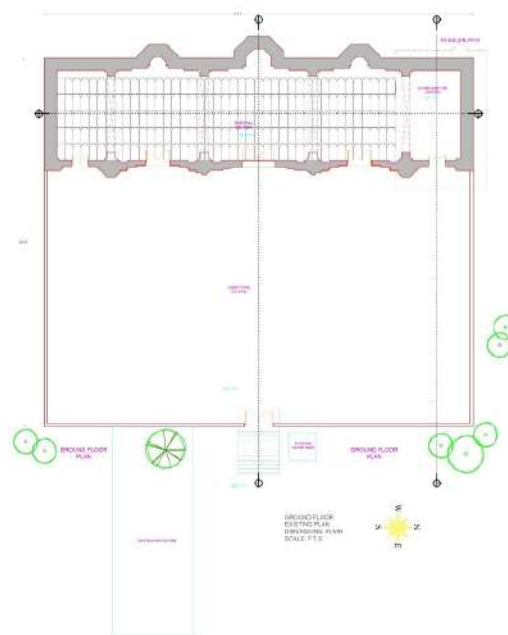


FIGURE 8

Rajgan Mosque existing ground floor plan.

(Image courtesy of the First Author)



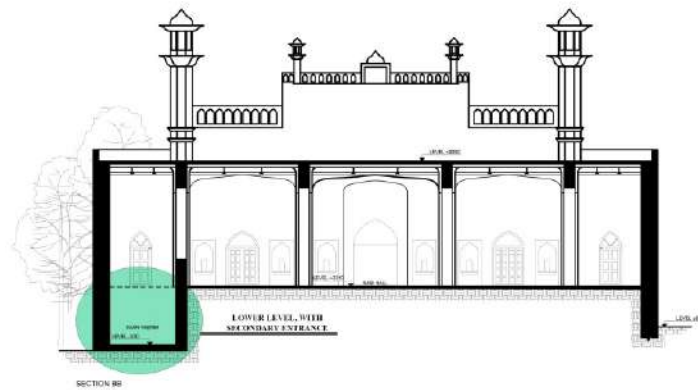


FIGURE 9

Existing section of building showing lower level of the building.

(Image courtesy of the First Author)

Seeing the present exterior pictures, one can see some trees just in front of mosque front (east) boundary wall, which by passing time have grown into the boundary wall making a natural picturesque impression of the mosque. The open to sky courtyard in front of the main hall is bounded by the walls on three sides with the main access to the building from the east side just in front of the main hall. The area around the site is slightly contour in which the mosque site rests on a high plate form (Figure 10).



FIGURE 10

Contour section of site, with Rajgan Mosque.

(Image courtesy of the First Author)

Rajgan Mosque: Site History and Macro Level Analysis

The mosque's rich history, sound physical condition, and idyllic location are attractive conditions for a new narrative. So, the research focused beyond the periphery of the Rajgan Mosque building, and a macro level analysis was done around the area of mosque building. For this, area about 40km in radius was selected to look for interesting historic





points of reference. In between this area, site survey or analysis was carried out to find a building or a site or landscape which have some architectural or historical background. This 40km was selected on a specified criterion which includes: direct access from mosque to point of interest, easily accessible road, have strong historical background, and having some architectural features. And the outcome of the survey was quite interesting: there are many historical gems lying around just few miles from the Rajgan Mosque. The most important and famous is the ancient city of Taxila, just at the boundary of two provinces and 19km away from the mosque. Which also reveal that the history of the site not only relates to 19th century when the old Khanpur community lived here but goes back to as far as 6th century BC, which have seen many historical events, rulers, conquers, religions, and development of many economic regions in the area during different time periods. Taxila has been a very famous site in Pakistan and around the world for international visitors for a very long time. These ruins are different sites, spread on different locations in Taxila, but functionally relates to each other. Modern day archaeological Taxila consists of 18 sites of important cultural values. Among the most significant are remains of four ancient settlement sites, from 6th century BC: Achaemenids settlement in Bhir Mound to the ancient Neolithic tumulus of Sarai Kala to the ramparts of Sirkap (2nd century BC) and the city of Sirsukh (1st century AD). Besides these settlements, there are many Buddhist monasteries with stupas, a Mesolithic cave, a Zoroastrian religion temple and a Muslim mosque with remains of a madrassa (school type). These sites reached their higher level from 2nd century BC to 5th century AD. Since 1980 Taxila have been included into “UNESCO World Heritage Site” along with its 18 archaeological sites to its list of preserved sites. (Allchin and Allchin, 1982; Bin Naveed, 2015; Somuncu and Khan, 2010).

Along with this, few kilometers north-west of Taxila are the “Wah Gardens” or also known as “Mughal Gardens” which dates to 16th century AD. These are the gardens which were built by the Mughal Emperor Akbar, as a replica of the world famous “Shalimar Gardens” in Lahore (Tr: beveridge, 1909) (Figure 11).





FIGURE 11

Historical site around Rajgan Mosque in radius of 40km.

(Image courtesy of Google map. Bin Naveed; edited by the First Author)

All these sites are under the administration of the Archaeology department of KPK, and Punjab province, which are doing best to provide the best facilities to the visiting tourist. But since 2007, the number of tourists are dropping (Somuncu and Khan, 2010). And Taxila has been marked as one of 12 sites of “UNESCO Heritage Site” at the edge of irretrievable damage due to insufficient management plan by administration, pressure of developing authorities and by the land mafia (Global Heritage Fund, 2010). All these factors have incorporated in creating an environment of less interest to visit these sites by the local and the international tourists, and by the passing of time the young generation is unaware of all these sites status, history and the role which they had played in shaping the present culture of the area. And it will not take longer that these sites of antiquities will start disappearing from the map (Somuncu and Khan, 2010).

Rajgan Mosque can act as a central platform for all these sites. Figure 13 shows how the site of the Rajgan Mosque is surrounded by the historical ruins of monasteries, stupas, and earlier settlements of the area. The mosque building has the potential to be converted into a new nucleus center for Taxila and its surrounding ruins and using the building of mosque for promoting these heritage sites in an appropriate, qualitative manner.



Design Strategy for New Functions

As an outcome of our analysis of mosque functions on conceptual and historical base and practical analysis of the Rajgan Mosque and its surrounding area, a design strategy is suggested to use the different spaces of the mosque for organizing different activities in the mosque like a reading space, area for display for communicating, information of historical or culture significance site around the mosque to a visitor, multi-functional gathering hall for educational, social, cultural, and religious events. The purpose of these functions will be to attract not only the tourists to the mosque but also the local community who are neglecting the mosque. In this way, the Rajgan Mosque building will provide opportunities to the local community for developing its social, cultural, and economic conditions.

According to these new functions, the mosque space is been divided into three types (Figure 12). The first type is the public spaces, which includes the open courtyard in front of the main mosque building. This space will be accessible for everyone so display areas for the awareness of cultural heritage of ancient Taxila and its adjoining sites will be adjusted in it. This area will be split further into two one semicovered entrance portico to the east side of the existing building, along with two wing verandas leading to the building on right and left side of it. All display areas will be open for public and these spaces will be arranged in the outer courtyard of the building along with the boundary of the site to have open space in between the old and new building, which will be converted into open to sky garden space following the concept of “Mughal gardens” of Wah. Toilets will also be adjusted in the new part along the boundary wall. The existing front facade of the Rajgan Mosque was inspired by the Jamia Mosque Delhi, so new proposed building in courtyard will be carter in a way to show some resembles and respect to existing facade and not to disturb or block the front view of the mosque (Figure 13).



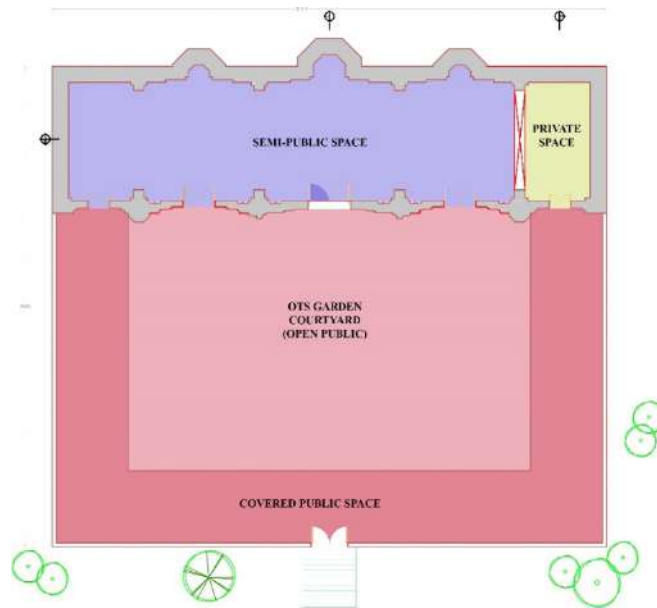


FIGURE 12

Space division of the Rajgan Mosque according to new function.

(Image courtesy of the First Author)

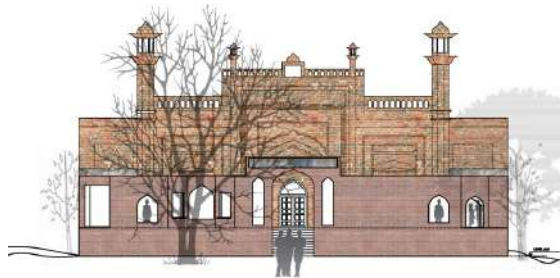


FIGURE13

Proposed front elevation of the new building.

(Image courtesy of the First Author)

The second type includes semipublic spaces which will be open to the public, but during the time of an event or lecture or conference will be restricted. Utilizing the height of the hall, a library with lecture room is proposed on the new upper level floor in hall and multifunction event hall on the lower level. The third type is private space which is ceremony room. As this room is fully dedicated for ceremony of “nikah” (an Islamic ceremony of signing legal contract between bride and groom before marriage), so only the members of celebrating families will be allowed to enter these rooms.



For this function the north side of the mosque will be used on a -1 level with separate entrance. As mentioned earlier, nowadays the mosque is only used twice a year on occasions of *eid* celebrations, so the building is converted into new spaces in such a way that new functions are showing respect for the original function, and at the time of *eid* celebrations all the spaces in the building including open to sky courtyard and semicovered verandas can be used for praying. In addition to this a new space is introduced at -1 level with capacity of 20 to 25 people, which will be used regularly for the praying function throughout the year (Figure 14).

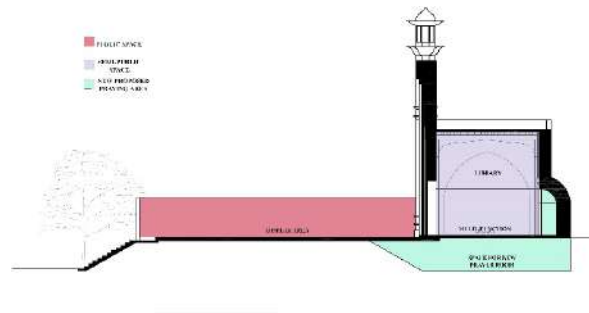


FIGURE 14

Section division of new functions in the main hall.

(Image courtesy of the First Author)

Besides this, Rajgan Mosque will serve as the starting point for a guided tour to historical sites around Rajgan Mosque during which a guide will also explain the history and story of each site to tourists. The tour will end at the Mughal gardens in Wah, 35 kilometers away from Rajgan Mosque (Figure 15).



Figure 15

Proposed guided tour map: red = starting point (Rajgan Mosque), yellow = stay points, green = end point (Wah Gardens).

(Image courtesy of Google map; edited by the First Author)



CONCLUSION

This contribution is an attempt for finding some possible solutions towards adaptive reuse of a mosque which is either abandoned fully or partially due to some social, cultural or economic reasons. Through this paper, a detailed comparison was made of the Prophet's mosque in Medina, and the key role which mosque as institute played throughout his lifetime, shows that mosque building was a central point welfare state of Medina. And mosque compound played an important role in the development of the society by providing a platform for social, cultural, and religious unification of local community. And the reason behind it was not that the building is very holy and sacred to Muslims, but the function of the mosque was to act as a communal facility center providing opportunity for various cultural activities to attract Muslims, as well as people from other religions to come to mosque and populate and use the mosque as a social center. Which proves that mosque program does not stress the function of only praying, instead mosque as a place which should be used as a center of providing opportunities for the development of community in every aspect of life. These opportunities range from a person's daily life issues to collective values on community level making a mosque from "house of God" to as equal as "house of community".

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MOSQUE AS LIVING ARCHITECTURE AND CULTURAL HERITAGE

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INTRODUCTION

THIS research effort aims at reconceiving and reawakening our consciousness on the versatility and comprehensiveness of the “theory of mosque” in the scheme of worship and its significant role in the eternal success of Muslims and Islam. The target is to identify points of derailment by the contemporary Muslims in sustaining or reviving the invaluable institution of mosque as a place where life begins, grows, and ends for Muslims, as exemplified by the Prophet and the companions and unravel the unidentified solution(s) that has been part of the revealed knowledge with us, which will return us to excellence of the past. The study beams light on the new approach to mosque development that seeks to render residential houses as mini mosques – in tune with prophetic gift “granting the whole earth as a mosque” – and agents of rebuilding the love and refocusing the heart of Muslims towards the congregational mosques.

The original meaning and conception of the mosque and Islamic Living Architecture were elucidated prehistorically and historically from the Qur’an and *sunnah* and their connectivity with “worship” as the central phenomenon for existence underscored. The divine role of Ka’bah and the last prophetic mission were juxtaposed in their eternal goal of defining and delivering the living architecture via the essentiality of the institution of *solat*. The trajectory of cultural heritage bequeathed by the Prophets in the mosque evolution was highlighted. Attention was focused on the factors that attached the hearts of the companions to the mosque which made it center of excellence in governance, mundane, and spiritual matters.

The above formed the basis for examining the 21st century Muslims and their negative attitude towards the “mosque” with the consequential





declination in their spirituality and failure to uphold the success of its glorious past in guiding and leading mankind in all human endeavors. This led to the discovery of proffered solutions – as enshrined in the concept of Islamic Living Architecture and the reenactment of the cultural heritage associated with it – traceable to the provisions of Qur’anic instructions.

This research work had to contend with the subjective utilization and contextual shades of meaning the phrase “Living Architecture” has passed through in literature. A detail exposition on this was made early in the conceptual definitions. It is also noticeable that while there are numerous written works that employed “Living Architecture” in presenting different arguments in the field of architecture, very few have actually being found to exhibit the thought process and the conviction employed here.

CONCEPTUAL MEANINGS

The Mosque

Taken from the authentic tradition of Prophet Muhammad (PBUH) where Allah SWT related to him three special grants to his *ummah* (generation), one of which being: “*the whole earth surface has been purified as a mosque*” (Al-Jazairy Jabir A., 2002). This is where the original meaning of mosque as far as earthly existence is concerned stems from. It follows that every space or place is potentially a mosque, either articulated structurally or not, though with the conditions of “purity” and later “orientation” to the *qiblah* (S. Akkach, 2005). This conception of mosque is equally proved by the Qur’an when Allah SWT said: “*O children of Adam take your adornment at every masjid...*” [Q7:31], meaning beautify, bodily, and environmentally, every purified place for your prayers.

Furthermore, Muslim scholars have used “*masjid*” metaphorically in qualifying the purity and sacredness human body could attain, hence the interpretation of Qur’anic statement: “*And that the masjids are for Allah, so do not invoke with Allah anyone*” [Q72:18]. The word “*masājid*”, the plural of “*masjid*” is taken here to mean parts of body being used in worshipping or praying to Allah SWT.

Living Architecture

Designs that addressed ecological questions and natural habitat have always being described as “Living Architecture” as found in early Chinese



residential buildings. The phrase is synonymous with the “green” and “sustainable architecture”, where certain climbing plants are used to clad roof or wall elements naturally and thus generate local climatic control. Rachel Armstrong in her e-book calls for an unmediated connection between architecture and natural environment and thus described living architecture as “one in which architecture literarily behaves like nature: that is in which buildings will be able to grow, adapt, and mutate just like plants do”.

However in this century, the phrase got widely used in the UK and Europe in Holiday Resort Business. Famous architectural masterpieces by renowned architects are remodeled or refurbished for people to have direct living experience of the design, through rental services. A company, called “Living Architecture” said: *“Architecture is all about living the spaces we inhabit, the places we considered sacred, the magic of space, and of time and of gravity, inspire to create this second skin for living in...”*.

“Living Architecture” as contemplated in this study embraces the above meanings but operates within the framework of faith, belief, spiritual, and eternal ambitions. While, “Architecture” is the central theme of the two former definitions, “man” and his “worship” is at the center of defining “Islamic Living Architecture”. “Islamic Living Architecture” can thus be defined as: a divinely fashioned architecture in which habitation is taken fundamentally as a worship activity and its design conception derives from the ideology of “dwelling as mosques” heritage value, Islamic teachings and *qiblah* orientation.

Cultural Heritage

The cultural heritage here is the one pertaining to the house-mosque architecture and the underlining practices traceable to the prophets, (Adam, Ibrahim, and Muhammad) in line with its historical development. It should be stressed that cultural heritage will not be essentially complete or successfully bequeathed without the true comprehension of the underlying teachings or principles upon which the physical heritage is built, the goal is set to achieve, as well as the maintenance of its core value. This view significantly influenced my conviction and position presented subsequently in this paper on mosque as a cultural heritage.

WORSHIP PREHISTORIC AND HISTORIC PROGRESSION

Allah SWT in the beginning was solitude and at the end of existence will return to the status quo before resurrection. *“He is the first and the last,*



and the outward and the inward...” [Q57:3]. For the sole purpose of worship, as a means of exerting His Reign and Dominion, He thought of “differentiation” and “otherness” and thus began the creation of the worlds and the universe. *“And I did not create the jinn and mankind except to worship me”* [Q51:56].

The first created living souls from the Light of Allah SWT were the angels, who from the onset were assigned (without will) various forms of worship till the end of time. According to Islamic traditions, some of the angels are carrying the Throne of Allah SWT. Some were made to be in charge of certain functionalities tied to existence across the heavens and earth.

Most striking to note however with direct link to the subject of this writing is the angelic worship around Bayt-l-Ma’mur located under the Throne of Allah after the seventh heaven. This heavenly House is strongly linked with the earthly House of Allah, the Ka’bah, in term of its location falling in the same vertical axis, as well as in terms of shape, according to authentic tradition (Imam Jalālu-Din As-Suyūti, 1969). In the Grand Master Plan of the universe, the whole earth as the “house” and man as the “occupier” are at the center and the epitome of creation. This is so because, significant creations in the cosmos, like the sun, the moon, and the stars, as well as other creations within and outside the earth surface are subservient to the planet, earth, and to mankind respectively. Samer Akkach (2005) wrote: *“The Sufis along with most premodern Muslim thinkers advocate the view of a purpose-built cosmos designed by God for the accommodation of humankind. Man is at once, the center, the model, and the ultimate aim of existence”*.

It is therefore not farfetched and logical that when Allah desired worship, He thought of the “Voluntary Mode” anchored on man and jinn and “Non-Voluntary Mode” anchored on angels and the geo-atmosphere – and placed premium on the earthly worship reflective of man’s transcendent role in the scheme of existence – as demonstrated by the creation of the Ka’bah (Bayt-l-Atiq) ahead of the creation of heavens and earth. It was recorded in Ka’bah Al-Ahbār that “the Ka’bah existed 40 years before the creation of the heaven and the earth”. Hisham Mujahid also recorded that “God created the site of the House (Ka’bah) 2,000 years before He created anything on earth and that its foundations reached below the seventh underworld” (Najib Gedal, 1999).

But what significance does this house presents or what symbolism does it represent in the scheme of earthly worship, if it took this great prehistorical stance in the world of creation? It was the sacred center around which





the first mosque (Masjid-il-Haram) built by mankind was to germinate, the focal point towards which all prayers are to be directed and thus, the *qiblah* towards which all mosques from different parts of the world are to be orientated. (Spahic Omer, 2018). It also symbolically represents the “Face of Allah” at the center towards which other faces architecturally (house facades) are to face in “environmental guidance” while seeking His good countenance, favor and ultimate success. “... *So turn your face toward al-Masjid al-Haram. And wherever you (believers) are, turn your faces towards it...*” [Q2:144] (Abdul-Malik A.A, 2012). Thus, the Ka’bah began its mission on earth being rendered as the “House of Allah”, the first *qiblah*, and as well as the central meeting point for mankind in pilgrimage. “... *And to Allah from the people is a pilgrimage to the house...*” [Q3:97]) (Figure 1).



FIGURE 1

Holy Ka’bah sanctuary for pilgrimage and security.

ISLAMIC LIVING ARCHITECTURE

The first construction of Ka’bah by man was that carried out by Prophet Ibrahim, an action that exemplified and commemorated the sacredness imbue in the act of building as a foremost form of worship and a highly referred tradition which has been lost over generations of prophethood but rekindled by the mission of Prophet Muhammad (Abdul-Malik A.A, 2012). It can be said however that Prophet Ibrahim laid the foundation for the “Living Architecture” designed for mankind via the exemplary building of Ka’bah, a task which was later accomplished by Prophet Muhammad (PBUH).





But why did the long period between these two prophets elapsed before the Ka'bah was declared as the last *qiblah* for the last Prophet Muhammad (PBUH) in order to resume and accomplish its divine mission?

Three divine wisdoms were identified responsible. Firstly, prayer as the cornerstone and hallmark of worship in its complete form as dictated by the sharia was to be preserved and decreed for the last generation of mankind through the last prophet. No wonder the preceding prophets were given parts or stages of the prayer. Secondly, the prophetic mission which started from the navel center of the earth, Ka'bah – with the lowering of Prophet Adam to the earth surface and his guidance to the House to live, worship, and fulfill his prophetic task – was to continue according to the divine plan, in other designated chosen lands, chosen people with chosen prophets, before the mission finally returns to the sacred land, and to the Ka'bah where it originally emanated from, under the supervision of the last Prophet, Muhammad (PBUH) raised for this accomplishment. Thirdly, just as Allah had chosen man as the epitome of His creation, and actually created him last, He equally chose the last generation of mankind as the best of all generations that existed, and made them the bearer of the totality and accomplishment of all divine processes and phenomena that began from heaven to earth, and from the start of existence to its end. Here we mean first, the creation of knowledge – which started with the creation of pen and its commandment to write every minor and major happenings across the heavens and earth within time and space, and its progression and application by man – which started with the impartation of knowledge of all things into Prophet Adam and hence mankind, was a process that will progress through the ages and reach its peak with the last generation through scientific and artistic research discoveries.

Also we mean, the creation of Islam, as the natural way of life (*fitra*) and religion endorsed by Allah for mankind, and its procedural revelation that began with the mission of Prophet Adam through other prophets across nations and tribes, to the icing of the cake, Prophet Muhammad (PBUH) who sealed and accomplished this divine process with the mother of all books (Qur'an).

Lastly, we mean, the creation of the "Islamic Living Architecture" as a form of "environmental guidance" devised eternally for mankind to help him attain utmost success in his sojourn on earth and gain admission back into paradise, his former abode. "The Living Architecture" as conceived by its Master, Allah began at the instance of the exit of Prophet Adam





and Eve from the paradise and their beginning of life again on earth with the heavenly lowered Ka'bah placed on the angelic foundation, as their house and place of worship. Najib Gedal (1999) wrote: *“Wahab Ibn Munabbih said: ‘When God forgave Adam, He ordered him to make his way towards Makkah. God consoled Adam by rewarding him with a canopy sent down from heaven which He placed for Him in Makkah, on the site of Ka'bah.... After the death of Adam, the canopy was lifted back to heaven and Adam children rebuild the house using clay and stone, which survived until the great flood of Nuh. The traces of the Bayt (House) were completely erased and were not discovered until they were again revealed to Ibrahim’”*.

This prehistorical event constitute the foundation of the “Living Architecture” for mankind which requires *solat* as its essential ingredient and whose accomplishment would have to wait till the complete revelation of Islam as a way of life by the mission of Prophet Muhammad who reclaimed Ka'bah as the last *qiblah* for mankind, and repositioned it for the last mission of defining and engraving the “Islamic Living Architecture” on the earthly sand, with “worship” as its core value.

This architecture was earlier inspired unto Prophet Musa (Moses) as an antidote against Pharaoh's brutality on Israelites, and gave them victory. *“And We inspired to Moses and his brother, ‘Settle your people in Egypt in houses and make your houses (facing the) qiblah and establish prayer and give good tidings to the believers’”* [Q10:87]. In spite of this precedence, the gift still remain a “hidden treasure” embedded in the Ka'bah mission, to be discovered and applied by the last generation through the last prophet.

The Ka'bah's strategic location at the earth's geographic center corresponds with the cosmological center along a vertical axis connecting it to the Bayt-l-Ma'mur in the seventh heaven, through similar houses located in other heavens. Samer Akkach (2015) writes: *“The cosmic axis that passes through the Ka'bah connects it to its infraterrestrial, celestial, and supracelestial counterparts...”*. Along this axis concentrates the most powerful divine force, light of guidance, and mercy descending upon the House, which transmits it imaginarily along radial axes on the earth's surface. Dwellings are thus logically required in this “Living Architecture” to be orientated towards this center so as to receive these intelligible rays of guidance beaming from the sacred center along the *qiblah* axes (Figure 2).



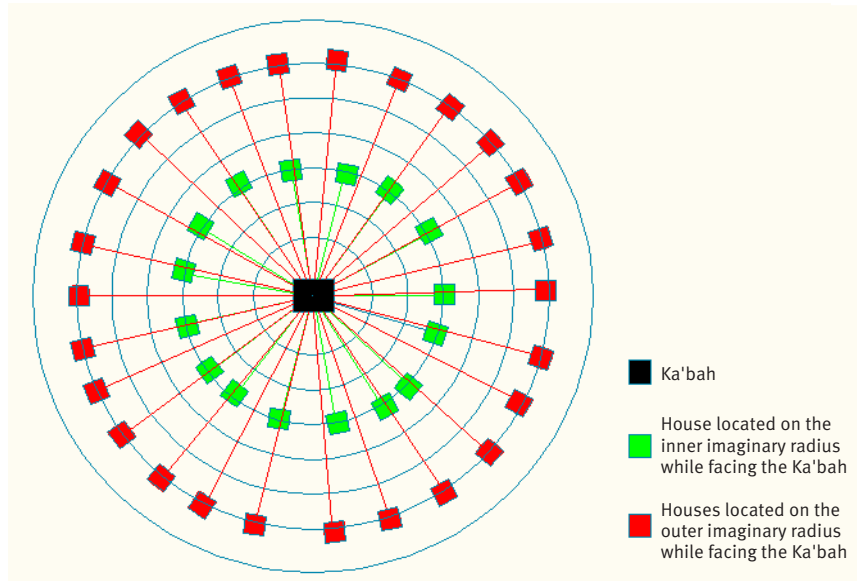


FIGURE 2

Houses connected to Ka'bah on concentric circles and rays of guidance.

Furthermore, Ka'bah as the most consecrated site on earth, symbolically constitute the heart of the world around which the protective layers of “Masjid-il-Haram” and “Mecca” were developed. This as it were in the beginning exemplified, what is to be replicated by the last generation of Muslims at the end time on the largest scale, by imprinting on the horizon, the beauty of the divinely structured house-mosque settlement on the earth surface. Implementing this in line with Allah’s decreed time, aptly informed the preservation, and reservation of the grant of the whole earth surface purified for use as mosque. Just as the Masjid-il-Haram wraps up the House of Allah (Ka'bah), at its core forming a body round it, so are the dwellings and habitations across the world, to be developed orientated towards the Ka'bah, forming a body of gigantic concentric rings around it, its immediate precinct, Masjid-il-Haram, and the Holy City, Mecca (Abdul-Malik A.A, 2012).

This is analogous to the way Allah fashioned man’s figure as the most beautiful creature of Allah. He placed the “heart”, the most valuable organ of human body at the inner core, and covered it up with flesh and external limbs which are usually engaged in the prayer (*solat*). This is why, as indicated above, our body is also referred to as a form of “mosque” by scholars, the heart being its sacred center. Qur’an states: “... *For indeed, it is not the eyes that are blinded, but blinded are the hearts which are*



within the breasts” [Q22:46]. And from a tradition in Arba’ina Nawaawiy: “... *Truly in the body, there is a morsel of flesh, which, if it be whole, all the body is whole, and which, if it is diseased, all of (the body) is diseased. Truly, it is the heart*”. The heart is comparable to the Ka’bah at the center of the earth, while the body limbs are comparable to the Masjid-il-Haram, or the world residential settlements around the Haram.

MOSQUE HERITAGE VALUES

The evolution of Mosque as a designated place of worship is umbilically corded to the divinely created object called “House”, lofty placed in the scheme of inanimate creation as alluded to by Allah’s possessive recognition conferred on “House” when He referred to Ka’bah as “My House” and in His statement; “... *To Him belongs the loftiest similitude (we can think of) in the heavens and the earth, for He is Exalted in Might, full of wisdom*” [Q30:27].

House-Mosque Spatial Exchange

“Mosque” emerged from “House” in the exemplars of Bayt-l-Ma’mur and the Ka’bah. Conversely, “House” emerged from “Mosque” in the exemplars of the Mosque of the Prophet (Masjid al-Nabawi) in Medina, and in every portion of the earth surface designed and developed as residential houses in conformity with Islamic dictates, facing the *qiblah*.

In the first instance, Bayt-l-Ma’mur was referred to as a “House” by its Creator, Allah SWT in the Qur’an, and its functional use for worship by the angels made a “Mosque” out of it. In the same vein, the Ka’bah was so called “My House” as a symbolic replica of the Bayt-l-Ma’mur above it, to be used by the earthly inhabitants for their circumambulation as the angels do in the heaven. In a bid to replicate the continuous angelic prayers and praises in various forms being carried out by groups of 70 000 angels in various locations of the heaven, after successive daily entering and leaving of Bayt-l-Ma’mur (Jalalu-Din As-Suyuti A.S, 1969) – though in a combined and comprehensive form – the immediate precinct of the Ka’bah got developed as the first mosque in response to that necessity. For the same purpose, the whole earth surface got annexed subsequently as mosque for Muslims wherever they are in any part of the world to observe their prayers towards the house accordingly. This is spatially articulated by mosques and house-mosques.





In the second instance, the Prophetic mosque in Medina developed simultaneously with his house, besides its functionality as the cultural, political, military, and administrative center of the first Islamic state. Following this *sunnah*, backed up by the principle of “the whole earth purified as mosque” Muslims residing in every part of the world could convincingly develop their “houses” from the divine “spatially-conferred mosques” on lands and sea, in tune with the “Living Architecture” and this will be reparative on their hearts and souls with attendance love and attachment to congregational mosques towards reviving the past glories. The Qur’an resonates along this line saying: “*O children of Adam, take your adornment at every masjid ...*” [Q7:31].

The Ka‘bah Legacy

The Holy Ka‘bah is symbolically tagged the “House of Allah” and spiritually the “Face of Allah” on earth whereby all other houses and mosques are to relate to and face, via its essential divine service, providing orientation for man’s “unity of worship and creation” while engendering the “Living Architecture”. Wan Norisma Wan Ismail *et al.* (2017) states: “The orientation of every Islamic dwelling should consider *qiblah* direction. The *sunnah* of the Prophet (PBUH) is to respect and revere the prayer direction. This is indicated in several hadiths, such as “when one of you stands in his prayer, he is in close conversation with his Lord or his Lord is between him and his *qiblah*. Therefore no one should spit in the direction of his *qiblah*” (Sahih Bukhari, *Kitab al-Salah*).

Prophetic Legacy

This is traceable specifically to Prophet Ibrahim who was directly involved in the construction of the Ka‘bah and Prophet Muhammad (PBUH) who came to compliment and finalize the achievement of its divine mission.

The divine task of building the Ka‘bah by Prophets Ibrahim (Abraham) and Ismael conferred worship status on the “act of building” and made it a sacred activity (Samer Akkach, 2015). In its commemoration lies eternal success for Muslims. Allah revealed: “*Without doubt, among men, the nearest of kin to Abraham, are those who follow him, as are also this Prophet and those who believe: And Allah is the Protector of those who have faith*” [Q3:68]. The declaration of the first *qiblah* and facing it for worship was formally established by Prophet Ibrahim through “Maqama Ibrahim”,



the station from where he also fulfilled the Ka'bah construction, prayed onto Allah SWT for its acceptance and pronounced the pilgrimage (Figure 3).

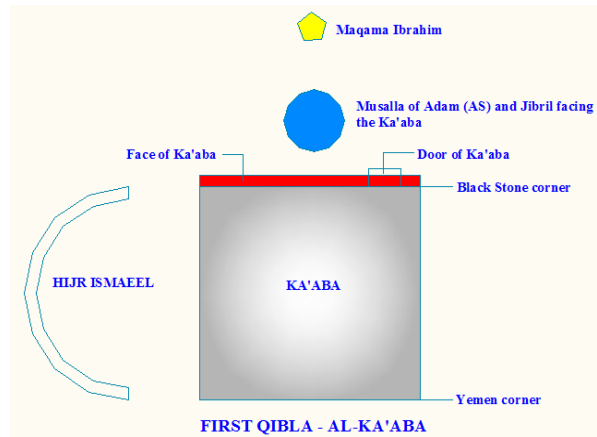


FIGURE 3

Maqama Ibrahim and Musalla of Adam facing the Ka'bah.

Prophet Muhammad (PBUH) whom he prayed for his coming upheld his tradition. He reclaimed, purified, and repositioned the House to resume its eternal mission. He notably orientated all his worships, including his reflections on seclusion in the Cave Hira, towards the Ka'bah, even before the divine ordering it as final *qiblah*. (Abdul-Malik A.A, 2012). Allah said: *"Ye have indeed in the Messenger of Allah, a beautiful pattern (of conduct) for any one whose hope is in Allah ..."* [Q33:21] (Figure 4).

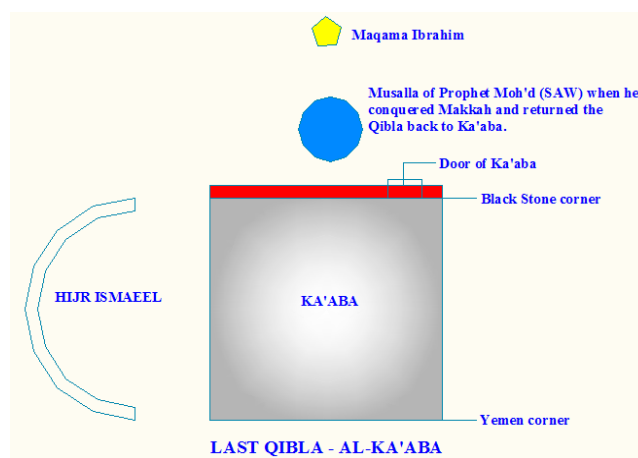


FIGURE 4

The Maqam Ibrahim and Musalla of Prophet Muhammad (PBUH) facing the Ka'bah.

FINDINGS

Knowledge-Based Findings

1. What triggered love that magnetized the heart of early Muslims to the mosque and made it the headquarters of their spiritual, social, and secular life was the presence of the Prophet and Qur'an revelation. These qualities faded out gradually through the era of caliphates and pious predecessors. The only obvious solution to revive the golden achievements of that time lies in dedicated return to utilizing the teachings of the Qur'an and *sunnah* and specifically in this regard, the fulfillment of the requirements of "Islamic Living Architecture" and upholding of the mosque heritage values.
2. Embracing the house-mosque theory and cultivating its practice will yield immediate practical benefits of; automatic and perfect fulfillment of the tradition of perpendicular positioning to the *qiblah* in the usage of lavatories (Figure 5); easiest bed space arrangement to achieve sleeping on the right side while facing the *qiblah* (Figure 5); and the resultant motivation and ease with which other worships would be performed. Spahic Omer (2004) says "... It facilitates, fosters, and stimulates one's ceaseless 'ibadah' activities".
3. Successes in the above prescriptions will launch the Muslim world back to their leadership role in spirituality, knowledge, and other spheres of human endeavor as demonstrated historically in the Islamic Spain.

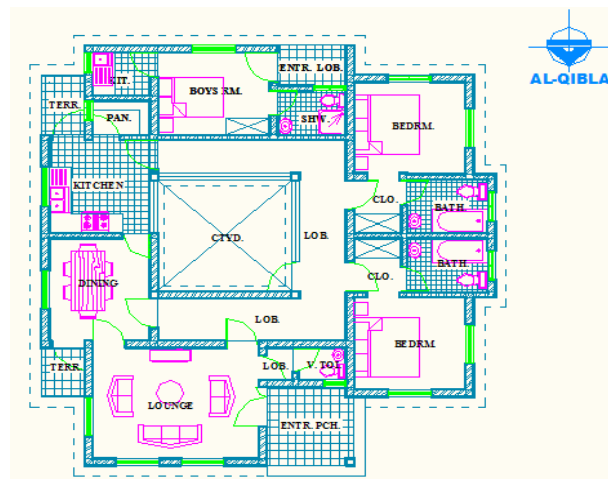


FIGURE 5

Ground floor plan showing water closets, bathtubs, and bed furniture easily placed perpendicular to the *qiblah*.

Spiritual-Based Findings

1. The sacredness and spiritual purity latent in every spatial enclosure of the earth surface will be released when developed in compliance with the dictates of “Islamic Living Architecture”.
2. With the implementation of this “Islamic Living Architecture” man shall attain spiritual growth and elevation through the elevation of the “house” to its potential status as a “mosque”.
3. Practicing “Islamic Living Architecture” is a fundamental act of worship which commemorates, resonates, and revives the tradition of the great prophets involved in its establishment. It further makes housing activities ontological and sacred providing the stage for successful implementation of other forms of worships.
4. House-mosque exhibiting this design style will be spiritually fortified against evil machinations and environmental hazards – comparable to Prophet Noah’s Ark.
5. When this living system is successfully implemented, there will be emergence of “Universal Islamic Monument” on the horizon – composed of unified house-mosques and congregational mosques – all converging at a Focal Center, the Ka’bah via their directional orientation. This monument would be a fulfillment of the provision in this verse: “... *And wherever you (believers) may be, turn your faces towards it in other that the people will not have any argument against you, except for those of them who commit wrong ...*” [Q2:150].

Correction-Based Findings

1. There have been inadequate career patronage and scholastic pursuits around this field and specialty of architecture. Therefore, more of Professor Samer Akkach and Professor Spahic Omer, need to arise to build it up. Particularly, more research studies and publications are needed in this area to speed up awareness and enhance the implementation of the “Islamic Living Architecture”.
2. The existing few professionals should channel and establish more of their services to encourage end-user design inputs and promote the awareness and patronage of Islamic Living Architecture services. Academic-based professionals and scholars should write and publish more works, organize seminars, and workshops to generate more public awareness.



3. Last but not the least, the academic and professional service providers in Islamic architecture need to synergize strategically to bring local, national, and international governments on board through seeking relevant statutory policies, regulations or legislations that would fully recognize Islamic Living Architecture, and create agencies or departments as tools to facilitate its implementation.

CONCLUSION

Mosque as an architectural form was not elaborated nor structurally legalized in sharia, but rather a command of spatial utility necessitated by prayer obligation. Mosque architectural development over time is therefore in its entirety a hallmark and flagship of Islamic Living Architecture, and ultimately in that capacity, commands the full right to epitomize the Islamic Architecture in “form”, as tangible contribution by man in the fulfillment of the promise of Allah SWT regarding the emergence of monuments and signs on the horizon. *“We will show them Our signs in the Horizons and within themselves until it becomes clear to them that it is the truth ...”* [Q41:53]. However its cultural values and essential role in launching the Islamic Living Architecture are more significant and should not be overemphasized.

It is worth noting that one big step was recently taken (about two decades ago) in line with the focus and implemental strategy of this research work – by the International Union of Islamic Scholars, in their Communiqué issued after Doha Conference, Qatar – advising all Muslims in the Arab world to “henceforth direct their buildings or houses facing the *qiblah* in Mecca”. As political and radical, the statement may portend, this study provides the academic background and proves the practicability of the idea, while the fact remains sacrosanct that the statement is underpinned by the truth of the necessity for Muslims over the world to wake up from their slumber and live by the divinely ordered and structured lifestyle to facilitate their utmost worldly and heavenly successes as predicated in the provision of Islamic Living Architecture.

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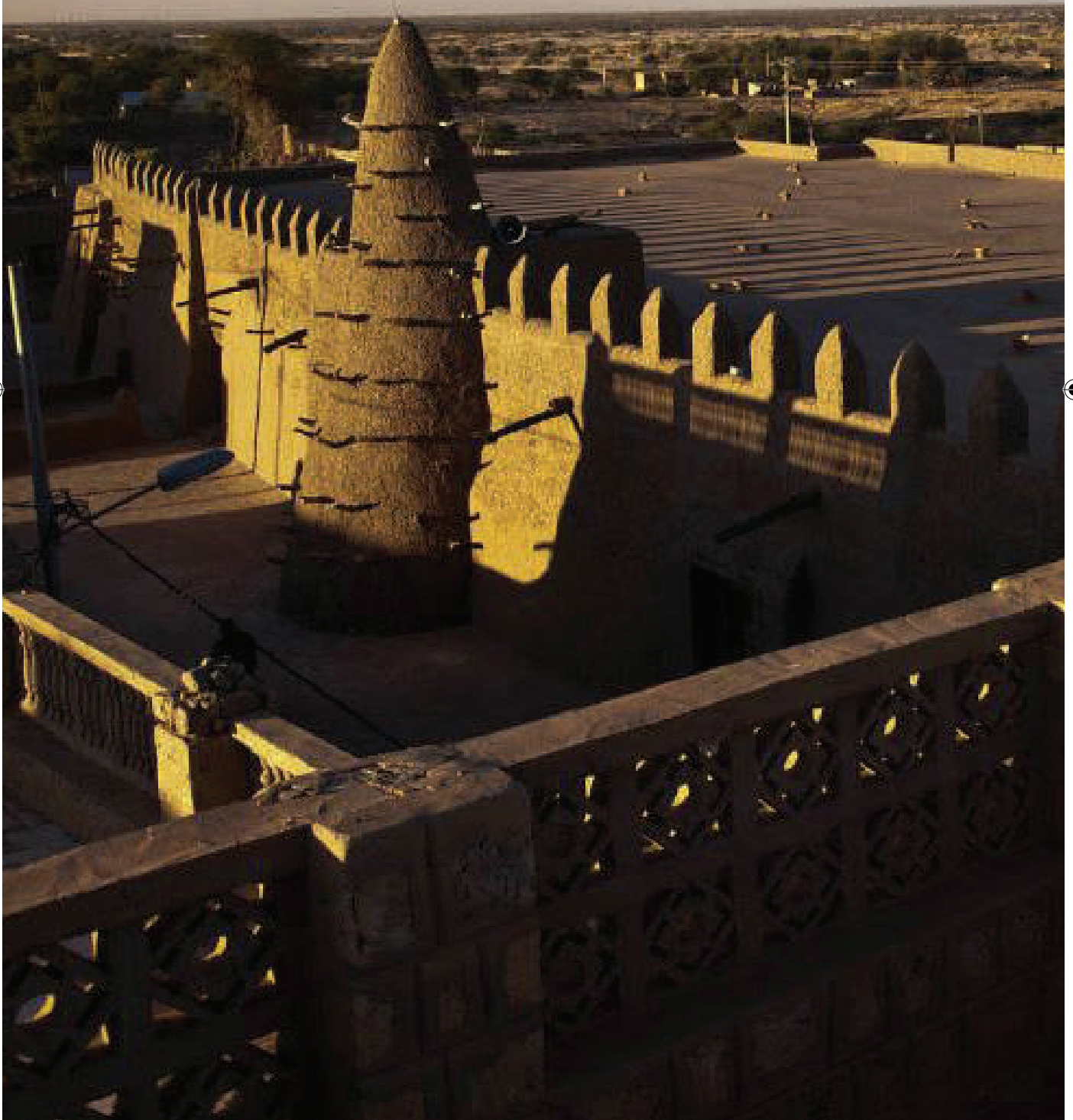


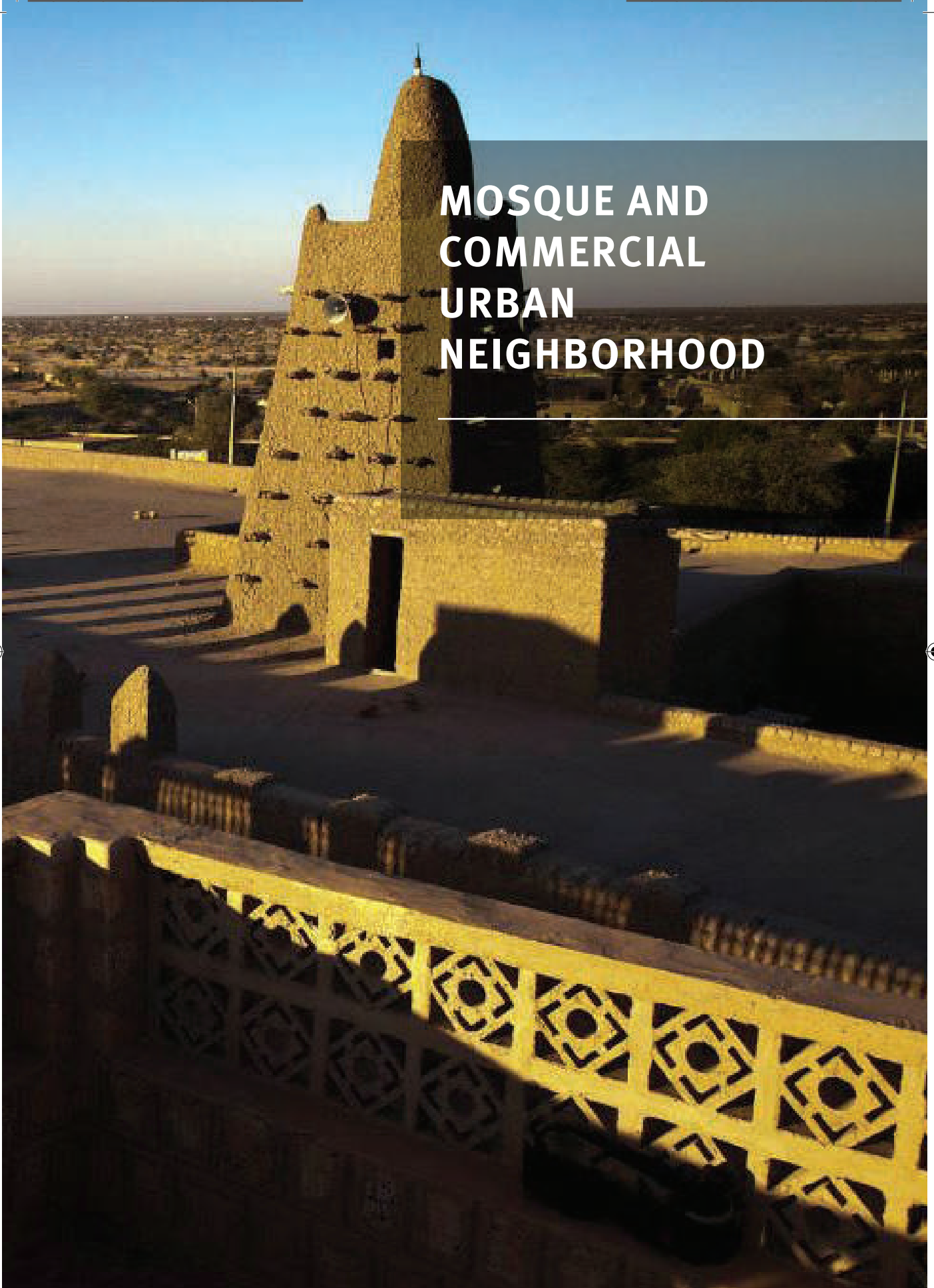
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MOSQUE AND COMMERCIAL URBAN NEIGHBORHOOD







**INTEGRATION, SEGREGATION,
OR FRAGMENTATION? JEDDAH
CONTEMPORARY MOSQUES IN THE
CONTEXT OF PUBLIC PLACES**

Dr. Mona Helmy







INTEGRATION, SEGREGATION, OR FRAGMENTATION? JEDDAH CONTEMPORARY MOSQUES IN THE CONTEXT OF PUBLIC PLACES

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INTRODUCTION

THROUGHOUT the decades, there was a historic integration of mosque architecture with the development of the traditional urban patterns and social formation, in which it was considered one of the most important characteristics of mosque design.

This was also manifested in the spatial interconnected hierarchical and harmonious relationships between the mosque outdoor plaza, internal courtyard(s), and other open spaces mosques have in their various contexts. Over the past decade, in newly developed areas and newly developed mosques sites in many locations, it was noted that mosques started to be considerably segregated from its urban context by setting, function, or both, which might significantly affect the role of the mosque as an urban, social, and cultural core in its context in Muslim communities.

MOSQUES IN URBAN CONTEXT

Since early history of Islam, i.e. the establishment of the Prophet's Mosque in Medina, and the later consequent mosques such as The Umayyad Mosque in Damascus, Al-Azhar Mosque in Cairo, etc., mosques have not only functioned as places for worship, but they played a significant role for forming their contexts to express their unity and harmony. Other mosques' functions are various, such as a place for social gatherings, or for learning, among other social and cultural activities. Often, mosque buildings constitute an increasingly important feature of the contemporary urban landscape in many Muslim communities.

There is currently growing literature on mosque architecture highlighting critical discussions over sites planning of mosques, in which the symbolic





role played by mosques in the articulation of social identities constitutes a central theme. See for example, Naylor and Ryan (2002). This paper complements this literature by exploring the place of site planning and design in setting the parameters for such conditions, an issue that is receiving increasing academic attention as per Gale; Gale and Naylor, (2002). Moreover, this paper attempts to move beyond the aesthetic aspects of the discussion, to focus primarily on the processes of forming social-spatial conditions around mosque.

However, numerous sources illustrate that the typology of contemporary mosques do not consider much the specificity of their urban conditions such as dense urban area, central locations, limited land, and vertical development, etc. The discussion here attempts to fill part of the gaps related to the current practices, with a focus on the role of mosque planning and the surrounding public space.

THE RELATIONSHIP BETWEEN MOSQUES AND PUBLIC SPACES

The public space as a medium of urban design, structured and shaped by built form, necessitates a hierarchy of coherent spatial design with many interconnections, juxtapositions, and overlaps between the elements of form.

In addition to its role as an extension of the mosque area to accommodate more worshiper during Friday or *Eid* prayer, nowadays, mosques' plazas are designed to house venues to many activities. In general, the role of contemporary mosque is not only limited to be a place for worshipers, but it extends that purpose to have other social, cultural, spatial, and visual realms. Therefore, mosques are considered as an urban core component for the surrounding public realm. In contemporary planning practice, especially in the Arab Gulf cities, mosques site planning targets a strong integration of mosques with their contexts in order to fulfill their tangible and intangible symbolic and social roles. As stated in Jeddah Streetscape and Urban Design Manual by Jeddah Municipality (2008): "*Mosques should be free from all requirements governing building placement and configuration*".

Social and Cultural Setting

Often, over many centuries, most of mosques are linked with social activities that are embedded in local culture of their context. As argued by Raymond (1984), "*There is a strong relationship between the mosque and the market in the definition of the Islamic city.*" The social and cultural



components embedded in mosques have evolved and manifested in the urban morphology of many societies. Serageldin (1996) indicates that “*The architectural expression of Muslim societies has tended to function as a subtle overlay on existing physical realities and cultural traditions*”, These socio-cultural activities are varied between educational, commercial, entertainment, and sport among others as follows:

1. mosques’ Plazas as a (Un)Planned Play Venues for Kids;
2. mosques’ Plazas as Sport Playgrounds;
3. mosques’ Plazas as a Place for Social Gathering;
4. mosques’ Plazas as a Religious Venue/*Eid* Pray;
5. mosques’ Plazas as Centers of Educational; and
6. mosques’ Plazas as Markets/Souqs.

Mosques’ Plazas as a (Un)Planned Play Venues for Kids

In some mosques, the external plaza was planned to serve as a gathering place for families. The main concept behind such function is to familiarize children with mosques. Also, to have the mosque as a point of attraction in residential neighborhoods. In this context, the Deputy Head of Religious Affairs of Turkey stated that “*It is necessary to build a playground for children in the yards of mosques*”. He also expressed the importance of integrating social life of citizens with mosques to satisfy their contemporary needs.

In contrary, children turned the courtyards of the external Prophet’s Mosque into places to play and stroll, where the courtyards turned into a gathering place for families and picnics. The worshipers lost their reverence in their prayers, as several visitors complained of the disturbance and chaos that were taking place before the eyes of the observers of the squares.



FIGURE 1

Children turned the courtyard of the external Prophet’s Mosque plaza into places to play.

Mosques' Plazas as Sport Playgrounds

Often, youth and adults take advantage of the plazas of modern mosques to practice certain types of sport, such as football. This is due to the lack of gardens and playgrounds in their neighborhoods. In the city of Tabuk, Saudi Arabia, some young people planned to paint them as white football fields. However, the department of awqaf and mosques and Tabuk authorities are concerned, pointing out in their speeches to convert the yards of mosques to playgrounds and yards to surround, causing harm to the worshipers.

Mosques' Plazas as a Place for Social Gathering

Especially after Friday prayer, plazas of congregation mosques are considered the main place for social interaction of worshippers. While mosques of neighborhoods have a big role in the social gathering of families living around it, which strengthen their social cohesion, sense of community, and reinforce their traditions that is embedded in Islam. To encourage the role of the mosque in social interaction, some of the mosques' plazas are connected with secondary plazas that include various types of urban amenities, such as shading elements, street furniture, small playgrounds, etc. (Figure 2) where the isolation of mosque positioning was compensated by adding hard infrastructure for social interaction.

Another type of social interaction is to held funeral events in mosques plazas, where people can express their condolences.



FIGURE 2

Al-Reda Mosque is located on Jeddah new waterfront, KSA. Although it is segregated from the urban fabric of the city, its surrounding is planned to accommodate social gathering activities.

Mosques' Plazas as a Religious Venue/Eid Pray

Especially in congregation mosques, plazas of mosques have a very important religious role as an extended place to the worshipers to pray in certain events, such as Friday or Eid prayer. In some mosques, *Eid* prayer is being held in the mosque outdoor plaza only.

Hakim (1986) noted that *"The city should have a congregation mosque, Masjid Al-Jami, in which the Friday sermon was given and in which the city's residents and its surroundings are served"*.

Mosques' Plazas as Centers of Educational

Since the beginning of Islam, mosques were considered places of learning. The mosque was a school for Muslims to learn about their religion and morals embedded in the culture of Islam. Some historic mosques, such as Prophet's Mosque in Medina where certain columns are dedicated as places for learning. The Complex of Sultan Hassan and Sultan Qalawun in Cairo spine have planned mosque and madrassa (school) designed to accommodate schools. Nowadays, the role of mosque as an educational institution is still active, where individuals and groups are learning various aspects about their religion.

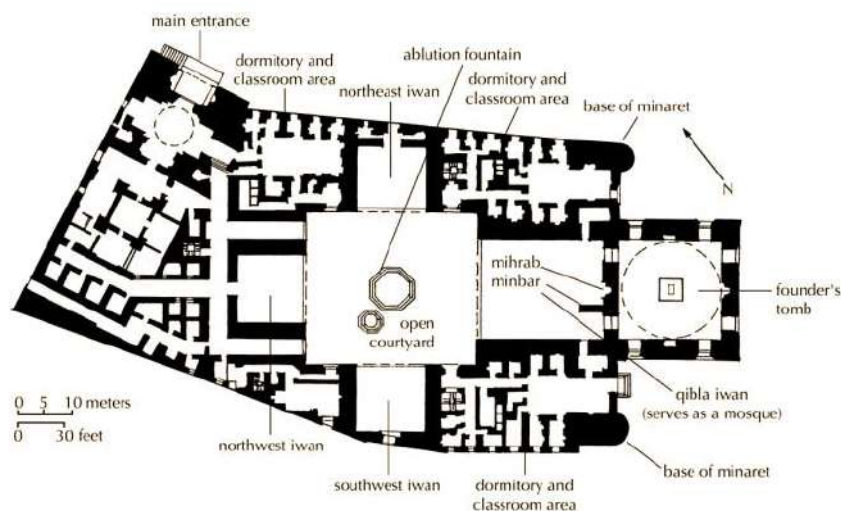


FIGURE 3

Mosque as an educational institution. The Complex of Sultan Hassan in Cairo, Egypt has a mosque and madrassa (school) as a main part of its function.

(Source: <https://www.pinterest.jp/pin/507499451740661181/>)



Mosques' Plazas as Markets/Souqs

Having souqs, or street vendors in mosques' plazas, selling home articles and food is a legitimate activity. As per Ben Othaimayeen, people can buy and sell in plazas of mosques.

However, in some cases, people turn the yards of mosques into centers selling vegetables and fruits. This is specially happening after Friday prayer, which affects the spirituality and the overall respect of the mosque and on a functional level, it hinders the physical flow of the crowd after the prayer.



FIGURE 4 (a) & (b)
Lack of organization in souqs.

(Source: <https://www.almowaten.net/2014/06/>)

Mosques' Spatial Configuration

The site planning of the mosque and its contextual relationship is very important. Positioning mosques and their connectivity with other open spaces in their context is a key factor in connecting and attracting people to fully use the mosques. This also applies to connectivity between the interior space of the mosque and its exterior open space(s) on various levels. In this context, Azam (2007) questioned the degree the building's interior can be understood in relation to the exterior context and the city at large.

In general, positioning mosques varies between being the center of the urban fabric to be a cornered objects, or an isolated building segregated from its context (Figure 5).





FIGURE 5

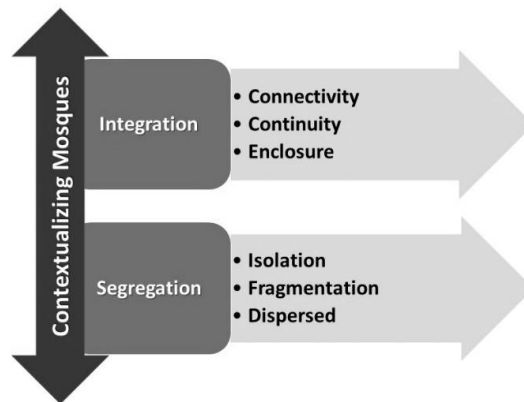
Aerial photo of northern part of Jeddah city shows the spatial organization of various mosques and their contextual relations.

(Source: The Author)

CONTEXTUALIZING MOSQUES BETWEEN INTEGRATION AND SEGREGATION

Integration is the direction different qualities to vary jointly, in a coordinated style, throughout a morphological structure.

The research examines the social and the spatial organization of selected mosques in Jeddah according to their types. Factors, such as connectivity, space continuity and enclosure will indicate the integration of mosques in their contexts. In contrary, factors, such as isolation or fragmentation will confirm the segregation of mosques from their contexts. This study is qualitative describing the practices regarding the site planning of mosques in urban settings. Two levels of analysis are used in this study; a descriptive analysis, and site remarks were adopted. Findings are discussed provided by observational findings wherever needed.

**FIGURE 6**

Spatial rating of contextualizing mosques.

(Source: The Author)

JEDDAH MOSQUES AND THEIR CONTEXTUAL INTEGRATION

The city of Jeddah is located in Mecca region, Kingdom of Saudi Arabia. It is the second important city in Saudi Arabia after Riyadh, which is the capital city. Jeddah is a historic city; as it is the official gateway to Mecca for pilgrims since hundreds of years (WHC 2013).



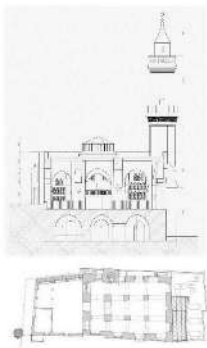


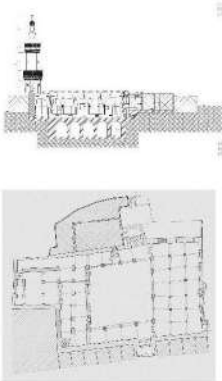
Helmy (2008) stated that the structure of Jeddah was guided by its history, recent and current function, as well as its massive urban transformation that has started in the 19th century in what so called Oil Urbanism. Hence, it has a variety of urban typologies that could be summarized into:

1. historic Jeddah: or what so called “The Walled-in City”, known as Al-Balad quarter. Located in the southern part of the city. Currently, it has residential, commercial and cultural facilities;
2. corniche strip: about 40 kilometers of coastline that extends all over the city, from the north to the south; and
3. modern development: mainly residential, commercial and business districts distributed around the historical area and extends into the northern part of the city, which has the concentration of the new mega projects and high end new residential quarters.

Accordingly, analysis of selected mosques of Jeddah in this paper follows its contextual typology as follows:

Mosques of Historic Jeddah

TABLE 1
Examples of mosques on historic Jeddah.



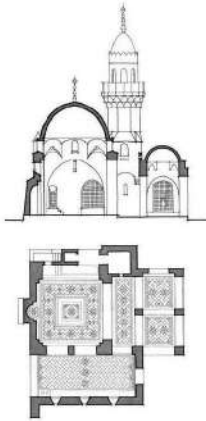



Mosque	Description	Location/setting	Drawings/Illustrations
Al Ma'amar Mosque 	<p>Location: Historic Jeddah, old souk in Mazloun quarter, along Souk al-'Alawi.</p> <p>Construction date: Unknown, but earlier than 1834</p> <p>Accessibility: Located on the intersection of traffic and pedestrian roads. Accessible both by car and on foot.</p> <p>Description: The mosque has a vaulted basement divided into three naves and an upper praying hall with six square pillars.</p>	 Source: Google Earth	 Section and plan of Al Ma'amar mosque
Ash-Shafe'i Mosque 	<p>Location: in the heart of Historic Jeddah, in Mazloun neighborhood.</p> <p>Construction date: in the 13th century by King al-Mudhaffar of Yemen. It was entirely rebuilt in 1539</p> <p>Accessibility: Accessible on foot.</p> <p>Description: The mosque's eastern side, is composed of three parallel galleries covered by a wooden ceiling. It has a square central courtyard. Its short minaret is architecturally subdivided into three sections: the lower and middle parts are octagonal, while the upper one is spherical.</p>	 Source: Google Earth	 Section and plan of Ash-Shafe'i mosque

Source: Historic Jeddah Nomination document for the inscription on the World Heritage List

As shown in Table 1, mosques located in historic Jeddah are following its condensed and integrated urban pattern, where the mosque is centered, open to its surrounding spaces with its urban structure, and accessible within its context. Accordingly, they are highly integrated within people's everyday life.

Mosques located on cornice strip



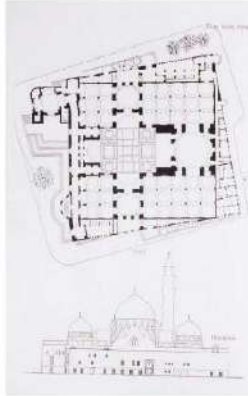


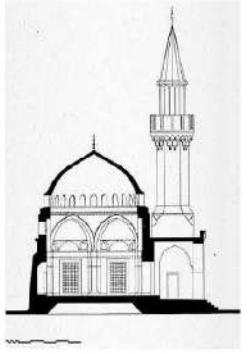
TABLE 2
Examples of mosques on cornice strip, Jeddah.

Mosque	Description	Location/setting	Drawings/Illustrations
Corniche Mosque 	<p>Location: on the new Jeddah waterfront development.</p> <p>Construction date: 1988 Designed by Abdel Wahed El-Wakil</p> <p>Accessibility: Accessible on foot and by car.</p> <p>Description: The architecture of the mosque is driven from a blend of Islamic vocabularies but relying most on the Mamluks' architecture of Egypt.</p>	 <p>Source: Google Earth</p>	
Source: Aga Khan Trust for Culture			
Al Rahma Mosque / Floating Mosque 	<p>Location: on the western part of Jeddah waterfront.</p> <p>Construction date: 1985</p> <p>Accessibility: Accessible on foot.</p> <p>Description: Also known as Masjid Al Rahma and Fatima Al Zahra Mosque. It is built on pillars, which is the reason it looks like it is floating. Masjid Al Rahma uses a mix of traditional architecture and modern technology. It consists of 52 outer dome surrounds the mosque as well as the main dome located in the middle. And 23 external umbrellas.</p>	 <p>Source: Google Earth</p>	

Most of Jeddah mosques located on cornice are relatively isolated. As shown in Table 2, the positioning of both mosques is on an island that is not integrated within its urban context. Also, according to the special positioning of the two mosques, there is no planned space for other functions of the mosque, but only as a place to pray.

Mosques Located along the Major City Corridors

TABLE 3
Examples of mosques located along city corridors, Jeddah.

Mosque	Description	Location/setting	Drawings/illustrations
King Saud Mosque 	<p>Location: located along Medina Road (a main city corridor) in Jeddah City.</p> <p>Construction date: 1987 Designed by: Abdel Wahed El-Wakil in Accessibility: Accessible by car and on foot.</p> <p>Description: King Saud Mosque has a complex plan, which is aligned with the surrounding streets on three sides. Its fourth side is also aligned with the qibla direction. The differences between the street directions and that of the qibla was solved by adding a triangular shaped area that is considered an outdoor entrance lobby to the mosque.</p>	 Source: Google Earth	 King Saud Mosque Retrieved from https://archnet.org/
Bin Laden Mosque 	<p>Location: located on King Road (a main city corridor) in Jeddah City.</p> <p>Construction date: 1988 Designed by: Abdel Wahed El-Wakil in Accessibility: Accessible by car and on foot.</p> <p>Description: The mosque has three domed bays flanked by a hexagonal minaret with a square base to the south. The porch leads into a rectangular domed prayer chamber</p>	 Source: Google Earth	 Bin Laden Mosque Retrieved from https://archnet.org/sites/578

Source: Aga Khan Trust for Culture

Mosques located along city corridors in Jeddah vary between being integrated with their urban context or being isolated. As shown in Table 3, although the two mosques are located on highway, they show two contradictory examples depending on the nature of their surroundings, as well as on their positioning within it.










The King Saud mosque is in a congested area with a dense urban fabric that makes it more attached and integrated with its surrounding. In contrary, Bin Laden Mosque located on King road, shows a segregation from its surrounding; as it is constructed in a traffic island between main and secondary streets that makes it more dedicated to the passer-by worshipers.

Accordingly, the role and the integration of mosques located on city corridors depends on their location in the city and their position within their context.

Mosques of Selected Residential Neighborhoods

TABLE 4

Examples of mosques located in residential neighborhoods, Jeddah.

Mosque	Description	Location/setting	Drawings/Illustrations
Aisha Mosque  Source: Direct observation	<p>Location: It is located in the center of a residential neighborhood in Al-Naeem district, northern Jeddah.</p> <p>Construction date: April 2013</p> <p>Accessibility: Accessible by car and on foot.</p> <p>Description: The mosque has a very modern design. Its form is dominated by the huge dome that is inspired from a tent like. The finishing of the mosque is a reflective metallic material that makes the form lighter. Although the mosque is surrounded by huge plaza, it usually has no meaningful function.</p>	 Source: Google Earth 	 
Mosque of the Custodian of the Two Holy Mosques 	<p>Location & accessibility: located in a residential area in Shatee district, northern Jeddah. At the same time the mosque is facing a main street where passer by can easily access it.</p> <p>Construction date: 2011</p> <p>Description: Custodian of the Two Holy Mosques or Khādim al-Ḥaramayn aṣ-Ṣarīfayn mosque is following a Royal style. However, many architectural details used in it are following a Moroccan style.</p>	 Source: Google Earth	 

Mosques located within residential neighborhoods are mostly serving the residence of their surroundings. Often, they are connected to outdoor plazas or parks that make them more comprehensive in terms of function and strengthen their integration with their community.

At the same time, the mosque accommodates its orientation (according to *qiblah* orientation) and the direction of the street by having a transitional plaza plays as an outdoor entrance and a gathering lobby.

As shown in Table 4, both residential mosques are well connected with their contexts. They also have a high degree of enclosure as often residences are built with certain guidelines in terms of height and density.

DISCUSSION

The brief investigation of local position of the mosque within its urban fabrics attempts to explore whether or not the mosque is qualitatively integrated with the surrounding structure, and what implication that has on the expected impact of the surrounding public space, especially the living activities and movement of people to and from the mosque location. An overall integration reveals that at least considerable efforts have been planned to connect the architecture of mosques in these neighborhoods near the mosque within its immediate surrounding spaces. The investigation assumes that specific positioning of the mosque site, the activities and movement influenced by the urban fabrics is in the integrated spatial and visual fields within the surrounding urban context contributing relatively to the global integration of the surroundings.

A further observation of the location of the mosque within its setting confirms further the possibilities of circulation around and to the interior of the mosque. This can result in more and strongly linking it up, with the extended activities with the inhabitants. It also indicates the degree of the site design in locating the mosque in the urban fabric.

This brief observation clearly illustrates that the reviewed mosque site plans are less active as an urban element. However, the investigation asserts the view that neighborhood mosques are not only special buildings or landmarks, but rather they are active urban element, which contributes to the community's spatial integration. This, however, should make this case better functional as a mosque within its related communities, stressing a better social cohesion, following one of the most important messages of mosques; the Islamic traditions of the spatial-social cohesion in the society.



As Azam (2007) outlined, “*The higher the embodiment of these traditions, the higher the built environment integration of the mosque; and the higher this spatial integration, the higher the social cohesion*”. As represented in successful urban settings, is achieved, this can therefore provides better urban designs and policies.

CONCLUSION

The relationship between mosque sites and the surrounding urban form has been always a significant urban design subject, particularly over the last two centuries, where planning of cities has been radically transformed following many social transformations. In general, the absence of contextual design approaches for the site planning of mosques, have not used a morphological understanding-based means in positioning mosques in the surrounding urban fabric in order to comply with the successful and workable planning solutions.

The case of designing mosques site in the city of Jeddah shows that this was to achieve a more appreciated traditional townscape of specific qualities. However, conventional planning and design practice in urban fabrics continue to be criticized, producing unsuccessful urbanism in many forms; such as lost spaces, discontinued spatial forms in terms of the format of streets and spaces, isolation of the mosques physically and symphonically from its surrounding contexts, and consequently affecting its direct spiritual symbolism in a negative manner. The lack of morphological integration of mosques with the surroundings without a good understanding of the form and functioning of the existing urban fabrics produced a sort of lack of socio-spatial perspective. This perspective may have three main concerns that must be taken into consideration for the future planning mosques sites.

1. The first concern relates to the perceived dislocation of mosque site design from socio-spatial forms, such as the social roles of the mosque in the living surroundings communities. This conventional practice of piecemeal and collage – like urban site design patterns comprise negative consequences with regards to morphology and design of Muslim communities at large. The related consequences of this dislocation will lead to a lost incorporation link between urban space and form to fundamental healthy and successful societal processes in Muslim communities. The process leads to deep fragmentation in the urban fabrics and further destruction



in both the urban and social roles of mosques and a coherent urban form.

2. The second concern, that of design of good mosque site planning, applies to contemporary planning models involving massive compositions of spatial and visually monumental surrounding developments, the result may be involving the loss of positive morphological qualities of the urban fabric. As, Campbell and Cowan (2002) points out: *“The more urbanism loses its ability to operate with the complex patterns urban space – “the lost art of sub division” – the less open, diverse and coherent are the urban fabrics turned out”*.
3. The third concern is the lack of design quality in the form and space of mosque site planning, and the enduring conservative practice land – use planning is one of the major problems for many contemporary planning practices. This can produce a total failed urbanism and ineffective mosque site design, especially in the context of increased socio-spatial complexity, at least from kind of disconnection between urban form in and mosque design.

GUIDELINES FOR CONTEXTUALIZING MOSQUES

1. Mosques should have the infrastructure to establish/maintain community social interaction of Muslim community.
2. Mosques planning/positioning should be strongly influenced by the urban context to avoid being segregated.
3. Mosques are strong landmarks that can establish/create or strengthen the identity of places.
4. Mosques should include open spaces that can increase their capacity, as well as raising their spatial value.
5. Congregational mosques should have comprehensive functions to have an active role in guiding the Muslim community.
6. Adding more daily needs' functions and potential for multi-facial activities to the mosque, such open areas for various needs or positioning it with connection to plazas rather than designing it only for prayer, makes it more integrated within its context.
7. Transitional spaces between the mosque and its surroundings should be planned to strengthen the physical integration of the mosque with its context.



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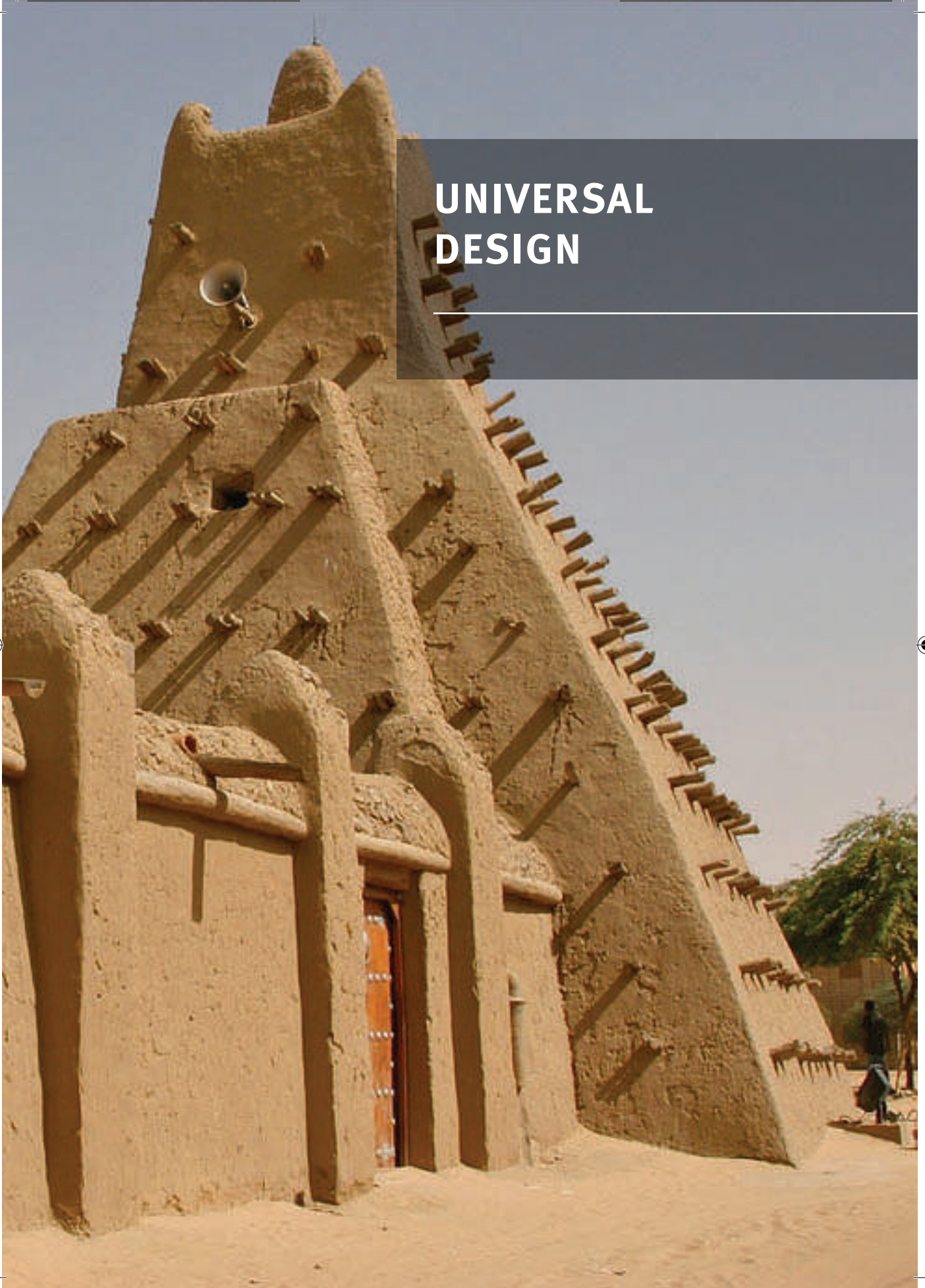
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UNIVERSAL DESIGN







**INCLUSIVE BUILT ENVIRONMENT FOR
MALAYSIAN HERITAGE *MASJID***

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INTRODUCTION

MANY studies stress on the vulnerability of inaccessible environment to the disabled people which highlights the importance of user-friendly or barrier-free environment in today's world (Nur Amirah, A.S. *et al.*, 2018; Asiah, A.R. *et al.*, 2015). With the enforcement of Persons with Disabilities Act 2008, government wishes to provide PwDs with better public transport facility, amenities and services, better health, education, information and technology, habilitation and rehabilitation, employment opportunities, as well as improved access to sports, leisure, and cultural life activities (*The Star*, 2010).

The number of existing public buildings that have done modifications as approved by the standards codes is very few (Chen *et al.*, 2007) which, some of the modifications are not correctly built according to the codes; therefore, they are risky to the users. Imrie (2000) argues that policies, practices, and values of professionals who create the built environment are the main contributors to the barriers in architecture. *Masjid* accessibility has been an issue and it is a problem that needs to be mitigated between design consultants and heritage policy officers in rationalizing upgrading heritage masjid facilities for accessibility purposes.





RESEARCH BACKGROUND

Masjid is a place for worshipping Allah the Almighty for devoted Muslims. Historically, cities were developed around *masjid* which acts as the society centre of the community (Aisha, 2009). *Masjid* also has many other functions besides being a place of worship since the time of Prophet Muhammad (PBUH) where it is a place for conducting meetings, gatherings, educations, celebrations, and even for medical services.

The Inclusive *Masjid*

Widely in Malaysia today, many main *masjid* has opened up their doors into organizing public events such as religious talks and seminars, weddings receptions, and solemnization events that requires the public' participation. There are some *masjids* that offer complementary functions such as nursery/day care, religious school (*madrasah*) and bazaar (*souq*) for business purposes and accommodation. Therefore, a *masjid* should be universally designed to cater all kinds of users, including the Persons with Disabilities (PwDs), the elderly, and children. The importance of providing accessibility is to give the PwDs an equal opportunity for them to perform congregational prayers together with other devoted Muslims in respect of helping them perform their obligation (Utaberta, N. *et al.*, 2017; Asiah, A.R., and Nur Amirah, A.S., 2014).

Accessibility Concerns in Heritage Building

Heritage buildings has been coping with the demand of providing accessibility for PwDs and *masjid* is a priority as it is most visited and used by the public at a daily basis whether historical or heritage, and big or small usage capacity.

Some previous research has shown that in comparing Malaysia and Singapore to the developed countries such as United Kingdom and Australia which had established the Guideline in Improving Accessibility in Heritage Environment, as to improve the equality of PwDs right in accessing the heritage building. The policies in Malaysia regarding PwDs and accessibility in Heritage Environment may not reach the level of that in developed countries such as United Kingdom and Australia. This matter of policies should be taken seriously by government as it will ensure the equal right to enjoy and learn from historic building and places and in the same time it will increase the market for tourism (Zahari, N.F. *et al.*, 2016; Mohd Marsin, J., 2014).





Overcoming the difficulties faced by PwDs requires interventions to remove environmental and social barriers (Asiah. A.R. and Nur Amirah. A.S., 2010). At the moment, the disable people are being neglected from this group due to lack of access and facilities provided. Additional features on having access and facilities for PwDs shall not change the whole view of the heritage building but complimenting with the important activity in conserving the heritage buildings (Yaacob, N.M. and Hashim, N.R., 2007).

Accessibility and Tourism

Currently, one of the highest tourist attraction contributors in Malaysia is the heritage building sector and becomes popular due to its diverse historical background and culture. It attracts local and international tourists to visit. However, the lack of facilities provided especially for PwDs has hindered its future prospects to become globally popular. This matters could hinder the tourist to bring their elderly to visit the building again. Furthermore, the current conservation guidelines and requirements are not comprehensive enough to address the disabled accessibility aspects as important criteria in conserving the heritage building which open to the public. For further recommendation, the author suggests to analyse the act, manual, or guidelines of heritage in Malaysia purposely for disabled accessibility (Zahari, N.F. *et al.* 2016).

The national heritage should be viewed, explored, and enjoyed by everybody without discriminating anyone. Insufficient of provision for disable facilities in heritage act has caused barrier to the disable people to enjoy and visit the heritage buildings and sites. After further searching, there were several acts and regulation associated to accessibility in relation to heritage buildings and *masjid* in particular. These documents are broken down into themes as follows:

Category	Implicating documents
ACTS	<ul style="list-style-type: none">• Persons with Disability Act (Act 685), Sect 26• Street, Drainage and Building Act 1974. Uniform Building (Amendments) by-Laws (UBBL) 1991. By-law 34A
MALAYSIAN STANDARDS (MS)	<ul style="list-style-type: none">• MS 1184:2014 – Universal Design and Accessibility in the Built Environment – Code of Practice (Second revision)• MS 2577:2014 – Architecture and Asset Management of Masjid – Code of Practice• MS 2015-1:2017 – Public Toilets – Part 1: Design Criteria (First revision)
GUIDELINES	<ul style="list-style-type: none">• Garis Panduan Pemuliharaan Bangunan Warisan (2012) www.HistoricEngland.org.uk/advice/technical-advice/easy-access-to-historic-buildings-and-landscapes/





PROBLEM AND ISSUE

Making our heritage *masjid* accessible is an effort of its own as it will have modification and renovation barriers that contradict with the heritage building planning policies and requirements. The lack of access in heritage *masjid* is identified consequential of the design aspect of it that is usually with many steps and stairs, making it an obvious physical barrier for wheelchair users and difficult for temporary ambulant and the elderly. This inaccessibility will eventually discourage the PwDs to visit *masjid* for prayers and other activities at *masjid*.

AIM AND OBJECTIVES

The aim of this research is to: 1. identify and analyse the level of accessibility for PwDs and elderly in heritage *masjid*; and 2. to initiate design adaptation and innovation to upgrade the existing facilities to be Universally Designed for heritage *masjid* with compliance with MS1184:2014, MS2577:2014, MS2015:2017, UBBL, planning permissions and building regulations; and to create awareness for accessibility needs and requirement of PwDs and elderly for management staff of the Masjid and authority personnel.

RESEARCH METHODOLOGY

The research methodology approach is Qualitative Method that will be participatory and narrative design (Creswell, 2009). The qualitative research design selected is content analysis of regulatory documents relating to Accessibility and Heritage Buildings where the form of analysis consists of examining the live situation of obstructions on-site in comparison with the requirements of regulatory building (Walliman, 2011). The data collected from content analysis of related document reviews of Malaysian Acts, Design Guidelines in: Town and Country Planning Department; Department of Public Works; and Department of Islamic Development Malaysia, planning permissions, building regulations, and Malaysian Standards that has been gathered.

The data will be analyzed within the capacity of a case study or a “bounded system” of a specific case example as concluded by Merriam (2009) and the case study that has been selected is a notable enlisted national heritage *masjid* in Kuala Lumpur (Groat and Wang, 2002; Merriam, 2009).

In order to identify and analyze the level of accessibility for PwDs and elderly, an Access Audit Simulation Method was conducted at this





national heritage *masjid* that was selected as the case study. As coined by Holmes-Siedle (1996), this particular method of access auditing a building is to examine an existing building against predetermined criteria designed to measure the “usability” of the building to be “accessed” for disabled people. Usability ranges from getting in and around to exiting the building. Depending on the measurement criteria or checklists of facilities, the assessment examines the percentage of the facilities that can be used independently by disabled people.

The on-site simulation was conducted with Access Audit Team with expert Access Auditors and actual Persons with Disabilities (PwDs) of four identified disability category, namely; wheelchair users; physically challenged; blind and deaf; with interviews on aspect of access and barriers issues. The Access Audit was conducted in three stages:

1. **Pre Audit Preparation Stage** – using a checklist form extracted from MS1184, which is used during access audit simulation to conform the level of accessibility.
2. **Access Audit On-site Simulation** – conducted by a team of Access Auditor Experts and PwDs representatives using specific tools.
3. **Access Audit Report** – report generated in detail addressing existing facilities, issues and design solutions recommendations for further upgrading/renovation.

RESULTS AND FINDINGS

Access audit simulation conducted with an access audit team at the national heritage *masjid* in Kuala Lumpur.



FIGURE 1

Introductory and Access Audit briefing meeting with officer and care taker from the national heritage *masjid*.



FIGURE 2

Starting simulation at an available existing ramp to the *masjid* from the parking area.





FIGURE 3

Ablution area for wheelchair user before entering *masjid*.



FIGURE 4

Identifying all other main entrances are long flights of stairs.



FIGURE 5

Entrance to the prayer hall from the corridor.



FIGURE 6

The prayer hall when not praying hours.



FIGURE 7

Identifying another entrance with stairs.



FIGURE 8

Available toilet at main floor level that is not accessible.



FIGURE 9

Seating or resting facilities that are well designed with the facade .

(a)



(b)



(c)



(d)



FIGURE 10(a)–(d)

Seamless corridor area for path of travel.





Identified Existing and Possible Accessible Route on Plan

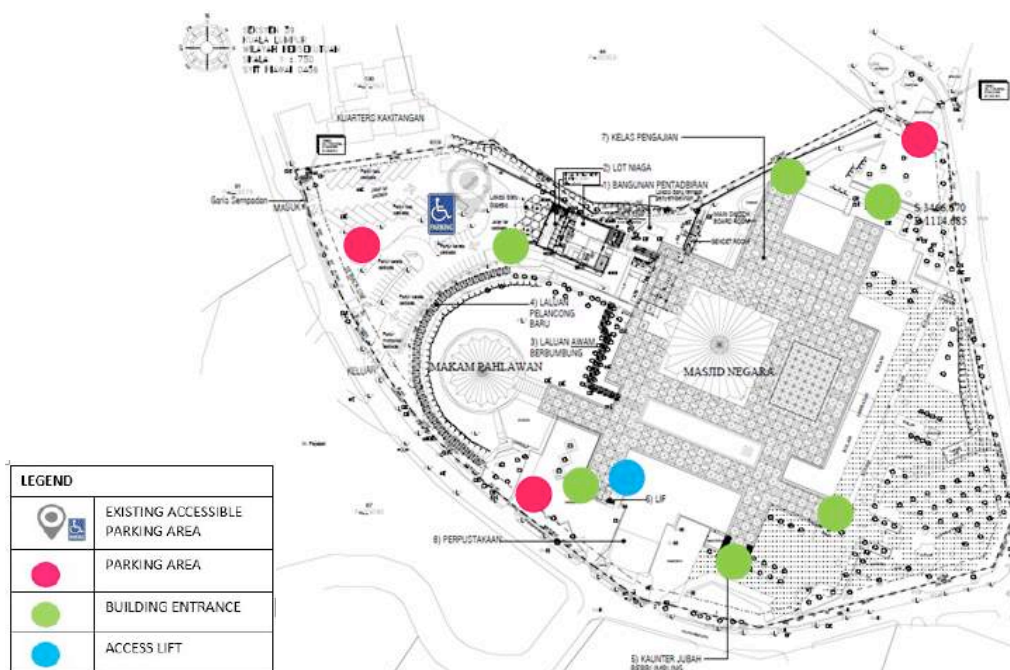


FIGURE 11

Plan location of existing accessible parking, public parking, entrance and access lift.

Access Audit Checklist and Access Audit Report

	1F. ENTRANCE RAMP	Yes	No	Remarks	Score (x)
(a)	<p>Location of the ramp is clearly identify or located at main entrance</p> <ul style="list-style-type: none"> Is the ramp next steps or stairs? 		✓	<p>Entrances into the site. I propose two PWDs wheelchairs where we have lift the entrance 4? (Ramp poorly design with gradient 1:6 at dedicated OKU entrance. Propose to reconstruct new ramp 1:12). Encik Rahmat (WC user) says he is using the temporary ramp installed due to construction works as existing OKU parking is closed. To make good for existing OKU Parking pavement, outdoor ablution, ramp, and OKU toilet.</p>	0




The ramp gradient is 1:12 or > 1:12				
• Ramp at main entrance			Existing ramp with 1:6 gradient. Too steep, slippery and dangerous	0
• Ramp at other locations	✓		To add Additional ramps required at level 1: • To Makam Pahlawan, by taking width 1.2m n gradient 1:12 and need to readjust the steel gate to the makam	0
• Ablution area	✓		Only from OKU entrance has outddor ablution area	1
(b) Ablution area (within the Musolla/Prayer Room area)				
• Limited space allocated		✓		0
• Skid-resistant surface		✓		0
• Bench at ablution pipe		✓		0
1M. ABLUTION AREA (Not Attached/Stand Alone)	Yes	No	Remarks	Score (x)
Ablution area			For ladies, toilet and ablution area are at underground level	
• Limited space allocated		✓		0
• Skid-resistant surface		✓		1
• Bench at ablution pipe		✓		0
1N. MEANS OF ESCAPE DURING EMERGENCY	Yes	No	Remarks	Score (x)
Good lighting and legible signage clearly indicated		✓		0
(c)	 Fair/ Basic Accessibility and Basic Compliance with MS1184:2014			
			21–40%	35-35%

FIGURE 12(a)–(c)

Part of the checklist of access items and score star rating for *masjid* typology in particular this case study of the national heritage *masjid*.



ANALYSIS AND DISCUSSION

TABLE 1

Access audit analysis extracted from the access audit report
conducted at the case study heritage *masjid*.

No	Items	Wheelchair User	Elderly/ Physically Challenged	Deaf	Blind	Remarks
1.	Approach to the building	✗	✓	✓	✓	Current maintenance work
	Accessible parking	✗	n/a	n/a	n/a	Only have one accessible parking and no standing signage
	Path of travel	✗	✓	✓	✗	Has step and stairs at entrances and no warning tactile
	Pedestrian crossing and zebra crossing	✗	✗	✗	✗	No zebra crossing from nearest KTM and public transport
	Kerb ramp	✗	✓	✓	✗	No kerb ramp with no warning tactile
	Entrance ramps	✗	✓	✓	✓	One entrance only with poorly designed ramp, gradient 1:6
	Main entrance of the <i>masjid</i>	✗	✗	✓	✓	Five entrances with stair going up. Only one entrance with ramp (steep, 1:6)
	Horizontal circulation area and corridor	✓	✗	✓	✗	No warning tactile/ too spacious/distance between the area too far
	Door	✗	✗	✓	✓	Heavy glass doors at all area
	Signages, symbol, and wayfinding	✗	✗	✗	✗	Poor wayfinding. No signages provided (due to heritage building restriction)
	Accessible toilets	✗	✗	n/a	n/a	No accessible toilet
	Prayer Hall	✓	✓	✗	✓	Alternative solution for deaf people during <i>khutbah</i>
	Ablution area	✗	✗	✓	✓	Not accessible because underground
	Means of escape during emergency	✗	✗	✗	✗	Evacuation only one access and no alarm and warning light



2.	Steps/Stairs	X	X	✓	X	Difficult for wheelchair user to maneuver within the <i>masjid</i> areas. Width of stairs are very wide and convenient
	Lift	X	X	X	X	Under construction
	Mean of vertical escape during emergency	X	X	X	X	No access for vertical escape
3.	Handrails	✓	✓	✓	✓	Complement original building heritage design
	Resting facilities	✓	✓	✓	✓	Lack of seating for elderly
	Equipment, controls, and switches	✓	✓	✓	✓	—
	Information, technology, and communication	✓	✓	✓	✓	ICT facilities is not developed yet
	Finishes and fixtures	✓	X	✓	✓	No visual contrast
	Eating kiosk, food court, and restaurant	X	X	X	X	Eating kiosk located outside <i>masjid</i>
4.	Service personnel	X	X	X	X	Lack of awareness and communication skill for PwDs
	Facilities management and maintenance	X	X	X	X	Focus on preservation and conservation in term of heritage building

As conclusion from data analysis, the accessibility for horizontal circulation in Masjid Negara is 19.37%, 10.86% for Vertical Circulation, 4.12% for Supporting Facilities and Amenities, and 1.0% for Additional Facilities and Amenities. Thus, the grand total score of accessibility in Masjid Negara is 35.5% with two stars. A further design solution and recommendation for access upgrades for heritage Masjid Negara are as follows.

1. Wayfinding and signages

- to propose five standing accessible maps of Masjid Negara at each entrance showing accessibility for PwDs with logos;
- to initiate wayfinding strategies using directional signages, pictogram outside and within Masjid Negara including corridors, prayer hall, toilets, lift; and



- application of interactive information panel to show the location and access of ablution, toilet, and prayer hall.

2. Ablution

- to propose portable ablution at least two units to be located at praying hall Level 1. The design similar to Masjid Tuanku Mizan, Putrajaya; and
- to provide accessible ablution for VIP and can be used by PwDs using wheelchair.

3. Accessible toilet

- propose accessible toilet for PwDs wheelchair users at staff toilet Level 1.

4. Vertical circulation

- providing chairlift at all staircases to the Ground Level.

5. Horizontal circulation

- to provide ramp 1.2m width 1:12 gradient to Makam Pahlawan; and
- to provide ramp 1.2m width 1:12 gradient to Dewan Syarahan.

6. Awareness

- train awareness program to all staff of Masjid Negara.

7. Designated area

- to provide designated praying area Level 1 for wheelchair users. PwDs who are hearing impaired, to be located behind wheelchair users. Provide a chair for interpreter during *khutbah*.

CONCLUSION AND RECOMMENDATION

It can be concluded and recommended that the proposed improvements should initiate an Access Heritage Masjid Action Plan based on the Access Audit Report established as follows.

Short Term Plan (Immediate Action)

1. Proposed bilingual and pictogram signage designs and direction for effective “way finding”.
2. Periodic maintenance of pedestrian pathways completes with railing and identifying existing stairs and ramps that need to be added.





3. Ensure car parks areas safe for PwDs which provided with zebra crossing as well as improvement of signage and building layout information for them.
4. All staffs who engage at Front Desk should be trained specifically communication skill with PwDs.
5. Add benches around the masjid especially for senior citizens' purposes.
6. The speaker voice of public address system should be increased and cleared information specifically for the Disabled Visible person.
7. Bollard barriers on pedestrian pathways should be discarded due to block wheelchair access to the building.
8. Every disabled toilet should be provided emergency light and panic button specifically for Disabled Blind and Deaf person during emergency case.
9. Projector and monitor in front of the prayer hall should be provided for conveying information specifically to Disabled Deaf person.
10. More Unisex Ablution Area complete with "cubicle screen" or closed area for "privacy" at L1 level specifically for PwDs.
11. Seats should be provided at ablution area specifically for senior citizens.

Long Term Plan (Including with Operational Cost)

- 1 Focusing on and upgrading works specifically for ICT technology facilities.
2. Proposed innovation of the "Accessible Route" Map Design complete with 3D topography/building model that shows the access route and facilities provided in the building.

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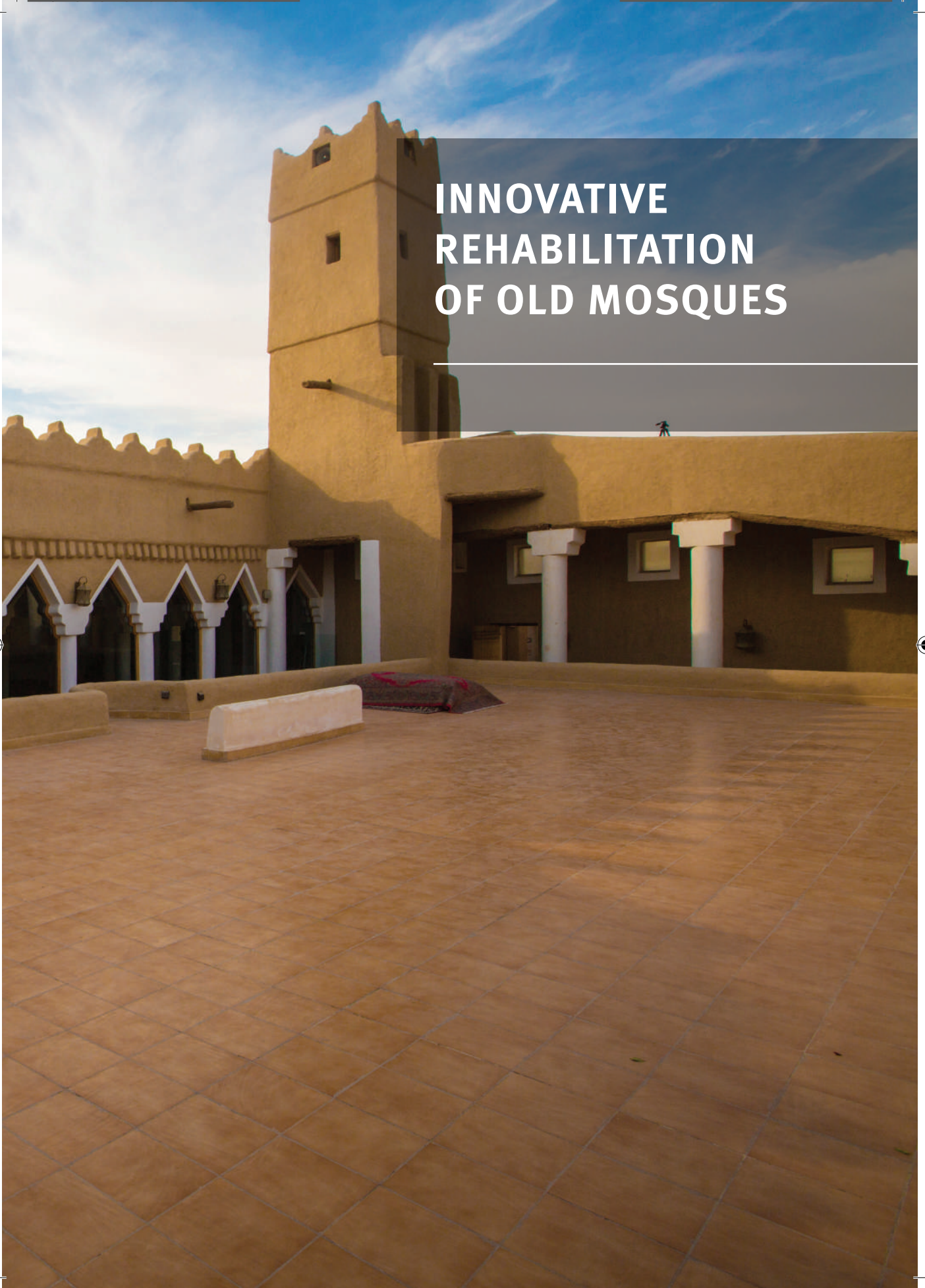
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INNOVATIVE REHABILITATION OF OLD MOSQUES







GUIDELINES FOR THE MANAGEMENT OF HISTORIC MOSQUES

Hossam Mahdy, Ph.D







GUIDELINES FOR THE MANAGEMENT OF HISTORIC MOSQUES

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INTRODUCTION

THE author gathered observations and notes from his professional and academic experience as a conservation architect specializing in the conservation of Islamic built heritage, many of which were historic mosques. The premise of the present paper is based on these field observations and desk research efforts.

A historic mosque is a cultural heritage resource as well as a functioning mosque, and a tourist attraction. It is expected to fulfill at least three roles and is the interest and engagement of three groups of stakeholders, which often results in conflicts of interests as well as functional and aesthetic challenges.

The balance of the three roles requires careful planning and management in order to avoid any conflicts between different functions, users or stakeholders.

A major cause for such conflicts is that each of the three roles is planned and managed by a different group of professionals and stakeholders, who often do not effectively coordinate their efforts to manage the same historic mosque. This lack of coordination is often formalized and deepened by legislations and governmental institutions' mandates, which address each of the three roles in isolation of the other two.

Historic buildings' conservation professional address tangible heritage with little or no interest in the intangible. Religious leaders address intangible heritage, with little or no interest in the tangible. Tourist professionals' interests are often limited to simplified, sometimes shallow, aspects and



representations of both tangible and intangible heritage. The balance between the three roles and groups of stakeholders cannot be reached without proactive interdisciplinary collaboration with regards to both tangible and intangible heritage (Figure 1).

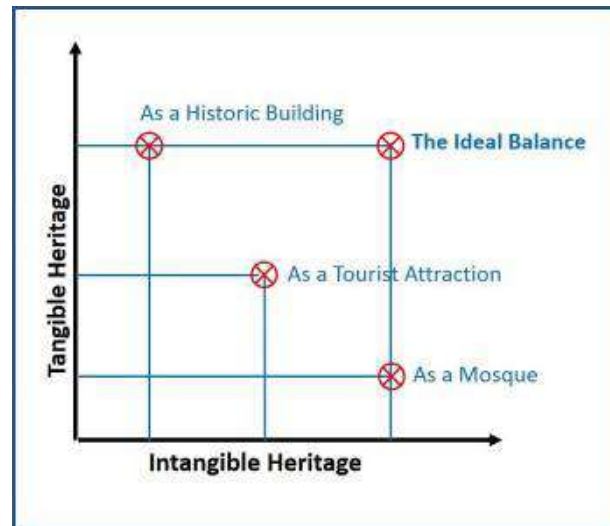


FIGURE 1

Typical challenges facing the management a historic mosque caused by its different roles as compared with the ideal balance of tangible and intangible values.

In the case of Egypt, Syria, Iraq, Maghreb, and many other Muslim – majority countries, the absence of a holistic approach goes back to the process of modernization and the establishment of the modern nation state, with its legal system, educational policies, and institutional structure. The management of historic buildings, including mosques, became the responsibility of the Ministry of Culture or the Ministry of Antiquities. The responsibility of the management of religious functions in mosques became the responsibility of the Ministry of Awqaf and Religious Affairs. The management of tourist venues, including historic mosques, became the responsibility of the Ministry of Tourism. Professionals specializing in one of the three roles of a historic mosque were not informed, educated, or trained to deal with the other two roles in depth (Mahdy, 2017, pp. 46–51).

The result is that the management of historic mosques in many countries around the world manifest challenges to one or more of their three roles.

The present paper aims to propose guidelines for a sustainable, integrated, and inclusive management for historic mosques, taking into consideration all three roles.

The scope of the paper is limited to Sunni mosques in Muslim-majority countries. Furthermore, its scope does not include the holy mosques of Al-Ka'ba, Al-Medina, and Al-Aqsa. It also excludes mosques that are the center of sufi mass gatherings and celebrations (such as *mawlid*s).

The guidelines are divided into three sections. The first addresses the different roles and the challenges each role faces by the other two. Secondly, an approach is suggested to achieve inclusive sustainable management. Thirdly, a further step is suggested to develop an Islamic approach by reconciling traditional Islamic concepts with internationally accepted best practices for living religious built heritage.

DIFFERENT ROLES AND STAKEHOLDERS

For each of the three roles that a historic mosque fulfills, problems are often caused by insensitive management of the two other roles.

A Historic Building

The interests of the conservation authorities and specialists are the sustainable conservation and adequate management of a historic mosque and its interpretation and presentation to the public and to researchers.

A historic building should be managed with the aim of conserving its values in their authenticity, integrity, and cultural significance (Marquis-Kyle and Walker, 2004, pp. 16). A historic mosque is no different. From heritage conservation point of view, a historic mosque should be subject to a monitoring protocol and mechanism in order to monitor its state of conservation and to control changes in its historic fabric, which may be caused by functional or other reasons (UNESCO, 2011, pp. 169–176). Historic mosques are living religious buildings. Their management, therefore, require a delicate balance between functional requirements, sentimental religious embellishments, conservation requirements, and tourists' needs (Stovel, Stanley, and Killick, 2005, pp. 1–11). Unbalanced management of a historic mosque produces one of the following conservation problems, as observed in many mosques around the Islamic World.

1. Incompatible functional adaptations or modernizations, such as incompatible sound system, lighting bulbs, air conditioning units, ceiling fans, shoe racks, bookshelves for Qur'an copies (Figure 2), ablution facilities, toilets, arrangements for segregation between males

and females, accessibility and circulation arrangements. Furthermore, arrangements for special events and activities may be incompatible with the vulnerability of historic buildings such as offering food and staying overnight in the mosque during the month of Ramadan, and the arrangements for funeral prayers.

2. Incompatible decorative adaptations, as religious sentimental expressions, such as hanging Qur'anic verses, Hadith verses, Islamic calendar, prayers timetable, colored (often green) lighting bulbs, and graffiti either by painting over selected architectural elements or writing a religious text (Figure 2).
3. Insensitive visitors' programs, facilities, and services, such as the access of a great number of tourists, more than the carrying capacity of a historic mosque. Also, bus parking spaces and different services for tourists may threaten the integrity of a historic mosque.



FIGURE 2

The interior of Sinan Pasha Mosque, Cairo.

An example of incompatible functional and sentimental adaptations, such as book shelves, neon tubes for lighting, and a verse from the Qur'an lit by neon tubes around the *mihrab*.

A Mosque

Mosques are managed either by a local committee or by a central governmental body, such as the Ministry of Awqaf and Religious Affairs in many Muslim-majority countries. In the case of historic mosques, this role is often limited to religious functions and activities, while all issues concerning the historic fabric of the building, such as periodical maintenance, repairs, and alterations are the responsibility of the heritage authorities. In most countries, this is a strict separation enforced by legislations pertaining to the protection of historic buildings.

Islamic *fiqh* dictates the rules of prayers and the organization and management of mosques. The scope can vary greatly, from the mosque being simply a piece of land where Muslims pray directed towards *qiblah* as one extreme, to the other extreme of the mosque as a multifunctional complex designed, built and managed to house a big number of worshippers as well as religious and social activities.

A historic mosque is often rehabilitated and adapted to offer worshippers the convenience of modern living standards. An unsuccessful rehabilitation may result in one of the following problems.

1. Insensitive conservation approach that doesn't recognize that a historic mosque is a living religious heritage. This may result in the museumification of the building and denying worshippers performing their prayers and other rituals in a comfortable and a spiritual manner. This could be manifested in poor lighting of the interior, uncomfortable microclimate, absence or inconvenient of ablution facilities and/or absence of vehicular parking. In some cases, a mosque ceases to function and is kept as an archaeological ruin (Figure 3).



FIGURE 3
Qutb Minar.

An example of mosques which are conserved and managed as ruinous archaeological sites.



2. Insensitive visitors' programs, itineraries, facilities or services, such as organizing the visit of a big number of tourists, visits at inappropriate times, or tourists dressed or behave in disrespectful manner. Other challenges could be visitations during prayer times or loud tour guides' explanations. In the case of some monumental historic mosques, a sound and light show in front of a mosque may disturb the prayers inside, such as the case of Sultan Ahmed Mosque in Istanbul (Figure 4).



FIGURE 4

Sultan Ahmed Mosque, Istanbul.
The sound and light system, catering for tourism disturbs
the tranquility of the mosque during night prayers ('Isha).

3. Elements or aspects of a historic mosque which are considered prohibited or unacceptable by the school of thought (*madhab fiqhī*) that is followed by the present authorities and/or worshippers, such as the existence of a mausoleum or more inside a mosque, which may have been acceptable by the founders of a historic mosque at the time of its construction, but not acceptable by its users and managers today.

A Tourist Attraction

Most historic mosques are either tourist attractions or potential ones. Usually, Muslim tourists visit historic mosques for their intangible heritage values, such as being the mosque built or used by the Prophet or an important historic personality such as a companion of the Prophet, a scholar or a pious person. Muslims also visit historic mosques for being part of a historic narrative, such as an important event or battle.



On the other hand, non-Muslim tourists visit historic mosques mainly for their tangible heritage values, such as their architectural style, decorations or movable heritage objects housed in them (e.g. Qur'an historic copies, beautiful old lanterns or candle stands). Some countries prohibit non-Muslims from entering historic mosques, such as in Yemen and North Africa. However, in most countries, non-Muslims are permitted to enter historic mosques, which creates one of the following challenges.

1. The location and design of a historic mosque may not offer the appropriate facilities and accessibility expected by tourists. For example, historic mosques are often located in the heart of medieval urban fabric, where a tourist bus may not be able to access. In such urban context, there may be no appropriate facilities such as cafes, restaurants, toilets, or souvenir shops to serve tourists. Another example is the many steps that should be climbed up and down to access and move inside a historic mosque, which could be inconvenient, particularly for the elderly and tourists with special needs.
2. The religious functions of a historic mosque may restrict the times, durations, or itineraries for tourists. Also, tourists may need to receive basic orientation regarding the appropriate code of conduct inside a mosque, including dressing code, taking off shoes, reducing noise, and whether photographing is permitted or not.

The segregated zones and circulation paths in a historic mosque between men and women may require special arrangements or may impose certain restrictions on mixed-gender groups of tourists.

3. Understanding and enjoying the history, architecture and/or the significance of a historic mosque may be obscured by religious practices, such as covering important inscription by a sheet of prayers timetable, etc. It may also be reduced by functional arrangements for the comfort of the worshippers (Figure 5).

Another challenge may face the interpretation of a mosque is the difficulty to place signage and explanatory notes to inform and guide tourists, as such signage may be considered distracting or unacceptable from religious point of view by the worshippers using the mosque.

4. Security is a challenge facing non-Muslim tourists visiting a historic mosque as the rising tensions and fears between Muslims and non-Muslims caused by the phenomena of terrorism and Islamophobia.



FIGURE 5

Al-Hussain Mosque, Cairo.

High-tech shading devices liked by worshippers,
while considered inappropriate and confusing by tourists.

INCLUSIVE SUSTAINABLE MANAGEMENT

For the management of a historic mosque to be sustainable and inclusive, its three main roles should be integrated by accommodating the interests of the three groups of stakeholders. However, if a conflict arises between two or more of its roles, it is crucial to negotiate an informed reconciliation based on the understanding of what is negotiable and what is not.

Non-Negotiable Issues

Non-negotiable issues must be understood, acknowledged, and accommodated by any sustainable management plan. They are identified with regards to the three main roles of a historic mosque.

1. As a historic building, the authenticity and integrity of a historic mosque are non-negotiable issues. If a mosque is listed as a historic building, any compromise on its authenticity or integrity would be punishable by national laws on the protection of cultural heritage. This is more so for historic mosques that are listed as World Heritage Sites, or if they are components of a World Heritage Site. This includes both tangible and intangible attributes of a historic mosque (UNESCO, 2011, pp. 169–176).



2. As a mosque, Islamic *shari'ah*, *fiqh al-masajid*, and *fiqh al-salah* identify non-negotiable issues for a historic mosque (Rasdi, 1998, pp. 122–132). These issues are well defined and published as religious literature, even if mostly unknown to heritage conservation specialists.
3. As a tourist attraction, there are minimum requirements for the safety, comfort and support for tourists visiting a historic mosque (ICOMOS, 1999).

Integration and Reconciliation

Apart from the above-mentioned non-negotiable issues pertaining to the three roles of a historic mosque, a balance should be negotiated. Accordingly, integration of the three roles should be the aim of a historic mosque's management plan. If integration is not achievable, then reconciliation should be the aim (Figure 6).

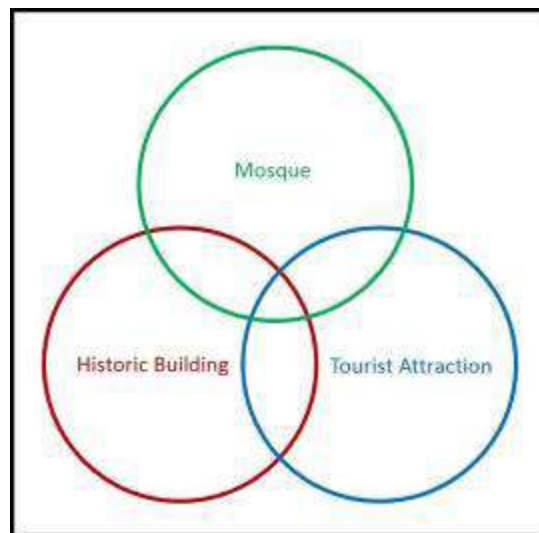


FIGURE 6

A diagram representing the integration and reconciliation of the three roles of a historic building that should be negotiated.

In most cases, a balance is achievable between the following two extremes.

1. One extreme is the case of a conflict between two or three of the roles, which does not allow for their integration (Figure 7). For example, in the case of a historic mosque of a very high archaeological value and



fragile fabric, reconciliation could be achieved by separating the three roles by the following arrangement:

- (a) moving the function, and religious activities outside the historic mosque and house them in a new structure on the site or in its vicinity;
- (b) restricting the presentation and interpretation of the historic mosque to an onsite visitor center, or in a 1:1 model, or an online virtual tour; and
- (c) restricting access to the historic fabric of the mosque to researchers, archaeologists, and conservation specialists.

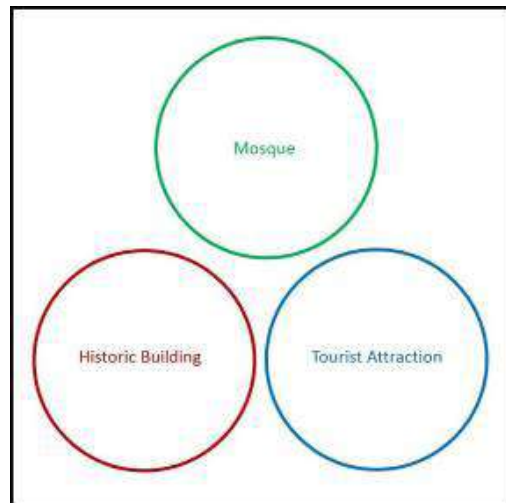


FIGURE 7

The separation of the three roles of a historic mosque if integration is not possible without unacceptable compromises, which may be the only balanced approach in some extreme cases.

- 2. The other extreme is the case of possible achievement of full integration between the three main roles of a historic mosque (Figure 8) by:
 - (a) including historic and heritage values of the mosque into the worshipers' awareness, and including tourists' visits into *da'wa* activities (introducing Islam to non-Muslims);
 - (b) raising tourists' awareness of the code of conduct inside a mosque, and integrating the intangible and spiritual values and dimensions of a historic mosque within its interpretation for tourists; and



- (c) conserving, rehabilitating, and managing the historic mosque as a living religious heritage with respect to its roles as a mosque and as a tourist attraction.

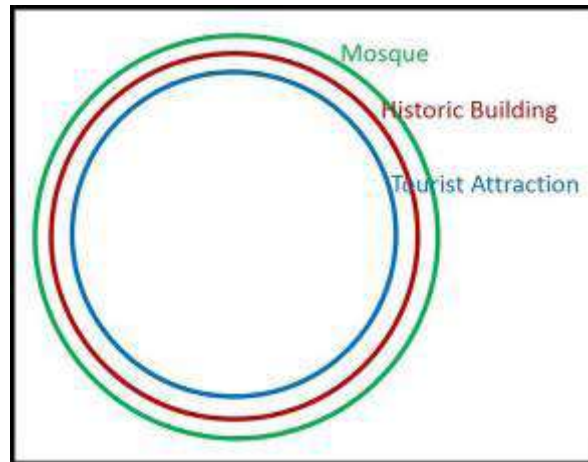


FIGURE 8

The full integration of the three roles of a historic mosque, as the other extreme.

TOWARDS AN ISLAMIC APPROACH

Further integration and reconciliation should be sought between internationally recommended best practices for management of religious living built heritage and well established centuries-long Islamic concepts and practices of managing mosques.

A Holistic Approach

The last few decades witnessed calls to reverse pigeonholing of different fields of knowledge and action in favor of a holistic multidisciplinary and interdisciplinary approach. In the field of heritage conservation, efforts were made over the last two decades to integrate and reconcile previously separate fields of conservation such as culture and nature, tangible and intangible, movable and immovable heritage. Also, integration of development and conservation have been advocated by UNESCO, ICOMOS, the World Bank, and other leading organizations.

In premodern times, a holistic approach to different fields of knowledge, science, and arts was the norm, particularly in the Islamic World.



Muslims have a great advantage with regards to adopting a holistic approach as they have the moral and philosophical backing for such approach.

Islam instructs Muslims to reflect on the meaning of life and on man's role on earth. Premodern Muslims did not restrict their knowledge to a single specialization in isolation. Muslim scholars often excelled in more than one field of knowledge. Consequently, Islamic different plans and activities in premodern times were holistic and inclusive.

The management of a mosque, and other buildings was holistic up to the establishment of modern nation states. Revisiting and reclaiming past management models should be taken into consideration in the planning of a holistic approach for the management of historic mosques.

Learning from the Prophet's Approach

The design, function, and management of the Mosque of the Prophet in al-Medina al-Munawwarah has been the reference and model for mosques around the world. The Prophet's approach was to establish the mosque as the hub for the community of Medina, where meetings, education, communal activities and even entertainment took place as well as prayers and other Islamic rituals. Furthermore, Muslim and non-Muslim visitors to the Prophet and his companions were received in the mosque. The Prophet established an integrated and inclusive approach that should be observed in managing historic mosques today (Rasdi, 1998, pp. 122–132).

Waqf

Although the endowment system has been well known before Islam, the *waqf* system as a form of *sadaqah jareeyah* was initiated by the great companion of the Prophet, and the third Khalifa, Uthman ibn Affan at the time of the Prophet and developed over time into a formidable mechanism for sustainable conservation and management of buildings and institutions. Historic manuscripts of *waqf* deeds (*waqfeyyahs*) from different historic periods and different geographic regions of the Islamic world testify to thorough effective legal, financial, administrative, and maintenance arrangements that secured the conservation and flourishing of mosques for centuries after the death of their initial founders (Ghazaleh, 2011, pp. 1–22).



The centralization and/or abolishing of individual *waqf* administrations in modern times caused the loss of such an efficient system of conservation and management for historic mosques that stood the test of time (Al-Beshri, 2010, pp. 665–680).

It is essential that modern approaches to conservation and management of historic mosques reconsider the *waqf* concept. More so than other types of buildings, since any mosque is itself a *waqf* by definition, for its ownership is transferred from its founders to Allah once the building is completed and used as a mosque.

Required Changes

The proposed approach for managing historic mosques is high level guidelines that requires changes, which should be tailored and differ from one place to another and from one country to another.

Changes are required on different levels:

1. on the level of a single historic mosque, architects, conservators, imams, worshippers, and other stakeholders need to adopt a collaborative and transparent approach to negotiating an integration and reconciliation of different interests and requirements into a holistic approach for managing historic mosques;
2. on national and regional levels, there is a need to introduce the appropriate changes to institutional structures and mandates as well as to legislations and planning procedures in order to encourage, if not to enforce a holistic, sustainable, and inclusive management approach; and
3. on the academic level, research, education, and training should address the challenges facing the implementation of the proposed approach in different situations and localities.

CONCLUSION

The management of historic mosques should be planned and implemented with understanding and respect of their different roles dictated by their values as living religious heritage resources.

The present paper suggests high level guidelines in three main steps: The first is to identify the different roles and stakeholders for a historic mosque



and the resulting conflicts and challenges. Secondly, to identify the non-negotiable issues for each role, then find the right balance that respects these issues with the aim of reaching integration and reconciliation of all roles. The third and final step is to work towards an Islamic approach by identifying relevant tried and tested approaches and practices from Islamic history in order to reconcile them with internationally accepted best practices for management of built heritage.

Further research is required on:

1. changes required in different places, and on different levels to follow the proposed guidelines;
2. requirements for the management of the holy mosques of Al-Ka'ba, Al-Medina, and Al-Aqsa, which assume much more roles and stakeholders than other historic mosques, therefore require careful investigations and research for each of them;
3. requirements for the management of historic mosques that are the center for a religious festival (*mawlid*), such as the mosques that house celebrations of the birthday of the Prophet or the birthday of pious Muslims;
4. requirements for the management of historic buildings that were built and used by non-Muslim, then adapted and used as mosques by Muslims, such as many mosques in the West. Although such buildings are categorized as “historic buildings”, they require specific investigations and research since their historic values are not related to their function and meaning as mosques;
5. requirements for the management of historic buildings that lost the role of a mosque. As they were built and used by Muslims before the Muslim populations were defeated and expelled out of the city, region, or country, such as in the case of Andalusia and many areas in east Europe and the Palestinian occupied territories.

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A photograph of a mosque courtyard. On the left is a long, high wall made of reddish-brown mud-brick. The wall has a decorative band of small, dark, triangular openings. Above this band, a series of white, conical structures are visible along the roofline. To the right, a tall, slender minaret rises into the sky. The courtyard floor is paved with light-colored stone tiles. In the foreground, there is a curved wooden railing made of dark, weathered logs. A large, green palm tree stands in the center of the courtyard. The sky is blue with scattered white clouds.

INNOVATIVE TECHNOLOGIES IN SPIRITUAL CONTEMPLATION

MIZWALAH TAHA:
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OF TRADITIONAL MOSQUES
ARTEFACTS

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APPROPRIATE DAYLIGHTING
SOURCES DESIGN FOR SPIRITUAL
SPACES IN SAUDI ARABIA

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Ahoud Al Bat'hi
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REVERBERATION TIME IN
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Nazli Che Din

SUGGESTED FRAMEWORK
FOR NOISE ASSESSMENT
IN MOSQUES

Mostafa J. Sabbagh
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MIZWALAH TAHA: TOWARD THE REVITALIZATION OF TRADITIONAL MOSQUES ARTEFACTS

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INTRODUCTION

THE importance of time and timekeeping in Islam cannot be overstated. Out of the five main principles of Islam, four of them can only be properly executed within specific times. The Medieval Islamic civilization, with its great emphasis on time measurement and timekeeping, especially in the regulation of prayer times, adopted and utilised sundials, among other scientific instruments, towards these ends.

Time has traditionally been measured by the apparent movement of the Sun and Moon in the sky. The diurnal motion of the Sun is used to measure periods of 24 hours and longer periods of time can be measured by the phases of the Moon.

Sundials have been used, as a primary instrument, since time immemorial, by various civilisations, to measure time. The apogee of sundial development was during the medieval Islamic civilization, with the design and production of various types of sundials that were well documented via treatises. These sundials were built for mosques and madrasahs, either architecturally incorporated in the mosque designs or as standalone instruments.

Nowadays, sundials can still be found in gardens, parks and recreational areas in Western countries, not so much as timekeepers but as cultural and scientific artefacts. However currently, sundials are not being built in the Muslim world and have been relegated as museums exhibits. An initial effort has been made to reintroduce sundials in an Islamic setting in Malaysia by the construction of a sundial, Mizwalah TaHa, in the new Lembaga Tabung Haji complex.

This paper presents the importance of time and astronomy in Islam and the historical and traditional designs and usage of sundials in mosques. Detailed design criteria for the construction of Mizwah TaHa are given, taking into account the features of traditional mosque sundials. A proposition is made that modern Islamic sundials, be built for new mosques, where they can showcase Islamic science and art and that these sundials can be used as pedagogical tools for the study of astronomy and also used as spiritual contemplation aids.

ASTRONOMY AND ISLAM

The eighth to the fifteenth Common Era (CE) centuries, were known as the Golden Age of Islamic science when there was a flourishing of sciences from astronomy to zoology. Astronomy is a science that is especially important for Muslims. The Islamic world was the center of scientific breakthroughs, innovations, and inventions. Great astronomers and scientists such as Al-Khwarizmi, Al-Battani, Al-Biruni, Ibn Yunus till Ulugh Beg produced monumental works that set the foundations for modern science generally and astronomy specifically.

Among the key objectives for the development of Islamic astronomy from the earliest periods of Islamic history were the practical needs to determine direction and times for the execution of Shari'ah mandated activities. There are many verses of Qur'an and Hadith of the Prophet Muhammad (PBUH) that provide encouragement and guidance for the determination of qiblah, time measurement and calendar structure. For example:

"It is He Who made the sun to be a shining glory and the moon to be a light (of beauty), and measured out stages for her; that ye might know the number of years and the count (of time). Nowise did Allah create this but in truth and righteousness. (Thus) doth He explain His Signs in detail, for those who understand."

[Surah Yunus (10): 5]

"They ask thee concerning the New Moons. Say: They are but signs to mark fixed periods of time in (the affairs of) men, and for Pilgrimage. It is no virtue if ye enter your houses from the back: It is virtue if ye fear Allah. Enter houses through the proper doors: And fear Allah: That ye may prosper."

[Surah al-Baqarah (2): 189]

The other main objective for the study of astronomy was to know and glorify Allah as the Creator of the heavens and the Earth.

“Verily in the heavens and the earth, are Signs for those who believe. And in the creation of yourselves and the fact that animals are scattered (through the earth), are Signs for those of assured Faith. And in the alternation of Night and Day, and the fact that Allah sends down Sustenance from the sky, and revives therewith the earth after its death, and in the change of the winds, – are Signs for those that are wise.”

[Surah Jathiyah (45):3–5]

“Behold! In the creation of the heavens and the earth, and the alternation of Night and Day – there are indeed Signs for men of understanding. Men who celebrate the praises of Allah standing, sitting, and lying down on their sides, and contemplate the (wonders of) creation in the heavens and the earth, (with the thought): “Our Lord! not for naught hast Thou created (all) this! Glory to Thee! Give us salvation from the penalty of the Fire.”

[Surah Ali ‘Imran (3):190–191]

Allah SWT has enjoined mankind to study, contemplate, and reflect on the signs of nature in order to know Him.

The sundial can meet the above-mentioned objectives, thus being an instrument for time measurement as well as an aid to contemplate the wonders of the heavens.

SUNDIALS IN TIME

Introduction to Sundials

A sundial is a scientific instrument for telling the time and date from the position of the Sun in the sky. In its most basic form, a sundial consists of two main parts viz, the gnomon and plate. The Sun shines on the gnomon and the shadow of the gnomon falls on the sundial plate that has lines inscribed on it to indicate time and dates. The daily apparent motion of the Sun in the sky rising from the east and setting in the west makes the shadow of the gnomon move from west to east.

Figures 1 and 2 illustrate the working of an armillary equatorial sundial.

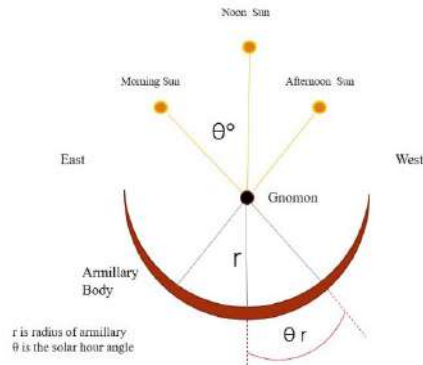


FIGURE 1

The daily apparent motion of the Sun from east to west casts the shadow of gnomon on the armillary body surface to indicate hours.

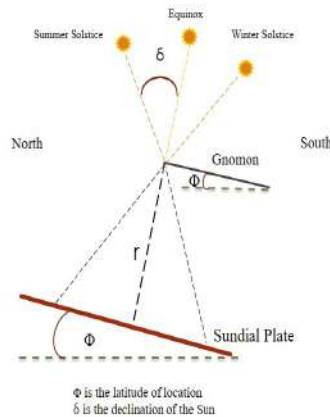


FIGURE 2

The apparent position of the sun (solar declination) in the sky over a period of a year changes in the north south direction to give dates.

Characteristics of Sundials of Islam

There were several types of sundials that were invented and used throughout the medieval Muslim world. Prominent astronomers such as Al-Khwarizmi, Al-Biruni, Al-Battani, Thabit ibn Qurra, and others designed, built and wrote treatises on sundials. Ibn al-Shatir (1371 CE) the resident astronomer and timekeeper, the muwaqqit, at the Umayyad mosque in Damascus had designed a polar pointing gnomon for a horizontal sundial. This was the first sundial in history to measure equal hours and was the most sophisticated sundial known before the European Renaissance¹. Prior

to this, sundials would indicate unequal or temporal hours, the hours in summer being longer than the hours of winter.

According to Prof David King², mizwala was an ancient Arabic generic term for sundials and rukhama and munharifa are respectively terms for horizontal and vertical type sundials. Many sundials found in medieval mosques and madrasahs tended to be of the horizontal and vertical types. However, there were special types of sundials such as the vertical declined, and cylinder types that were built in the mosques in Damascus, Algeria and Cairo³. The earliest and existing sundial, in Islamic history, is the gnomon ('asa) of Mu'adth ibn Jabal (RA), in the mosque of Janad in Yemen⁴. Mu'adth ibn Jabal (RA) was sent by the Prophet (PBUH) as governor to Yemen.

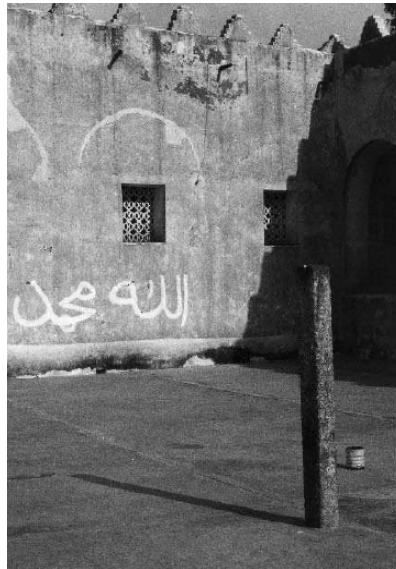


FIGURE 3

'Asa Mu'adth ibn Jabal (RA), in the courtyard of Janad mosque.

Islamic sundials tended not to have any artistic ornamentation on them. This is in stark contrast to other Islamic scientific instruments, such as astrolabes, celestial globes, quadrants and many others that have very rich ornamentation. The reason could be that sundials are placed in the open and as such are exposed to the elements. Sundials, with metal gnomons, tended to be made of marble with the timelines engraved on them. However, other instruments mentioned earlier tended to be made of brass and are portable and only taken out of their casings when used.

One of the main uses of the sundials in the medieval Islamic period was to indicate the times of prayers apart from counting the passing of hours. The indicated prayer times depended on the type of sundial, place used, and the local requirements. It is possible to indicate on most types of sundials all the prayers times, i.e. Fajr, sunrise, Zhuhr, 'Asr, sunset (Maghrib) and 'Isha start times.

The most common prayer time to be indicated on the Islamic sundials are the Zhuhr and 'Asr prayer times. There are some differences in the definitions of the start of the Zhuhr and 'Asr prayer times depending on the localities and school of thought (mazhab) practiced there.

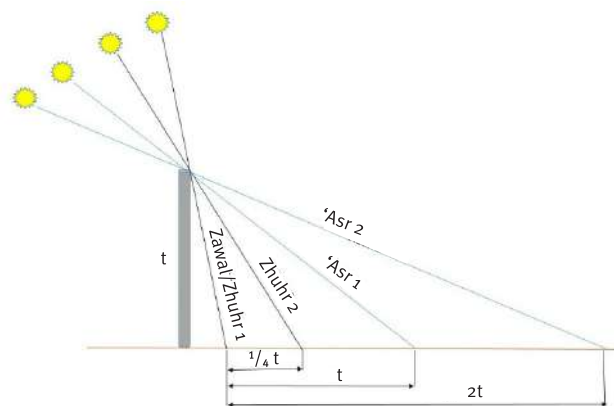


FIGURE 4

The position of the Sun and the shadow length of a vertical gnomon for the different start times of Zhuhr and 'Asr.

Conventionally, the start of Zhuhr prayer time is when the Sun has transited the local meridian and the length of the gnomon's shadow is the shortest (Zhuhr 1 in Figure 4). However, according to King², in medieval Andalusia and Morocco, the start of Zhuhr time was when the shadow length was at Zhuhr 2, i.e. when the gnomon shadow has extended more than its shadow at meridian transit by a quarter.

For the start of 'Asr prayer time, there are two main practices. The majority practice of the mazhab is that 'Asr ('Asr Awal) starts when the gnomon shadow length is equal to its height plus its shadow length at solar transit (zawal), shown as 'Asr 1 in the Figure 4. The second practice, by the Hanafiyah mazhab, is that the time of 'Asr prayers is when the gnomon shadow length is equal to twice its height plus its shadow length at solar transit, shown as 'Asr 2 in Figure 4. 'Asr 2 is also known as 'Asr Thani.

Three representative types of sundials, viz. the muharifah, rukhamah and khatulistiwa (Equatorial) shall be discussed to illustrate their designs. The Ottoman munharifah or vertical declined sundial can still be found on walls of mosques in Turkey³. They tend to be placed on south west walls of the mosque buildings, whereas the qiblah is towards south east. The sundials have two gnomons, one for measuring the hours and the other specifically for 'Asr Awal and 'Asr Thani. The hour lines are marked for every 20 minutes and the hours are based on ezani (Ottoman denotation) or ghurubi hours. The ezani or ghurubi hours were used to mark time since sunset, as the day started at sunset and was denoted 12 hours in the time system used. The following information was also given on the sundial:

1. Zhuhr time;
2. hours to sunset (Maghrib prayer time);
3. Time to 'Asr;
4. 'Asr Awal and 'Asr Thani start times;
5. line to denote 4 hours before start of 'Isha times;
6. lines to indicate 14 hours before start of Fajr.



FIGURE 5

Dr Ilnor Azli beside the *munharifah* of the Fatih Mosque
(built in 1717 CE) in Istanbul.

(Source: Ilnor Azli)

A sophisticated design of a rukhamah is the sundial at the Sidi Okba mosque (built in 688 CE) in Khairouan in Tunisia. An interesting feature of this sundial is that it has 4 gnomons as shown in Figure 6.



FIGURE 6

Four gnomon *Rukhamah* of Sidi Okba mosque in courtyard of mosque.

(Source: Gianni Ferrari)

According to Gianni Ferrari, the information provided by this sundial are as follows:

1. the solar hour angle and local apparent time;
2. Babylonian hours, i.e. hours after sunrise;
3. Italian or Ghurubi time, hours after sunset;
4. Zhuhr time;
5. Fajr, 'Asr Awal, 'Asr Thani and 'Isha start times;
6. direction of qiblah.

The method to obtain the times of Fajr and 'Isha is interesting as its determination is made whilst the Sun is shining, and the time is noted using an astrolabe. The determination of the beginning of Fajr is made when the western most gnomon's (left in figure) shadow falls on one of 2 lines. One of the lines indicates Fajr beginning 20 hours later and another line indicating 21 hours from that instance. The muwaqqit would note the time from the sundial and then determine a reference star which would be above the horizon at the beginning of Fajr the next morning. The next morning, before Fajr, the muwaqqit shall observe the rising of the reference star using his astrolabe. Once the reference star is seen, it signifies the start of Fajr.

Determination of the start of 'Isha times is similar to that of Fajr. However, in this case, the eastern most gnomon's shadow would indicate the number of hours to 'Isha.

There are not many old mosques in Malaysia and of these very few have sundials. The Serkam Pantai mosque, built in 1883 CE, in Melaka state

Malaysia has two simple sundials in its compound. The first is an equatorial (khatulistiwa) sundial for measuring local apparent time and the other a vertical gnomon sundial to indicate Zhuhr and 'Asr times⁵. It does not have the sophistication of the sundials of the Middle East and does not indicate the other prayer times.



FIGURE 7

Serkam Pantai mosque in Melaka state with two sundials.

(Source: Syed Kamarulzaman)

MIZWALAH TAHA

The Malaysian Islamic Astronomy Society had been given the responsibility to design and build a sundial at the new Tabung Haji Hotel and Conference Centre Complex in Sepang, near to the Kuala Lumpur International Airport. This sundial serves as a unique landmark for the complex. Several sundial designs, including the horizontal and armillary types, were submitted to Tabung Haji to make the choice. Finally, the agreed design was the equatorial armillary sundial.

The sundial resembles the logo of Tabung Haji which is made up of the Arabic letters "Ta" and "Ha". It consists of two main parts namely, the armillary body shaped like "Ta" and the gnomon in the form of the letter "Ha". The time and date are indicated where the gnomon shadow or "Ha" shadow falls over the semi-circular surface of "Ta".



FIGURE 8

Panoramic view of Tabung Haji Complex with the Mizwalah TaHa.

(Source: Syed Kamarulzaman)

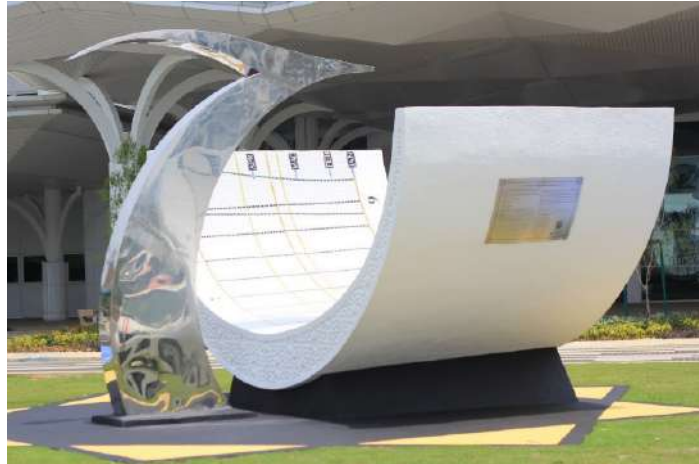


FIGURE 9

Mizwalah TaHa where the “Ta” armillary body and “Ha” gnomon face true north.

(Source: Syed Kamarulzaman)

The technical parameters of Mizwalah TaHa are as follows:

TABLE 1

Technical parameters of Mizwalah TaHa.

Type of Sundial	Equatorial Armillary with axial style
Latitude	2° 47' 19" North
Longitude	101° 40' 39" East
Time zone	UT + 8h
Longitude correction	1hr 13 min 17 s
Height of Gnomon (Ha)	3,500mm
Arc Length of armillary Body (Ta)	6,850mm
Width of armillary body (Ta)	2,500mm
Inclination of Axis of armillary body (Ta)	2.78
Year of construction	2018

The main design objectives for Mizwalah TaHa are as follows:

1. a functional sculpture that showcases Islamic science and art. This sculpture, not only has aesthetic and artistic value, but will also be able to demonstrate the range of measurements of time and dates;

2. it should be easy and practical to read and use;
3. as a teaching tool of astronomy. Hours, prayer times and the position of the Sun above the sky every day are marked. Information is provided in three languages, namely bahasa Malaysia, English, and Arabic. If users need more information, they can browse the related website for more information;
4. as a tool for contemplation and realization of Allah's wisdom and power in ordering the intricate movements of the Sun and Earth. "Do you not see the power of your Lord? How he lengthened the shadows! If He desires, He will make it fixed (unmoving and unchanging), Then We made the Sun as the guide of the shadow" [Surah Al-Furqan (25):45]. This verse was made into a motto for this sundial. Contemplation on the flow of time and reflections on shadows can be made whilst watching the shadow of the gnomon slowly move.

A Functional Sculpture of Islamic Science and Art

In order to meet the stated objective of a functional sculpture to showcase Islamic science, the sundial was designed to measure time as accurately as possible. The Sun makes a revolution of 360 degrees in 24 hours across the local meridian. The meridian line being the imaginary line of longitude connecting the north and south poles, through the location. The Sun's hour angle increases by 15 degrees every hour of time with respect to the meridian line of the sundial. With the height of the gnomon at the centre point of the circular arc being 2,500mm, the gnomon's shadow would move an arc length of 11mm for 1 minute of time and its movement is quite easily discernible. The shadow would move against a background of white mosaic tiles. Tiles of 25mm square are used to indicate lines and the background. Different colours are used to differentiate the various times and dates. It is possible to read the time from the gnomon shadow to an accuracy of 1 minute.

The time shown on the Mizwalah TaHa must be as accurate as possible as any observer would instinctively check his watch or smart phone to compare the time shown on the sundial with that of his device. The displayed sundial time is not meant to compete with the other devices' accuracy as their highly accurate digital time is synchronised with the vibration of caesium crystals, since the adoption of atomic time standards in 1967, and time is no longer from the Sun's apparent movement⁶. In contrast, the sundial time is synchronous with the Sun's movement in the heavens.

Three dimensional decorative embellishments in the form of Islamic geometrical patterns, made of Glass fibre reinforced concrete, were attached to the front and back of the armillary body of the sundial. As the sun moves, the protuberances of the geometrical patterns throw their own shadows on the patterns that make them seem animated rather than static.

The information displayed on the curved surface of the sundial is shaped and sized in such a way that a user can easily read off the surface comfortably while standing.



FIGURE 10

Islamic Geometric patterns on front and back of crescent body of Mizwalah TaHa.

(Source: Syed Kamarulzaman)

Practical and Ease of Use

Islamic sundials in the past were meant to be used by the expert muwaqqits and muadzin and generally not for use by non-experts. The lines engraved on them tended to be numerous and overlapping, with sometimes several gnomons on a single instrument. Thus, reading time from them needed some expert knowledge.

In Mizwalah TaHa, only needed lines are marked so there are not too many lines that can confuse the user. A colour coded system is used to differentiate the line type. The curve's surface is white so that the colour of the information lines can be clearly discerned. This allows a layman to be able to read the time and date. The medieval Islamic sundials did not have any colour coding of the lines making them more difficult to read.

The time given is from 9:00am to 5:00pm Malaysian time (UT + 8) and the time in Mecca, from 4:00am to 12:00am, as the facility is for pilgrims going for Haj pilgrimage. This also allows the observer to see the time difference (5 hours) between the countries clearly and is also a demonstration of the Earth being a globe, where the Sun has risen in Malaysia, whilst it is still night in Mecca.

Astronomy Teaching Tool

An innovative feature that has been set up with the sundial is a website (www.th.mizwalah.org) that contains information, explanations and even animations on the astronomy of the Earth's motion around the Sun. The website is easily accessible via a Quick Response (QR) Code that can be scanned using a smart mobile phone. This is the first of its kind for a sundial.

Contemplations on Time

"It is He who made the sun a shining light and the moon a derived light and determined for it phases – that you may know the number of years and account [of time]. Allah has not created this except in truth. He details the signs for a people who know" [Surah Yunus (10):5]. Man is exhorted to reflect, think and contemplate on the signs (ayat) of Allah in the Universe in order to understand Him and the truth. Approximately 750 verses or one-eighth of the Qur'an exhorts Man to undertake contemplation and thinking. Time is one of the most important of Allah's sign, so much so that several oaths and adjurations in the Qur'an are about time.

There is a Hadith Qudsi in Sahih al-Bukhari (No. 4549) and Sahih Muslim (No. 2246) that Abu Huraira reported: The Messenger of Allah, peace and blessings be upon him, said, "Allah Almighty said: 'The son of Adam abuses me. He curses time and I am time, for in my hand are the night and day'."

The Economist magazine had an interesting study on the social problems in modern cultures that result from a "time-is-money" mindset in people⁷. Once time is financially quantified, people worry more about wasting, saving or using it profitably. Psychologists⁸ have discovered that there exists a correlation between time, money and anxiety. "Busy" is that frenetic, always alert multitasking that propels people through overburdened lives. It involves being always "on", glancing regularly at their phones and jumping from task to task. It is the juggling, cramming and rushing that make up so much of their daily existence. It is urgency, distraction and exhaustion.

In this era of ubiquitous communication technologies where computing power and internet connection speeds are increasing exponentially along with sheer quantity of information and entertainment such as instant messaging and social media, people have developed a greater urge to satisfy their needs instantly. Any delays in their ability to satisfy desires instantly also breed impatience and anxiety. The 2014 Economist article quotes research from Google that people visit websites less often if they are more than 250 milliseconds slower than a close competitor. Newer research in 2016, by Google⁹ has found that 53% of mobile website visitors will leave if a webpage does not load within three seconds. When experiences can be calculated according to the utility of a millisecond, it can create impatient and harried individuals.

Albert Einstein noted: "An hour sitting with a pretty girl on a park bench passes like a minute, but a minute sitting on a hot stove seems like an hour". Thus, when one is engrossed and busy with someone or something that is the objective and love of one's life, time seems to pass very fast and there is not enough time to do things.

From an Islamic spiritual perspective, this phenomenon is prevalent because modern man has secularised time. Sheikh Imran Hosein¹⁰ explains that all through history, time has remained as Allah created it, except in this age. Professor Syed Muhammad Naquib al-Attas had analysed secularisation and its danger to Islam in his landmark study on "Islam and Secularisation"¹¹. He states that secularisation is a loosening of the world from religious and the breaking of all supernatural myths and sacred symbols. It is the turning of Man's attention away from the worlds beyond and towards this world and this time.

S. Imran Hosein goes on to refer to the Prophetic tradition of the secularization of time as one of the early signs of the Last Age. The Prophet (PBUH) said that time would move faster and faster until a year would pass like a month, a month like a week, a week like a day, a day like an hour and an hour like the time it takes to kindle a fire. The secularization of time has brought this about and time no longer leads the heart towards Allah but makes it busy and preoccupied with the present world (dunya).

Unfortunately, the Ummah is not immune to this disease that the Prophet (PBUH) called al-Wahn, that the Prophet defined as "Love of the dunya, and hatred of death". We have fallen in love with dunya. Anytime one is enamored with someone or something, it becomes next to impossible to get over that love or be separate from it.

In the Mizwalah TaHa, it is believed that the analogue nature of the information, and the way the information is derived from nature, will contribute considerably toward a perception of time that is less intertwined with human needs and desires.

Reflections on Shadows

Shadows, in Arabic al-dzil, are the opposite of brightness. Allah has described Heaven where, "Food and shade are perpetual" giving a meaning that Heaven is always shaded. Al-Abbas bin Abdul Mutalib and al-Nabighah al-Ja'diy characterised Heaven as covered by shadows that make it shady¹².

Allah also describes the condition of the inhabitants of Heaven where they "shall find therein neither the severe heat of the sun nor intense cold". This can mean that Heaven is shady due to shadows of the trees that encompasses its inhabitants¹³.

Surah Ar-Ra'ad (13):15 illustrates Allah's power over every created thing, including their shadows; "And to Allah prostrates whoever is within the heavens and the earth, willingly or by compulsion, and their shadows [as well] in the mornings and the afternoons". In another ayat, in Surah An-Nahl (16):48, "Have they not considered what things Allah has created? Their shadows incline to the right and to the left, prostrating to Allah, while they are humble".

In above verses, shadows are described as prostrating, due to their natural movement from west to east and lengthening and shortening in the duration of a day.

Allah has created several kinds of shadows, that have their own meanings and functions. Hence, the word shadows in the verses is always in the plural tense. There are beneficial as well as harmful shadows. The beneficial shadows are found in Heaven and the harmful ones in Hell.

Shadows have also been used as metaphor for the ephemeral and transient by Muslim scholars and mystics. Ibn al-Qayyim (14 century CE) a prominent ulama is reported to have said that "This worldly life is like a shadow. If you try to catch it, you will never be able to do so. If you turn your back towards it, it has no choice but to follow you"¹⁴.

Observing the movement of the shadows on a sundial can bring one to a contemplative state and brings one to be in synchrony with the motions

of the heavens. This can bring about a slowing down of modern man's life that is dictated by ever smaller divisions of digital time, to the primordial slower tempo of life, especially in the environs of prayer and meditation. The Mizwalah TaHa can hopefully also be used as an aid to such spiritual contemplation.

Information Given by Mizwalah TaHa

The information given by Mizwalah TaHa mirrors the information given by medieval Islamic sundials, such as prayer times and hours whilst adding modern time and date information as follows:

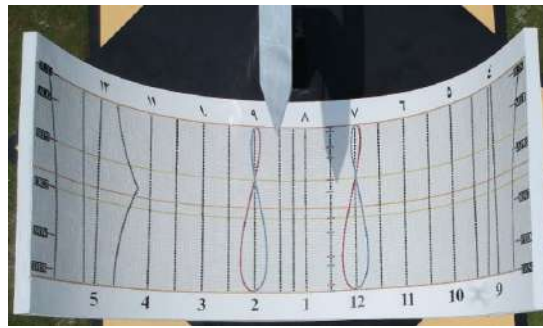


FIGURE 11

The shadow of the gnomon casted on the body of the Mizwalah TaHa indicating 12:20 hrs. on 8th April.

(Source: Syed Kamarulzaman)

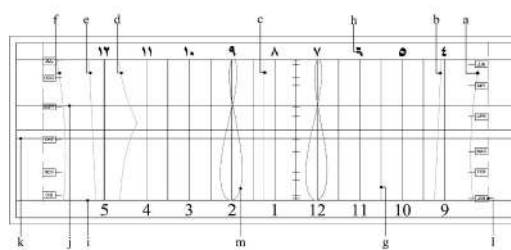


FIGURE 12

Lines and marking on crescent shaped body.

(Source: Syed Kamarulzaman)

The following information can be obtained from the sundial. The following numbers refer to the parts of the sundial body in the figure above (prayer times lines are coloured green):

1. 2.5 hours after Fajr;
2. 2 hours after sunrise;
3. start of Zhuhr;
4. start of 'Asr;
5. 2 hours before sunset and Maghrib;
6. 2.5 hours before start of 'Isha;
7. local apparent times, that have longitude correction built in for 120 degrees time zone, are indicated with black lines. Times are from 9:00 a.m. till 5:00 p.m. with half hour lines;
8. Mecca times are shown in Arabic numerals from 4:00 a.m. till 12:00 noon;
9. sun declination in orange colour; summer solstice (22 Jun.), winter solstice (22 Dec.), equinoxes (22 Mar./22 Sept.). It indicates the position of the sun in the sky during the course of a year;
10. anniversary date for Malaysian Independence Day on 31st Aug. 1957 is indicated by a horizontal yellow line;
11. anniversary date of incorporation of Lembaga Tabung Haji on 30 September 1963 is indicated by a horizontal yellow line;
12. the first of the months are indicated by short lines and coloured blue for January to June and red for July till December;
13. analemma, shaped like the number eight, consists of two colours; blue from January till end of June and red for dates between early July till the end of December.

CONCLUSION

Mizwalah TaHa was designed in the tradition of Muslim scientists, as an effort to revive and revitalise an important architectural, cultural and scientific artefact associated with medieval mosques.

It is recommended that efforts be made to build Islamic sundials as landmarks of mosques, parks, schools or institutional buildings serving as functional sculptures showcasing a combination of Islamic art and science.

With the use of modern materials and construction methods, an innovative and creative designer can turn a purely functional scientific instrument into a versatile conduit for the expression of his creativity and imagination, that can be a work of art as well as a fascinating utility for the general public.

In the present age of heightened environmental consciousness, sundials are the ultimate eco-friendly, solar powered device, which does not produce any pollution and almost requires no maintenance. Sundials can continue to function as long as the Sun continues to shine in the sky.

Sundials can also be used as a means to contemplate and reflect on the continuously unfailing, systematic and precise movements of the Heavens and the Earth. These are indications and evidences that this universe has a Creator and a God that holds it together by the laws that He decreed.

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APPROPRIATE DAYLIGHTING SOURCES DESIGN FOR SPIRITUAL SPACES IN SAUDI ARABIA

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INTRODUCTION

SPIRITUALITY is introduced as a critical variable in the meaning of space. It is defined in the Oxford English Dictionary as “the quality of being concerned with the human spirit or soul as opposed to material or physical things”¹. Spiritual space involves places that are constructed for spiritual purposes, such as mosques and churches. In this research, the study is carried out in a mosque as an example of the common spiritual spaces, in KSA.

The mosques are classified into two major types: (a) the masjid jāmi, or collective mosque: a large state-controlled mosque that is the heart of community worship and the site of Friday prayer sermons; and (b) smaller mosques operated personally by different groups within the community². In general, the mosque is usually roofed over and contains a Mihrab, which is a semi-circular niche reserved for the Imām to lead the prayer. It also contains the Mimbar, which is a seat at the top of steps placed at the right of the Mihrab, and it is used by the preacher (khatib). In most cases, carpets cover the floor of the mosque, where the ritual prayer is performed².

Mosques in KSA are generally built by government authorities as well as private individuals. The mosque varies between the small neighborhood mosque and the large Friday mosque. The Technical Department of the Ministry of Islamic Affairs, Endowment, Da'wa, and Guidance of the Eastern Province (MIAEDG) had established standard designs for mosques. This study adopts a local mosque as the design of a model reference base, Ibn

Al-Qayyem Mosque, in Dammam, was chosen due to its conformity with the specifications and characteristics of the typical small neighborhood mosque in KSA.

In spiritual spaces, daylight has a significant role in creating a bridge between God and believers in spiritual spaces³. The openings such as windows considered as one of the most suggestive building components, that have a positive influence on the health, performance, comfort, and well-being of building occupants⁴⁻⁵. Moreover, the light – including quality and quantity of light, the combination of lighting, color, and shadows – played a symbolic role of sacred, faithful, cosmologic beliefs, and the overall spiritual and mystical balance^{3, 6, 7}. The light, particularly daylight in the religious buildings is an influential factor in the spiritual relationship between the believers and the religion and between the believers and the building⁶.

LITERATURE REVIEW

Some research studies have been conducted to investigate relevant aspects of daylighting issues in spiritual spaces^{3, 6-10}. Most of these previous studies consider the daylight performance regardless of the spiritual aspects, while others focus only on the spirituality without consideration of the quantity and quality of light. In respect to the spirituality aspects of the sacred spaces, a study investigated the relationship between the spatial structure and the daylighting based on a comparative analysis of a Byzantine church and an Ottoman mosque in Thessaloniki. The comparative analytical method is done by using depth-map software and light analysis in the interior space⁶. Fitoz and Berkin³ explained how the daylight provides a character to the religious spaces, and how it shows the sacred and aesthetical images.

Other research studies have been conducted about the lighting analysis in mosques. Arab and Hassan⁸ analyzed a particular technique of roof construction, which is the pendentive dome to measure the performance of daylighting in a specific mosque in Istanbul. However, the results cannot be generalized on other mosques. Another research investigated the opportunities for providing sufficient daylighting for reading Qur'an before Friday prayer, through openings' design in terms of its location, area, and orientation⁹. Moreover, Yahya¹⁰ identified the quality and quantity characteristics of daylighting in Sinan's mosques and analyze the daylight in terms of the light zone concept. However, the utilization of daylight sources (openings) in spiritual spaces yet needs further investigations.

More research is needed to understand how these openings can be applied to minimize the using of electric lighting sources during the day, while still providing a comfortable visual environment and considering the enhancement of the spirituality aspects.

LIGHTING DESIGN CONSIDERATIONS FOR SPIRITUAL SPACES

In spiritual spaces, such as churches or mosques, lighting design requirements and decisions vary according to worshipers' needs, religions, and liturgy. Whether it is a church or a mosque, lighting is one of the primary design criteria that should accommodate the particular needs and desires of a user. In mosques there are some key aspects should be taken into consideration, for example, space type (prayer hall), where Muslims congregate to carry out prayer and activities relevant to their faith such as recite the holy book "the Qur'an", and socializing¹¹.

Quantity of Lighting in Spiritual Spaces

Quantity is a measurable value of how much light is in space. When incident light illuminates an interior space (e.g. prayer hall), the total amount of received light coming from all directions can be measured at a point by one of the lighting metrics which is illuminance (light level) in lux¹²⁻¹³. In mosques, light levels are mostly related to the creation of an environment with adequate general illumination across space, rather than to accentuate objects⁶. Visual comfort for face-to-face communication between people is also required for socializing. Table 1 shows the recommended quantity of light as a minimum maintained illuminance level (lx) in relation to tasks in the mosque. However, recommended illuminance should be used in conjunction with other relevant lighting criteria to provide a comfortable lit environment, such as the uniformity of distribution of light across task or space that may influence lighting quality¹².

Quality of Lighting in Spiritual Spaces

Uniformity: Illumination on the floor surface in mosques should be uniformly distributed over main tasks. This is due to the praying task that can take place at every point inside the mosque⁶. Uniformity, which is expressed as a ratio; either minimum illuminance to average illuminance (E_{\min}/E_{avg}), or minimum illuminance to maximum illuminance (E_{\min}/E_{\max})^{12, 14}, is recommended to be not less than 0.3, using the E_{\min}/E_{avg} over task area in a mosque, as shown in Table 1.

Daylight Glare: high quality of general illumination should also consider the proper direction of the light, minimal glare and other problems¹⁵. Glare interferes with visual performance and has very detrimental effects on the ability to see. There are two main types of glare, direct (occurred straight by the light source in the field of the view), and indirect (reflections of light sources on the task surface), which can then result in discomfort glare (described as the feeling of annoyance, but it does not prevent seeing) or disability glare (prevents vision)¹³. Some of the recommended qualitative illumination in relation to the main tasks in the mosque are shown in Table 1.

TABLE 1

Recommendations of quantity and quality lighting according to the mosque's tasks.

Task	Illuminance (lx) ^{6, 12}		Uniformity ¹²	Illum. Distribution ⁶	Direction/shadows ⁶
Praying (collective meditation)	Horizontal (E_h)	100	Min: Avg. 1:3 = 0.3	General	Diffuse/ shadow-less
Reading (Qur'an)		300		Local – General	
Imam Zone (Mihrab), performance (speech)	Vertical (E_v)	300		Local – General	

Furthermore, people's perception of lighting quality is influenced by many factors including their cultural background¹⁶, and the subjects' preferences for illuminance levels differ between individuals¹⁷. Therefore, the evaluation of the quality of daylight in this study is not only based on light meters and mathematical calculations but also through the eyes of worshipers.

METHODS

The method in this study was divided into three main stages to evaluate the existing daylight conditions in terms of the spirituality aspect, the quantity and the quality of light in a typical neighbourhood mosque in Saudi Arabia in Dammam. At the first stage, actual measurements were conducted to evaluate: the quantity of light in terms of illuminance levels, at specific dates and times, and the quality of light in terms of daylight uniformity and discomfort glare. At the second stage, a field survey was used as a subjective measurements to explore worshipers' point of view

about the quantity of light (level of light), the quality of light (visual comfort state) and the spirituality in terms of how the worshipers' spiritual feelings are affected by the natural light in this mosque. It was also used to explore the worshiper's inspiration and preferences of their spiritual state. Moreover, an individual interview was conducted with the Imam of the mosque. At the third stage, simulation software was used to verify the performance of new modifications of the openings.

The case study was selected in consonance with characteristics of the typical small Saudi mosques in terms of shape, construction, zoning, and lighting. It has been stated that the shape of typical Saudi mosques is an open rectangular space for prayer area, with the long axis that facing the Holy Ka'bah (qiblah) in the city of Mecca. These mosques are mostly constructed with concrete blocks and reinforced concrete slabs, and their typical height ceiling is from 3 to 5m¹⁸. At the typical Saudi mosque, tasks are performed at floor level, where people sit and read the Qur'an, on carpeted floors. The nominated case is a single storey mosque. For this study, the rectangular prayer area (for men) was only considered. It was 28m, 16m wide and 3.2m high. The men's prayer hall contains 12 windows (1.3m x 1.8m), which are distributed on three facades: The Northwest, the West, and the Southeast. Each one of these facades has four identical windows, as shown in Figure 1.

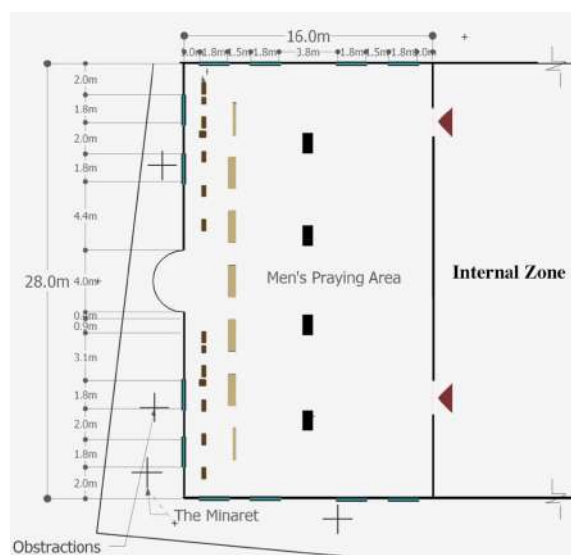


FIGURE 1

Floor plan of the prayer hall in Ibn Al-Qayyem Mosque.

Measurements

Visits were carried out to take the actual measurements to evaluate the daylighting performance, illuminance levels (lx) at horizontal and vertical plane were measured by an Extech digital illuminance meter. In the typical Saudi mosques, occupancy for per person area is 0.72m^2 ($1.2\text{m} \times 0.6\text{m}$), and the main tasks in these mosques are performed by worshipers at the floor level, where people are sitting and reading Qur'an¹⁸. Accordingly, three readings were taken for each point on a $1\text{m} \times 1\text{m}$ grid. The first was horizontal illuminance levels at the floor level (0m). The second and third were vertical readings the same points of the grid at the worshipers' eye level when they are sitting on the floor (0.75m), and when they are standing for praying (1.5m). The measurements involved only four rows behind Imam's row (about 35% of the prayer area), which is the most occupied zone. Some studies showed that in most of the Saudi mosques no more than 30% of the prayer area is occupied by worshippers¹⁹. Additionally, the measured area is most influenced by daylight sources. The other zones in the prayer hall were excluded from the measurements, due to the lack of daylight reaching these areas by wide columns (0.90m), as shown in Figure 1.

The illuminance level readings were taken under the source of daylight (side windows) for each point at two times during the day (11:00a.m. and 3:00p.m.), which are Dhuhr and Asr prayer time. The measurements were carried out during summer within two days, 24th and 25th of April. The performance of this study is assessed with three indicators. The average illuminance level in the prayer area was calculated. This was then compared with the recommended light levels required in a mosque. The uniformity of the daylight distribution in the space was also calculated and compared with the recommendations. Finally, the effect of glare was quantified using the simplified daylight glare probability (DGPs).

The Average Illuminance Level

Since the calculation of the average illuminance level was carried out for a big area, the measured prayer hall was divided into three equal zones for more accuracy. It was calculated separately for each zone (A, B, and C), as shown in Figure 1. At each part, the mean illuminance was calculated as the sum of all the measured points divided by the total number of points in the zone. Table 2 shows the average illuminance for each zone. Overall, the measurements indicate that the illuminance level is significantly

low in zone B at both times (11:00a.m. and 3:00p.m.) compared to the recommendations for the main worship tasks in the mosque, as shown in Table 2. This due to the location of the zone, where there is no direct incident light from the daylight sources (side windows). Furthermore, the sudden drop of the light level is due to some furniture that obstructs the distribution of light across space, as shown in Figure 1. On the other hand, measurements of both times show that zones A and C have sufficient light levels for praying (Table 2). However, it is insufficient for a reading activity, that should reach 300 lx.

Uniformity Ratio

By observing the previous results of the average illuminance levels, the daylight is unevenly distributed across the prayer area. However, it was calculated with one of the methods used in testing the uniformity of daylight distribution in the space. The uniformity was calculated as a ratio of the minimum illuminance to average illuminance (E_{min}/E_{avg}). Table2 presents the uniformity ratios for each zone (A, B, and C) at two times. The measurements indicate that the uniformity ratio over zones A is less than the recommended ratio, as demonstrated in Table 1. In contrast, the uniformity of zone B is more than the recommended value. Zone C, which is influenced by daylight coming from the Northwest side, matches the recommended uniformity ratio for praying and reading tasks. However, the uniformity values show significant differences between the zones. Thus, the daylight distribution over the whole prayer area is non-uniform.

TABLE 2
Mean Illuminance levels and uniformity ratios for each zone in the measured prayer area.

Zone	Zhuhur prayer time at 11:00a.m.		'Asr prayer time at 3:00p.m.	
	Avg Illuminance (lx)	Uniformity Ratio	Avg Illuminance (lx)	Uniformity Ratio
A	127	0.2	130.5	0.2
B	18.3	0.6	25.6	0.6
C	128	0.3	169.9	0.3

Daylight Glare Probability Index

Sources of daylighting including skylights, dormer windows, and window wall systems must be used with care from glare, which could reduce its usefulness by creating visual competition during the worship activities²⁰. The glare was calculated for each point in the measured area based on vertical illuminance at eye level for both, people sitting on the floor (0.75m) and standing (at 1.5m). A simplified Daylight Glare Index (DGPs) Equation was introduced by Wienold²¹. It is based on the vertical illuminance at eye level (lx). The calculation of DGPs were done for each point according to the following equation: $DGP_s = (6.22 \times 10^{-5} \times E_v) + 0.184$ where E_v is the vertical illuminance at eye level (lx), (at 0.75m and 1.5m). In addition, Wienold²⁴ developed the simplified daylight glare probability equation used above, specifies that the best comfort class (A) occurs when 95% of the DGPs ≤ 0.35 , good class (B) occurs when 95% of the DGPs ≤ 0.40 , and the reasonable class (C) occurs when 95% of the DGPs ≤ 0.45 . Results show that all the DGPs values for both prayer times (11:00a.m. and 3:00p.m.) are below 0.35, which indicates acceptable DGPs values in the prayer area.

Survey Method

This study used a survey questionnaire to evaluate the natural lighting conditions from the worshipers' point of view. It aims to evaluate the current situation of the daylight in terms of quantity, quality of light and spirituality, in four sections. The first section (quantity measurements) evaluates the light level in the mosque and the worshipers' satisfaction. The second section (quality measurements) evaluates the worshiper's visual comfort and assess their general impression in terms of the light distribution and level in the mosque. In the third section, the questionnaire measures how the worshipers' spiritual feelings are affected by the natural light in this mosque. Additionally, it explores the worshiper's aspirations. The fourth section highlights worshiper's preferences regarding openings and strategies to meet their spiritual feelings. Finally, one open question was used to collect the respondents' general comments and suggestions. A draft questionnaire was distributed to check the phrasing of the questions and the images used in the survey. The survey was conducted among ten worshipers during a visit on 15th of May 2017. It was distributed when all the electric light sources were turned off and curtains were opened. The targeted participants in this survey included worshipers who frequently pray in this Mosque. Moreover, an individual interview was carried out with the Imam. It was a semi-structured interview, which includes related sections of the questionnaires.

Simulation

The case study was built in OpenStudio simulation software to verify the validity of the model by comparing the actual measurements in terms of the average illuminance level and uniformity. OpenStudio used to provide advanced daylight analysis using Radiance. Moreover, it is integrated into SketchUp with the help of a designated plugin. In the program, a single model, in.osm format, is shared by both daylight and thermal simulations and contains geometrical and material properties of the building.

The model has been built in SketchUp, which are the modeling environments for OpenStudio. Building materials, dimensions, and location of illuminance map were exactly replicated from the real case. The model is located on the eastern coast of the Arabian Peninsula, north of the tropic of Cancer, at a latitude of 26° 19' North, and a longitude of 50° 09' East. This area is classified as a hot-arid desert climate²²; thus, the ASHRAE standard for climate zone 1 is used.

In OpenStudio plug-in, 1m x 1m illumination maps of 36 sensor points are placed into each of the three zones same as in the real case. The daylighting controls are placed in the center of each zone, at floor level. In the model, default simple glazing system windows with 3mm thickness and 0.23 solar transmittance. Finally, Dammam weather file attached, Radiance simulation parameter selected, and Radiance daylighting measure added before running the analysis. In the simulation processes, the two prayer times, as in the real case, were recorded across the task surface in the space which is the prayer area at 11:00a.m. (Zhuhr) and at 3:00p.m. ('Asr). The program in each zone calculated the mean illuminance. Additionally, the uniformity for each zone was calculated manually as the minimum illuminance to the average illuminance ratio (E_{\min}/E_{avg}). By the end of the simulation, it was essential to compare the results obtained in the real case and the computer modeling of the case study. The computer model was tested with the same parameters and sky and site conditions available during the site measurements. Illuminance values throughout the praying area were found and compared. The comparison was taken at 11:00a.m. and at 3:00p.m., and it indicates that the model is valid to use for suggested modifications (Table 3).

TABLE 3
Comparison of simulation model vs. real case in terms of average illuminance and uniformity.

		Average Illuminance (lx)			Uniformity (E_{\min}/E_{avg})	
		Real case	Simulation	Difference percentage (%)	Real case	Simulation
11:00 a.m.	A	127	138	8	0.2	0.1
	B	18.3	18.5	0	0.6	0.5
	C	128	128.5	0	0.3	0.2
3:00 p.m.	A	130.5	133.5	2	0.2	0.2
	B	25.6	28	9	0.6	0.7
	C	170	185	9	0.3	0.2

RESULTS AND DISCUSSIONS

Results from the actual measurements, the survey and the interview with the Imam of the mosque are discussed in this section. The discussion of the results is about the evaluations of the existing light condition in terms of the quantity of light, quality of light and the spiritual aspects. Results are based on both mathematical calculations and the subjective reactions according to the worshipers' eye.

The Quantity of Light – Illuminance Level

The actual measurements indicate that the illuminance level in the intermediate zone of the prayer hall has deficient illumination levels, and significantly less than the recommendations for the main tasks in the mosque. Whereas, the other two zones (A and C) have sufficient light levels for praying but insufficient for reading activity (300 lx). However, the analysis of the survey shows that all responses to be satisfied with the daylight level in the mosque. A high percentage of them indicate that the light level is sufficient, and they split equally into two groups of 40% each. The first group indicated that the daylight level in the mosque is sufficient, and the other group said that the light level is moderate. Whereas, the rest of the respondent finds that the light level is insufficient. Specifically, the survey asks if there is a sufficient daylight level available to perform different tasks in the mosque, as demonstrated in Figure 2. For praying and seeing the Imam, majority of the respondents found the daylight levels are

between sufficient and moderate levels. These results correspond to the actual measurements findings, which indicate that these two tasks met the standards.

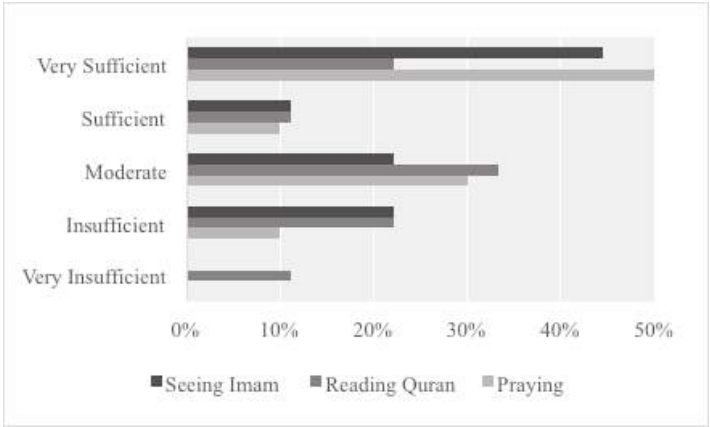


FIGURE 2

Survey's outcome of the sufficient scale of light level in the mosque for different tasks.

In respect of praying task, answers show that 60% of respondents found the daylight levels are sufficient and 30% found it is moderate. However, only 10% of worshipers found it insufficient. For seeing the Imam, 55.5% of participants indicate that daylight level is sufficient, 22.2% responded with moderate daylight level, and the rest found it is insufficient. On the other hand, for reading tasks, the survey shows that around 33.3% of respondents find the light level is insufficient. Moreover, the Imam points out that at the middle of the mosque, the daylight level is inadequate, especially for reading the Qur'an. These results correspond to the actual measurements findings, which indicate that the daylight level is insufficient for reading tasks, especially in the middle of the mosque (zone B). Thus, the light level should be increased to reach the recommended level (300 lux).

The Quality of Light

In order to estimate the quality of general illumination in the mosque, results from the actual measurements of uniformity and the DGPs values are discussed. In addition, it is compared with the evaluation of the quality of light from the viewpoint of worshipers and the Imam in terms of their visual comfort. Results of the real measurements indicate that the prayer area has a non-uniform distribution of light due to the significant differences between the uniformity ratio of the measured zones (Table 2). This is also confirmed by the participants when they were asked about their

general impression of the light distribution in this mosque. A significantly high proportion of respondents (90.0%) stated that the prayer area was unevenly lit. Likewise, the Imam of the mosque asserted that the middle area of the prayer hall has inadequate incident daylight. This affects the visual comfort of the worshipers and Imam. The quality of light should be improved by increasing the uniformity ratio over each zone (A, B, and C) without significant differences between these zones.

Another measured indicator (DGPs) was used to estimate the quality of light. Results of the DGPs values indicate that the Daylight Glare values are acceptable. This is also confirmed by the participants and the Imam when they were asked if the daylight openings cause any visual discomfort or bother them during the day. Around 70% of worshipers stated that they never had direct discomfort glare from the existing openings, while only 20% of them said that they are sometimes bothered by the current daylight sources. However, the Imam said that they are using a green screen on the openings on the West side (The qiblah side) to reduce the effects of the direct sunlight. Moreover, only 10% of the participants described their general impression of the light level as too bright, which might lead to uncomfortable visual conditions, such as glare. Whereas, half said that they have a neutral impression about the general lighting condition. The daylight glare is an essential visual noise problem relating to visual comfort and lighting quality. Therefore, it must be considered for the suggested modifications later.

In respect of the improvements of the quality of light, the Imam suggested some his preferred openings' techniques, such as bigger size openings (e.g., vertical windows) than the existing one with other glazing material. In winter, he preferred to get natural ventilation from the openings, but the amount of daylight in the space is significantly increased, so he suggested to provide solutions such as using more advanced shading devices.

The Spirituality

The spiritual quality in the mosque was evaluated based on how the users' spiritual feelings are affected by the existing natural light. The Imam and most respondents agreed that the daylight in this mosque affects and uplifts their spirituality, as 40% strongly agree and 50% somewhat agree. They are equally split into three groups in how their spirituality was affected in this mosque. 33.3% of responses stated that the light affects the spirituality very much. Another group indicates that it has effects significantly, and the

third one pointed out that it has a moderate effect. However, a minority (only 10%) somewhat disagree (Figure 3).

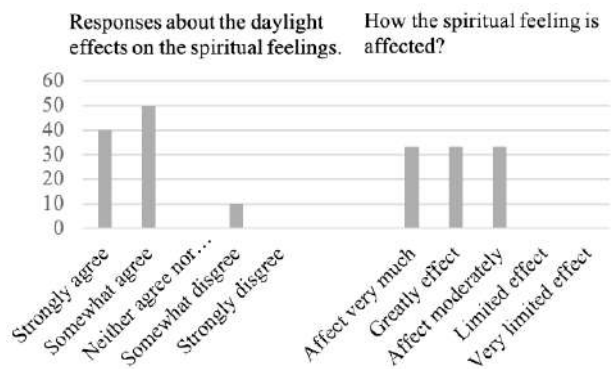


FIGURE 3
Daylight effects on users’ spiritual feelings and how much it is affected.

This result supports the mentioned statement in the introduction, which indicates that the daylight played a symbolic role of sacred, faithful, cosmologic beliefs, and the overall spiritual and mystical balance^{3, 6-7}. Additionally, the Imam agreed that the experience in this mosque met his spiritual needs.

Moreover, inspirations and preferences of worshipers’ spiritual states in mosques were raised to suggest modifications according to their opinions. Respondents’ preferences nominated three options of openings that impact significantly to their spirituality (Table 4). Vary percentages of preferences were shown by users; as 40% of them select the sidewall openings at the eye level, and 30% prefer the skylight or dome. However, the high majority of the respondents (60%) prefer the sidewall openings above the eye level.

TABLE 4
Users’ openings preferences which effect their spirituality.

Answer choices	Responses
From sidewall opening at my eye level	40%
From sidewall opening above my eye level	60%
From openings with stained glass	0%
From skylight or dome	30%
From openings covered with screening materials (stucco screen)	0%

Summary of Results

1. In respect of the quantity of light, results show that the light level is sufficient for performing some main tasks such as praying and seeing the Imam. However, it is inadequate for reading tasks, especially in the central zone of the prayer area.
2. About the quality of light, results show that the prayer area has a non-uniform distribution of light. Thus, the uniformity ratio over each zone (A, B, and C) should be increased without significant differences between these zones to improve the quality of light.
3. Results indicate that Daylight Glare values are acceptable. However, some of the participants described their general impression of the light level as too bright, which might lead to the visual noise problem. Therefore, the Daylight Glare values should be measured after any modifications.
4. Regarding spirituality, worshipers agreed that the daylight in this mosque affects and uplifted their spirituality. Most of them think that their spirituality is affected by sidewall openings above the eye level (60% of users). Moreover, the Imam prefers spiritual spaces that contain sidewall windows with stained glass.

MODIFICATIONS

The western facade was considered to modify the lighting condition because it has significant effects on the illumination level across the most occupied area in the prayer hall. Furthermore, this facade is the qiblah side, where there is direct incident light on the worshiper's eye. Modifications were made by OpenStudio simulation program in successive stages after the real case was run.

Modification 1: Without Moveable Obstructions

The uniformity of lighting is one of the goals to improve the quality of light across the prayer area. Therefore, the simulation was run after removing the movable obstructions from this area including furniture. Results show that there is a slight improvement in both the average illuminance level and the uniformity.

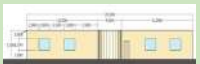

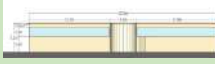
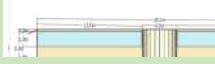
Modification 2: Windows above Eye Level

To increase light distribution and prevent glare to worshippers' eyes, windows above eye level were recommended as a second modification with a height of 1.75m, which are clearstory windows²³. Besides, users indicate in the survey and the interview that their spirituality is affected more by sidewall openings above their eye level. This solution will not distract the of worshippers' attention during prayer. Results show a slight increase in both illumination and uniformity. Thus, the lighting condition needs further modification.

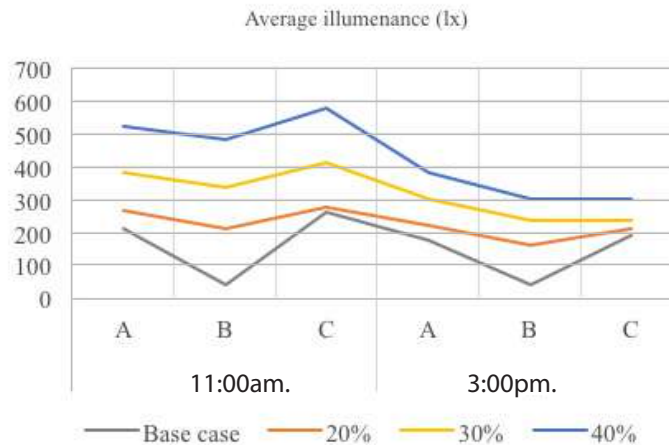
Modification 3: WWR Modifications

Window to Wall Ratio (WWR) in the base case is 10%. Due to the insufficient illuminance light and uniformity level, increasing WWR is suggested. It is gradually increased from 20% to 40% in an interval of 10%, as shown in Table 5. The maximum ratio is 40%, which is taken to practically limit the undesirable impact of solar penetration in the forms of heat and glare. However, this ratio can't be increased more than 40% because it exceeds the suggested window opening level above 1.75m.

TABLE 5
Comparison between the base case and WWR options.

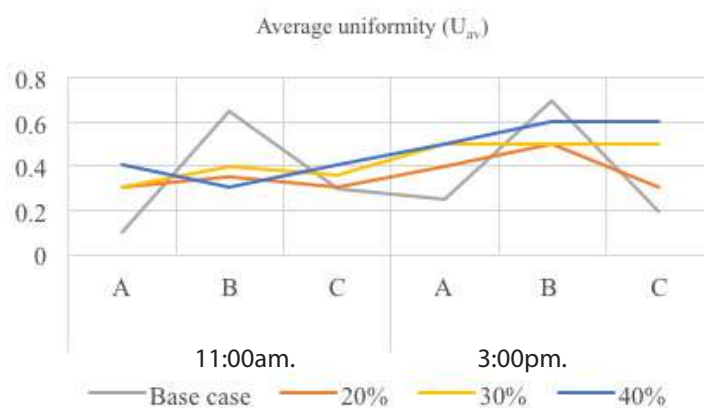
		Base case without movable obstructions		20%		30%		40%	
									
		Avg. illuminance	Uniformity	Avg. illuminance	Uniformity	Avg. illuminance	Uniformity	Avg. illuminance	Uniformity
11:00 a.m.	A	138	0.1	270	0.3	386	0.3	525	0.4
	B	18.3	0.5	214	0.35	339	0.4	483	0.3
	C	128.5	0.2	278	0.3	414	0.36	581	0.4
3:00 p.m.	A	133.5	0.2	220	0.4	305	0.5	383	0.5
	B	28	0.7	159	0.5	234	0.5	301	0.6
	C	185	0.2	213	0.3	235	0.5	301	0.6

In comparison between the base case and WWR options, it is observed that WWR is highly influential on all performance indicators (daylight factor and uniformity). Figure 4 and Figure 5 show the relationship between the influential input variables and the influenced performance indicators, in which the performance indicators are shown as mean values.

**FIGURE 4**

Relationship between WWR and average of Illuminance levels.

Figure 4 shows that the daylight factor raised as the WWR is increased, as more daylight is penetrated the space. At the WWR of 20% and 30%, the mean values of illuminance were lower than the recommended standards, while 40% was the most appropriate one. The Average illuminance with WWR of 40% has the highest value in zone C, which might give the risk of glare and overheat during noon time. Accordingly, glare values were recalculated based on vertical illuminance at eye level for both, when people are sitting on the floor (0.75m) and standing at (1.5m). Results show that all the DGPs values for both prayer times (11:00a.m. and 3:00p.m.) are below 0.35, which indicates acceptable DGPs values in the prayer area.

**FIGURE 5**

Relationship between WWR and the mean values of Uniformity.

In respect of the relationship between WWR and uniformity, it is observed that the average of the uniformity of all WWR options somewhat matches the recommended one. Figure 5 shows higher WWR results in a higher uniformity, linearly. Compared to the minimum criterion of 0.3, it seems that almost all values of WWR satisfy the requirement, except the first modification with the uniformity of 0.1. Overall, note that values are higher at 3:00p.m. than at 11:00a.m. in all zones.

CONCLUSION

The study was limited by the sample size. However, it was taken based on the worshipers who frequently pray in Ibn Al-Qayyim Mosque. Certain limitations represent opportunities for future research, as the daylight measurements were carried out on two specific days of summer seasons. For future studies, it is recommended to carry out the measurements on multiple days during different seasons. Moreover, studies are recommended to experiment on more solutions and strategies of openings, such as glazing specifications and advanced materials.

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IS SERENITY THE SOULS OF MOSQUES?

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INTRODUCTION

SERENITY has many definitions according to what discipline it is used in. Generally, it is defined as the state of being calm, peaceful, and untroubled. It is defined by Merriam Webster as “utter calm and unruffled repose or quietude”. In this study, we use it in an architectural context related to places of worship. Therefore, we define serenity as “a spiritual experience of inner peace, calmness that is induced by the physical presence within the spaces of a place of worship”. Serenity is essential in the design of places of worship, as it is the whole purpose of prayer. The Prophet (PBUH) became divested of all feelings of delight in complete bewilderment, he used to say, “O Bilal, comfort us by the call to prayer”. Sufi Sheikhs have discussed this matter at length. Some hold that prayer is a means of obtaining presence with Allah, and some regard it as means of being absent from self. The question is, can serenity be deliberate by design? Or is it spontaneous with little influence from the designer. The utility of this question is to learn – if it is deliberate – what design features may be introduced to increase serenity.



FIGURE 1
Serenity elements (after Roberts, and Aspy 1993).

SERENITY IN ARCHITECTURE RESEARCH

Shatha Malhish (2015) studied the spatial and perceptual analyses of the madrassas and mausoleums of 14 Mamluk examples (from 1260–1517AD). The researcher studied various spatial descriptor tools of space syntax to analyze and capture the differences in the experience. Analyses of the configurational characteristics, axial attributes, visibility structures, and isovists highlight how the spatial and formal properties of the layouts were used to express certain representational relationships.

The outcome of literature review on serenity reveals that one measurement of scale is the one developed by Kay Roberts and Cheryl Aspy (1993). The Serenity Scale used there was a 40-item self-report, that evaluates clients' serenity status relying on critical theoretical attributes, identified by serenity experts (Figure 1). The approach was adapted to mosques using three basic categories:

1. Sensory Measurement of Architectural Serenity;
2. Architectural Serenity; and
3. Spatial Organization (Figure 2).

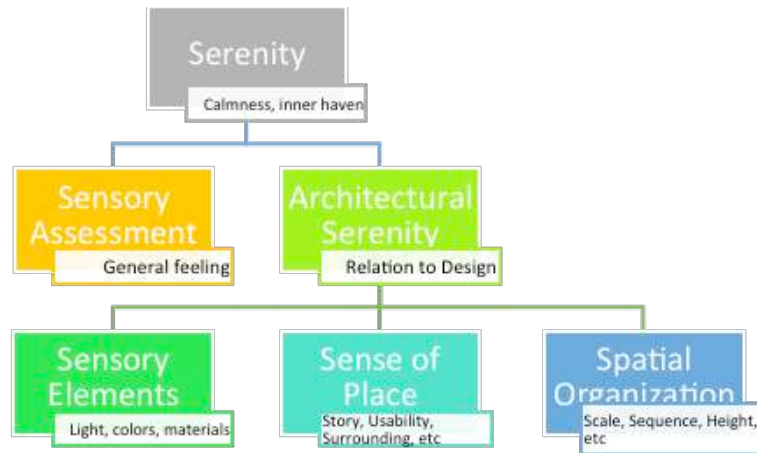


FIGURE 2
Survey structure (authors).

SPACE SYNTAX AND THE ANALYSIS OF SPACES

Space syntax refers to a group of theories and tools that investigate the relationship between space and society and the ways by which the resulting pattern on space affects its users (Hillier, 1996). In this context, space syntax assists in interpreting the spatial system on how spaces are related to one another in a set of complex spaces represented by a spatial hierarchy. Space syntax methods quantify the spatial patterns with the use of a set of measures that allow them to be compared mathematically and perceptually. This approach has been used in the analysis of hundreds of plans and urban areas.

The main idea behind space syntax spatial elements is “that people experience their environment in certain geometries: they move in lines [axial lines], interact in convex spaces [convex spaces], and sees changeable panoptical views when moving around [isovists]” (Akkelies, 2011).

METHODOLOGY

The paper follows an exploratory investigative methodology. The selection of the study sample has mosques built during Fatimid and Mamluk eras in Cairo (973–1517AD). These mosques are qualified according to users’ experience and then analyzed descriptively as well as geometrically. Space syntax allows two types of analysis on plans; axial lines and visibility graphs.

The syntactical analysis can convert architectural plans into a series of defined spaces, lines of sight, and visual locations. Such syntactical means form, along with the survey tool, the methodological basis of this research. Statistical tools are used for the descriptive analysis of the survey results as well as the regression model validation.

Selection of Mosques

The chosen mosques are among the most popular in Islamic architectural studies, ranging from early Fatimid Dynasty till late Mamluk Dynasty. The reason for the selection being the user's familiarity with majority of them (studied in various courses) and the availability of CAD files for analysis.

1. Ibn Tulun Mosque
2. Al-Moayed Sheikh Mosque
3. Al-Azhar Mosque
4. Al-Aqmar Mosque
5. Al-Hakim Mosque
6. Sultan Hassan Mosque
7. Qalawun complex
8. Faraj bin Barqouk Eastern Cemetery
9. Qaitbay Eastern Cemetery

The chosen mosques fall under two primary plan typologies. The first is the Courtyard style, common in Fatimid era, and the second is the iwan style, common in Mamluk era.

Survey Tool and Data Collection

An online public survey was presented to a sample of students and professionals all of whom were have visited the chosen mosques and experienced it at some point of time. The tool was structured to reflect three modules; Sensory Measurement of Architectural Serenity; Architectural Serenity; and Spatial Organization as shown in Figure 2.

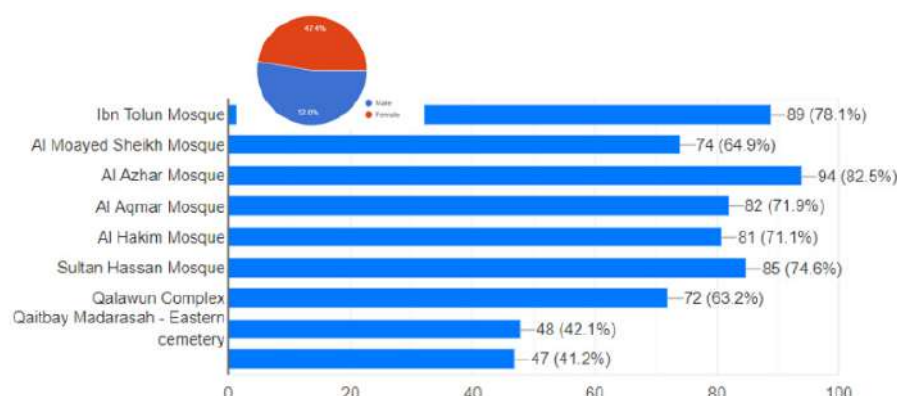


FIGURE 3
Breakdown of the survey data and the mosques.

Analysis Measures

Since the present research examines how each space is navigated through and perceived by the user, the focus has been on the visual information through visibility analysis measures. The following three indicators or measures are chosen to be most relevant to the assumed feeling of serenity.

1. Visual clustering coefficient: Measures isovist convexity (close to 1) or spikiness (close to 0) at a location. It indicates how much of an observer's visual field will be retained or lost as he or she moves away from that point. In other words, it indicates the changes in visual information as the system is navigated. Low clustering coefficients indicate increase in visual information as one moves from the current location that is a new area of the system may be discovered, whereas high coefficients indicate that little change in the visual information is likely to occur as one moves from the location to another. Turner, Doxa and O'Sullivan (2001) studied Alvar Aalto's Villa Mairea and Mies van der Rohe's Farnsworth House using clustering coefficient. They found that most private spaces, such as bedrooms and study rooms, are highly clustered whereas social spaces, such as the living rooms offer multidirectional fields of view and therefore low clustering coefficient.
2. Visual integration: Visual integration is a measure of visual accessibility. In other words, it is the extent to which any point in a spatial network is visible from any other. People tend to group in

areas of high visual accessibility. Turner and Penn (1999) found higher correlation between graph measures of mean depth and pedestrian movement within a department store when calculated with a VGA representation than with axial lines. Desyllas and Duxbury (2001) found significantly higher correlation between VGA-visibility and pedestrian movement than between any axial graph measure and movement.

3. Visual entropy: Entropy is a measure of physical disorder, where high entropy values represent a lack of order in the sense that the relationship between the parts and the whole of the spatial structure is not systematic (Hillier, 2007). Entropy also reflects concepts of diversity and spatial differences (Stamps III, 2002). Bhatia, Chalup, and Ostwald (2012) propose that higher entropy values for a point located in a space reveals high uniqueness of that space, as compared to other spaces within the entire layout.

RESULTS

The survey was answered by 114 students and professionals. The following figure summarizes the serenity values of eight mosques based on the survey (Table 1).

TABLE 1
Ranked order of mosques based on Serenity Score.

Monument	Serenity Score	Rank
Sultan Hassan	4.18	1
Al-Azhar	3.93	2
Ibn Tulun	3.85	3
Qalawun	3.74	4
Al Hakim	3.67	5
Qaitbay	3.58	6
Al Moayed Sheikh	3.45	7
Al Aqmar	3.24	8

Details of answers show how each mosque had serenity measures that accumulate to create that composite sense of serenity (Table 2).

TABLE 2
Results of Sensory Serenity of each monument.

	IT	MY	AZ	AQ	HK	SH	QW	FB	QT
1.1 Explore Details	3.29	2.83	3.75	2.83	3.17	3.21	3.00	2.38	2.71
1.2 Deep Breath	3.08	2.92	3.67	2.58	3.08	3.63	3.08	2.29	2.38
1.3 Feeling Detached	3.29	2.92	3.58	3.00	3.08	3.54	3.21	2.25	2.54
1.4 Spend Time	3.21	2.96	3.88	2.46	3.33	3.54	2.96	2.29	2.50
1.5 Forget the outside world	3.08	2.92	3.63	2.54	3.42	3.58	2.88	2.17	2.21
1.6 Sense of Purpose	3.08	2.71	3.54	2.75	3.08	3.38	3.08	2.25	2.38
1.7 Connected with the Space	3.08	2.83	3.67	2.83	3.17	3.63	2.83	2.13	2.38
1.8 In Touch with an Inner Haven of Peace	3.46	3.13	3.63	2.71	3.54	3.46	3.50	2.54	2.71
Average	3.20	2.90	3.67	2.71	3.23	3.49	3.07	2.29	2.47

The results also show two particular mosques dominate most dimensions of serenity; Al-Azhar Mosque and Sultan Hassan Madrasa. Yet, these two aside, serenity features vary from one monument to another. For example, Ibn Tulun is identified with the feeling of wanting to take a deep breath when inside, of feeling detached from outside world, with the desire to spend more time and being in touch with an inner haven of peace while inside it. Al-Hakim on the other hand is related to feeling connected with the space in addition to other sensations. These variations in responses intrigued us to study them in relation to the distinguishing plan features and syntactical design measures.

That is why an analysis of eight mosques using Depth Map Visual Graph was used to further understand the results. Three primary measures were used as explained in the previous section Visual Clustering (VC), Visual Integration (VI) and Visual Entropy (VE). The primary results are shown in Figure 4.

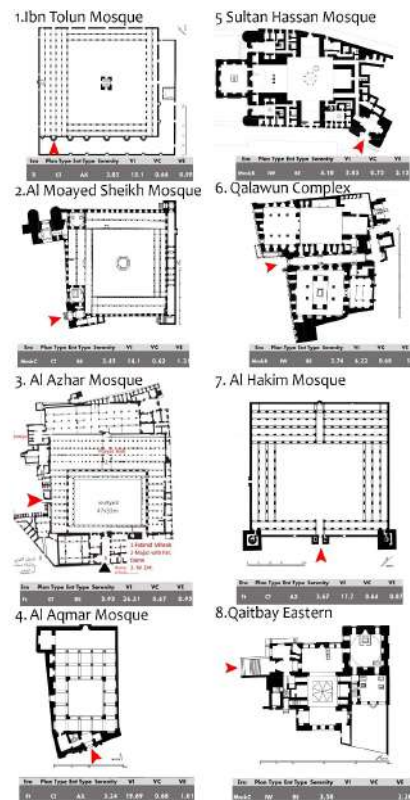


FIGURE 4

Plans and results of visibility graphs on eight monuments.

The visibility graph measures values alluded us to consider the distinction between two plan types; Courtyard style plans and iwan style plans. As shown in Figure (7) Courtyard plans have a significantly higher mean of Visual Integration (18.56) than that of iwan style plans (6). Similarly, for Visual Clustering and Entropy.

TABLE 3

Variations in visibility graph measures between Courtyard and *iwan* types.

Name	Plan Type	Entr Type	Serenity Score	Visual Integration	Visual Clustering	Visual Entropy
Al-Azhar	CT	BE	3.93	26.21	0.67	0.95
Ibn Tulun	CT	AX	3.85	15.1	0.64	0.99
Al Hakim	CT	AX	3.67	17.7	0.64	0.87
Al Moayed	CT	BE	3.45	14.1	0.62	1.31
Al Aqmar	CT	AX	3.24	19.69	0.68	1.01
Mean				18.56	0.65	1.0

Name	Plan Type	Entr Type	Serenity Score	Visual Integration	Visual Clustering	Visual Entropy
Sultan Hassan	IW	BE	4.18	5.83	0.73	2.13
Qalawun	IW	BE	3.74	6.22	0.68	1.7
Qaitbay	IW	BE	3.58	3.47	0.8	0.81
Mean				6.025	0.70	1.6

Many factors were perceived by respondents to have affected the sensation of serenity. The strongest of which was the Story (History) of the place, followed by the Alternating height of Ceiling, the Scale of the building, the Sequence of traveling through the Spaces and least was the Culture and Surroundings (Figure 5).

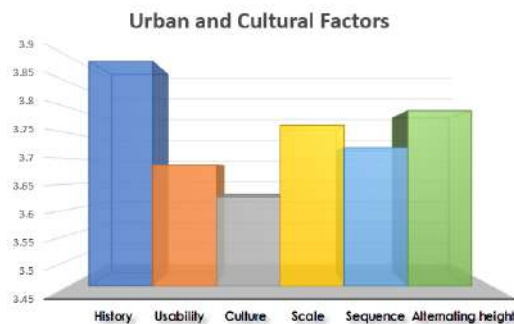


FIGURE 5

Other perceived factors affecting serenity according to survey.

The Story and History in particular seem to have affected serenity most in Ibn Tulun, al-Azhar, and Sultan Hassan (Table 4).

TABLE 4

Factors affecting serenity in each monument.

Name	History	Usability	Culture and surroundings	Scale	Sequence walking	Altern height
Al-Azhar	4.11	3.97	3.78	3.95	3.79	3.8
Ibn Toloun	4.11	3.61	3.43	4.04	3.8	3.81
Al-Hakim	3.77	3.67	3.53	3.88	3.54	3.72
Moayed	3.66	3.63	3.65	3.66	3.73	3.7
Al-Aqmar	3.64	3.58	3.46	3.24	3.34	3.36
Sultan Hasan	4.14	3.98	3.88	4.17	4.21	4.26
Qalawun	3.98	3.63	3.7	3.77	3.81	4.02
Qaitbay	3.71	3.43	3.56	3.41	3.55	3.68
Mean	3.89	3.69	3.62	3.77	3.72	3.79

Of particular interest was the role the “sequence of walking through the spaces” affected the perceived sense of serenity. The factor scored high in the survey (3.72). The reason it is interesting is that it goes against conventional design paradigm that ideally considers public spaces to be exposed for better wayfinding. In Mamluk Architecture, that seems not to have been the purpose. Iwan plan types, broken paths and bent entrances have long been a feature in mosques, madrassa, and homes. The second reason it is interesting is that Space Syntax already has measures to quantify the visual path clustering in spaces, so the concept could be tested.

The visual clustering coefficient was taken on a sequence of points along the path from entry to the qiblah iwan. This simulates more the sensory journey typically experienced by a user as they related their experience. Figure 6 shows the measurement points of visual clustering taken along the journey in Sultan Hassan from the huge monumental portal till reaching the qiblah iwan.

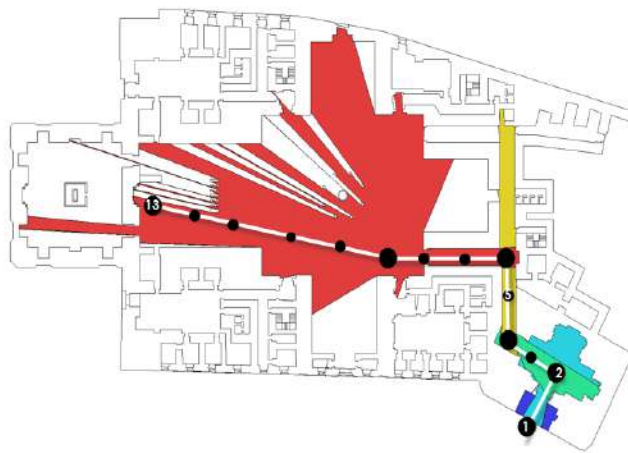


FIGURE 6

13 points along the path of Sultan Hassan Madrassa.

Results show a clear dichotomy in the standard deviation of the 13 points between those of Courtyard type plans and iwan type plans. Figure 7 shows a sample of the fluctuations in Qaitbay, Qalawun Complex, and Sultan Hassan on one side, and Al Hakim on the other side.

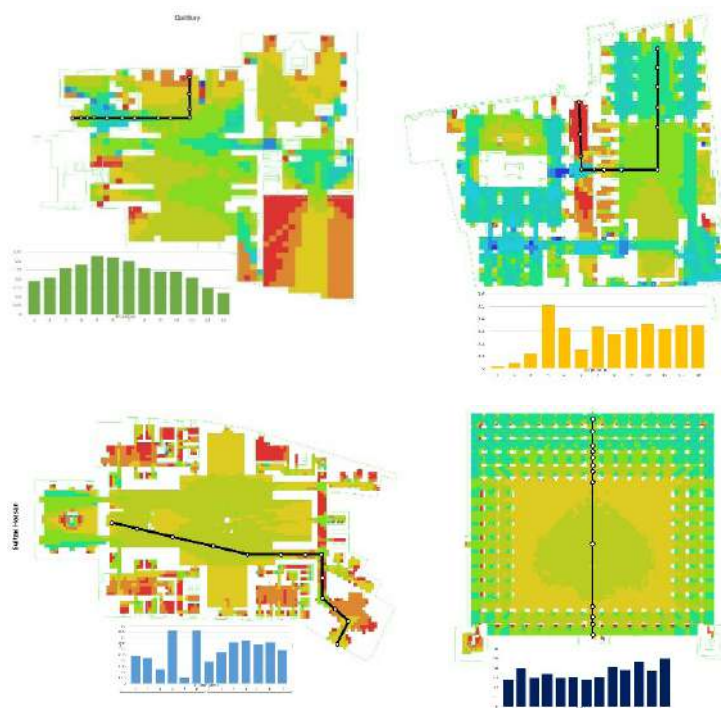
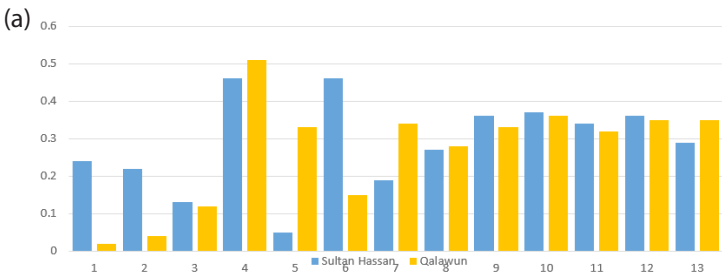


FIGURE 7
Visual clusters along paths of four mosques.

The visual clustering alternating signals vary significantly between the two groups. Whereas Al Aqmar and Al Azhar almost have flat visual clustering readings, Sultan Hassan and Qalawun alternate vigorously. The standard deviation between the two is shown in Table 5.

TABLE 5
The standard deviation between two plans.

Plan Type	Mean	StdDev
Courtyard	0.38	0.07
Iwan	0.27	0.10



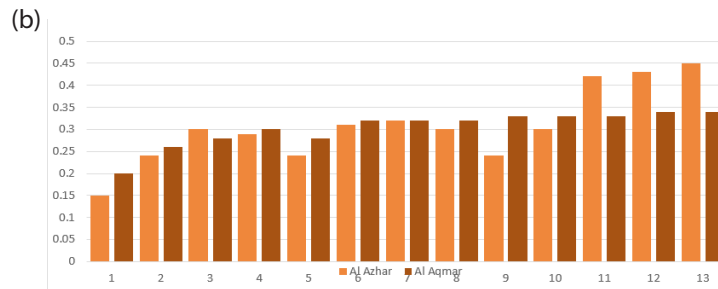


FIGURE 8 (a) AND (b)
Comparing the path clustering pattern along two courtyards
and two *Iwan* style monuments.

ANALYSIS

The above survey results indicate that Sultan Hassan Madrassa and Al-Azhar Mosque are the two most preferred mosques and the most serene. The analysis of the reasons lead us to two possible directions; either these are design driven or non-design driven. By design driven we mean that serenity is something an architect has the means and vocabulary to implant to leave such an impact. Alternatively, we can assume serenity is a God given gift related to the user or the intentions of the builder than transcends time and physics. However, since we choose to be scientific, we proceed to investigate the possibility of design factors that impact serenity.

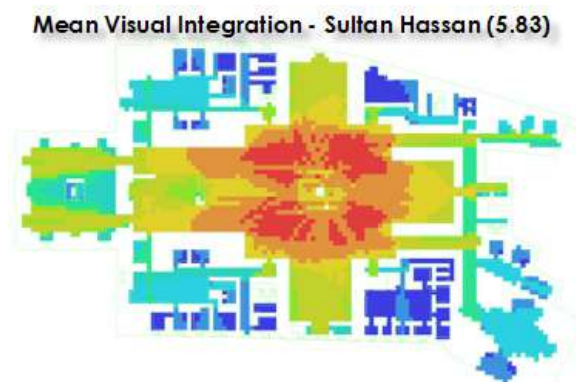


FIGURE 9
Mean visual integration of Sultan Hassan Madrassa.

Interestingly, evidence shows that Sultan Hassan Madrassa has lowest mean integration value and the highest mean depth value. This means that people are significantly more separated from outside than in other mosques.

The qiblah Iwan is five steps of depth from the entrance, each with a change of direction, ceiling height, illumination levels and surrounding. The mosque has the highest clustering coefficient value. The trip from the entrance to the qiblah iwan is a highly varied one. Views change dramatically as one moves from the entrance to the qiblah Iwan. As one enters the mosque into the entrance hall, he actually sees quite little, with no clue of the direction, until he gets into the middle of the hall to discover a way to the left. After few steps, one finds a stairway to the right, leading to a narrow and dark corridor. Before the middle of the corridor, a light from the left invites one to the prayer hall which emerges gradually as one walks down the left corridor until one reached the end of the corridor to be surprised by the size of the Courtyard and iwan. The trip involves three turns, ascending, light change, height change, isovist convexity change, which together help to distance the visitors from the external world and enhance their feel of serenity. However, having Al-Azhar as second in rank of serenity despite its lack of path clustering features suggest a more complex explanation.

Entropy was a measure used to reflect concepts of diversity and spatial differences (Stamps III, 2002). Visual relationship between the parts and the whole in the serene mosques are less systematic than courtyard mosques, as they have an average entropy value of (1.98) as compared to courtyard type mosques (0.94). This means that serene mosques are less systematic, more diverse, and spatially different than less serene mosques.

The regression model indicated that visual entropy alone accounts for 80% of the serenity variance. Adding connectivity increased predictability to 89%. Other variables add little to the model. This means that visual entropy and Connectivity are the two major contributors to the sensation of serenity.

Model Summary								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.894 ^a	.799	.799	.15474	.799	179067.164	1	4494
2	.943 ^a	.889	.889	.11503	.090	36385.416	1	4494

Al-Azhar has a courtyard with dominating visual characteristics in contrast to the surrounding riwaqs. Its current side entrance (not the original axial one in plans) creates that transitional zone between that resembles the iwan bent entrance style. Although both Al Aqmar and Al-Azhar are Fatimid and Courtyard style, Al-Azhar Mosque has a significantly higher mean visual integration value (26.2) compared to Al-Aqmar Mosque (19.7).

CONCLUSION

Serenity remains to be the one value designers of mosques strive to achieve. This paper has achieved two main leads on the topic of serenity-based design of mosques. The first is that some mosques indeed transmit a higher degree of serenity than others; and second is that some degree of architect driven purpose can in fact improve that goal. These factors could be the subject of future expanded research on many older and modern mosques. However, one conclusion is that plan typology is a differentiating factor. That is there is no one-size-fits-all formula. Iwan plan types are more prone to induce serenity due to their alternating directional and visual path signals. But Courtyard style plans also can lead to serenity with creating different distinctive features in courtyards and riwaqs such as the case of Al-Azhar.

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ACOUSTICAL PERFORMANCE IN MALAYSIAN MOSQUES: REVERBERATION TIME IN THE MAIN PRAYER HALLS

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INTRODUCTION

MOSQUES should not be ornaments without real impact on society. Grand and beautiful mosques may serve as the visuals to attract more to visit but the functionalities are the core to keep the ones attracted stay and utilize the mosques as a sustainable tool for self-betterment¹⁻⁴. It is of an ideal Muslim society if the members are accustomed to voluntarily being present in mosques, consistently gaining and enhancing knowledge, utilizing the facilities for good deeds and socializing towards unity. From the statistics published by the Department of Islamic Development Malaysia (JAKIM), it is reported that in February 2019, there were 6,333 mosques and 18,279 musallas built in Malaysia⁵. Thus, it is crucial to ensure that mosques are fit to become centers for Muslims, i.e. the compulsory Friday congregation, consisted of lectures and prayers led by an imam.

Acoustics, playing a vital role in so many aspects in mosques, e.g., speech intelligibility during lectures, noise pollution level, and individual privacy during rituals, should be taken care to its finest in contributing to building highly functional mosques. Research works on mosque acoustical performance are being carried out on numerous aspects, e.g., road traffic noise, HVAC noise, geometrical factors such as the mihrab and roof shape, and finishing material such as the usage of carved panels^{1, 4, 7}. This paper focuses mainly on the reverberation time RT60, generally indicating the effectiveness of mosque prayer halls in terms of speech intelligibility for lectures. The main intention was to accelerate the efforts to compile reverberation time RT60 readings in mosques around Malaysia and hopefully it will show the patterns of mosque architectural design impact on its acoustical performance.

A significant drive to this study is to counter the alarming norm for Malaysian mosque administrators to splurge on sound reinforcement system in pursuit of good sound quality either specified during the design stage, or as an after-thought approach for improvement, without considering the room acoustics. The cost-effective solutions should be studied thoroughly in combating poor sound quality as a design target utilizing an efficient mixture of both active and passive acoustic systems. This paper reports the performance of some of the existing mosques around Malaysia from the room acoustics' point of view.

METHODOLOGY

Leo L. Beranek in his works compiled the reverberation time of concert halls of good ratings around the world and became a guide for designers⁶. In the author's opinion, this is justified due to the fact that the "exemplary" halls are rated heavily based on the acoustic performance due to their main function in delivering musical performances. For mosques in the other hand, there are no ratings that heavily indicate acoustical quality. Furthermore, there are also no established qualitative research works on acoustical preference particularly on lectures held in mosque prayer halls in Bahasa Malaysia. Therefore, reverberation time values recommended for general architectural spaces meant for speech-based activities are adopted as an early step in determining the acoustical performance in Malaysian mosque prayer halls.

Measurements

Reverberation Time RT60

RT60 values tested are at 1/1 octave bands with the center frequencies from 250Hz to 2000Hz, a range that is of concern for speech-based activities. Most of the used methods for RT60 measurements in this paper was by amplifying sweep sine signals through an omni-directional speaker at the location of the imam, generated by ODEON acoustic simulation software. The signals were recorded by a microphone at various points throughout the prayer halls, feeding it back to ODEON for analysis.

TABLE 1

Average RT60 measured at mosques around Malaysia sorted by categorized by volume; small (green), medium (yellow) and large (red).

No	Mosque Name	Vol. (m ³)	Ave. RT60 (sec)
1	Masjid Batu Uban, Penang	171	0.95
2	Masjid Kampung Duyung, Melaka	413	0.75
3	Masjid Jamek Serdang	575	1.13
4	Masjid Kg Bukit Belimbing, Kuala Selangor	617	1.15
5	Masjid Kampung Gombak, Rawang	725	0.66
6	Masjid Dato Dagang, Klang	777	0.95
7	Masjid Tengker, Melaka	786	0.80
8	Masjid Kg Kling, Melaka	963	1.30
9	Masjid Lebu Acheh, Penang	1,001	1.53
10	Masjid Kg Laut, Kelantan	1,012	0.78
11	Masjid Sultan Alae ddin, Klang	1,030	0.78
12	Masjid Sungai Gulang-gulang, Tanjung Karang	1,109	0.75
13	Masjid Dato Panglima Kinta, Ipoh	1,401	1.88
14	Masjid Sultan Suleiman, Klang	1,844	2.23
15	Masjid Jamiatus Solahiah, Batu Caves	1,984	1.31
16	Masjid Kampung Rimba Terjun, Pontian	2,359	1.40
17	Masjid Jamek Kepala Parit Dalam, Alor Setar	2,436	3.00
18	Masjid Jamek, Kuala Lumpur	2,971	2.33
19	Masjid Kapitan Keling, Penang	3,014	3.58
20	Masjid Tun Teja, Rawang	3,153	1.74
21	Masjid Zahir, Alor Setar	3,409	2.45
22	Masjid Taman Putri, Kulai	3,425	2.43
23	Masjid Ar-Raudhah, Banting	3,740	2.45
24	Masjid Jamek Tandop, Alor Setar	3,751	1.85
25	Masjid Alam Impian, Shah Alam	3,933	3.11
26	Masjid At-Taqla, Bandar Bukit Mahkota (Figure 7)	4,300	1.59
27	Masjid Ibnu Mas'ud, KL	4,600	3.78
28	Masjid Tun Khalil Asahan, Jasin, Melaka	4,600	2.90
29	Masjid Jamek, Bandar Kajang	5,200	1.86
30	Masjid Muhammadi, Kelantan	5,571	2.05

31	Masjid Talhah bin 'Ubaidillah, Bukit Jalil	5,900	2.59
32	Masjid Al-Umm, Bandar Baru Bangi (Figure 8)	6,000	1.71
33	Masjid Cahaya Iman, Rawang	6,064	2.07
34	Masjid Jamek Kampung Jawa, Segamat	6,397	3.75
35	Masjid Pekan Nanas, Johor	6,734	2.00
36	Masjid Jamek Sedili Besar, Mersing	6,748	2.98
37	Masjid Darul Muttaqin, Klang	6,800	2.84
38	Masjid As-Syakirin, KLCC, Kuala Lumpur	7,700	2.59
39	Masjid Raja Haji Fisabilillah, Cyberjaya	8,126	2.38
40	Masjid Saidina Abu Bakar, Bangsar	8,317	2.68
41	Masjid Sultan Abu Bakar, Muar	8,440	2.03
42	Masjid Al-Khairiyah, Batu Caves	8,982	3.73
43	Masjid Ara Damansara, Petaling Jaya (Figure 9)	9,000	1.77
44	Masjid Al-Ikhlas, Seksyen 13, Shah Alam	9,000	1.31
45	Masjid Sultan Ibrahim, Johor	9,244	2.50
46	Masjid Bukit Indah, Ampang	10,507	3.04
47	Masjid Al-Bukhary, Senai	11,034	2.60
48	Masjid Jamek, Yong Peng	11,404	2.85
49	Masjid Ikram IUKL, Kajang	13,000	2.43
50	Masjid Khalid Al Walid, MINDEF	14,000	3.68
51	Masjid As-Salam, Puchong	15,700	3.31
52	Masjid Andalusia, Bandar Laguna, Sungai Petani	16,800	4.14
53	Masjid Jamek, Kampung Baru, Kuala Lumpur	17,000	3.42
54	Masjid Saiyyidina Abu Bakar, UTEM Melaka	19,500	3.98
55	Masjid Sultan Ismail, UTM	38,288	2.30
56	Masjid Bandar Diraja Klang, Klang	45,000	5.43
57	Masjid UPM, Serdang	51,400	4.24
58	Masjid Tuanku Mizan, Putrajaya	81,257	2.68

Room Volume

The volume of the prayer halls was approximated for the purpose of comparison and categorization. Most of the used methods for this purpose were on-site measurements, aided by a 3D modelling software, Sketchup®.

Categorization of Specimen Mosques

58 mosque prayer halls of differing sizes and designs were tested (Table 1). These mosques are then segregated into three categories: small, medium, and large. Respectively, the categorization of the volumes is based; below 1,000m³, between 1,000, and 10,000m³, and above 10,000m³.

Result Range Classification

The average RT60 values from the four octave bands (250Hz–2000Hz) were plotted in an X–Y scatter graph together with readings from previous literatures. Based on the recommended range of reverberation time for different room volumes and applications by Brüel & Kjær (B & K), the plotted X–Y graph are superimposed with the aforesaid ranges and classified. (Figure 1) Possible factors contributing to the respective classification are observed and discussed.

RESULTS AND DISCUSSIONS

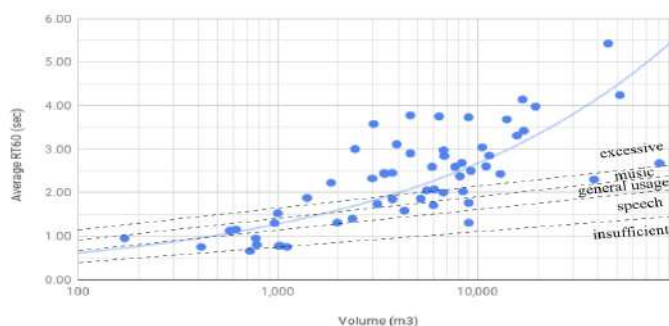


FIGURE 1

Average RT60 values measured at mosques around Malaysia plotted within their respective range classifications; excessive, suitable for musical activities, suitable for general usage (mixture of speech and music), suitable for speech-based activities and insufficient RT60.

Overall Average RT60 Performance

For small mosques, none of them had excessive average RT60 values and half of them suited speech applications well. More than half of the middle-sized mosques had excessive average RT60 values (59.5%) and only 8.1% are suitable for speech applications. While for large mosques, a majority (92.3%) of them had excessive average RT60 values and none of them managed to get the average RT60 values low enough for speech purposes.

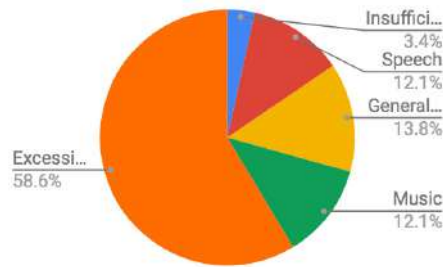


FIGURE 2

Distributions of RT60 classification for overall mosques.

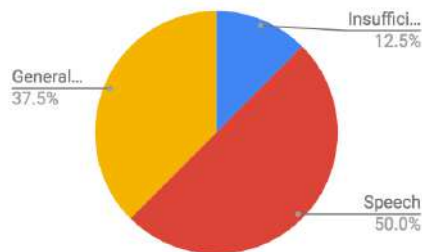


FIGURE 3

Distributions of RT60 classification for small mosques.

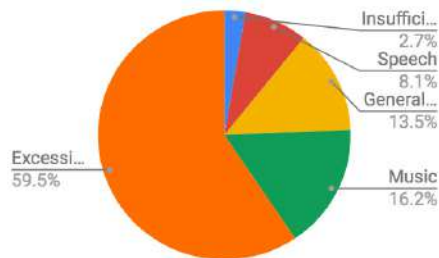


FIGURE 4

Distributions of RT60 classification for medium-sized mosques.

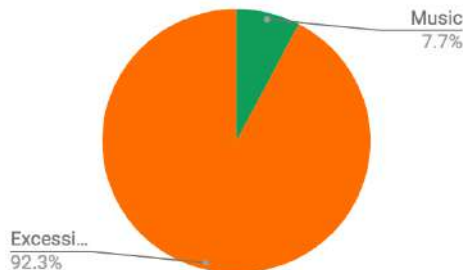


FIGURE 5

Distributions of RT60 classification for large mosques.

Based on trendline, tested mosques are prone to have excessive average RT60 value when the volume is above approximately $3,500\text{m}^3$. It is quite apparent that small sized mosques have lower RT60 values due to its low volume. For the middle sized mosques, three of them are acoustically treated, having the resulting average RT60 value in “general usage” region but Masjid Al-Ikhlas (Figure 6) stood out by having an average RT60 value (1.31 seconds) that suited speech applications, despite being just under the large sized mosque borderline at $9,000\text{m}^3$, and not having any after-thought acoustic treatment systems. The usage of ventilation block finish and large chandelier underneath the near-flat dome are two suspected contributors to this scenario. Common traits for medium mosques with high RT60 values are still unclear. For large mosques, majority of them had excessive RT60 values and highly likely were due to the high volume. However, Masjid Sultan Ismail UTM and Masjid Tuanku Mizan seemed to have deviated significantly from the trendline, which appeared to have ventilation blocks on the walls and nearly wall-less boundaries respectively, which might have contributed to less acoustic reflections.



FIGURE 6

The interior of Masjid Al-Ikhlas featuring ventilation blocks on the walls and a large chandelier underneath a near-flat dome.



FIGURE 7

The usage of perforated modular gypsum board panels believed to be contributing to a lower RT60 in Masjid At-Taqwa, Bukit Bandar Mahkota.

CONCLUSION

RT60 seems to escalate exponentially with the increment of room volume in mosque prayer halls. Care needs to be taken to prevent the likelihood of having excessive RT60 values in medium-sized and large mosques. If the conventional shape of mosques is to be preserved, counter measures like the application of sound absorbing materials may become a necessity. For large prayer halls, it may involve high procurement or maintenance costs to incorporate sound absorbing finishing materials. Hence attention maybe needed on the geometrical elements of the space, such as reduction of walls or the introduction of diffusive or deflecting major surfaces.

The rate of the emergence of new mosques in Malaysia is very small compared to the quantity of existing ones, so most of the efforts in improving the overall quality of Malaysian mosques in terms of RT60 will highly likely involve reform works, which will definitely give impact to the operating costs and the cosmetics of the mosques involved. It is, however, necessary to prioritize function over form in the author's point of view. Hence cost-effective improvements should be further studied to bring out the best in Malaysian mosques in terms of acoustics.

**FIGURE 8**

The interior of Masjid Al-Umm, Bangi utilizing GRG layered with rockwool for absorption.

**FIGURE 9**

The interior of Masjid Ara Damansara utilizing perforated metal ceiling panels for absorption.

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SUGGESTED FRAMEWORK FOR NOISE ASSESSMENT IN MOSQUES

Mostafa J. Sabbagh
Ahmed Elkhateeb

INTRODUCTION

MOSQUES represent a great value in the Muslim society. For its importance, Allah Almighty attributed it directly to Himself, Allah says: "And the mosques are for Allâh, so invoke not anyone along with Allâh"¹ (Chapter 72, Verse 18). He also made its construction and maintenance a form of the faith in Him, Allah says: "The mosques of Allah shall be maintained only by those who believe in Allah and the last day, perform as-solat, and give zakat, and fear non but Allah, it is they who are on the true guidance"² (Chapter 9, Verse 18). The prophetic Sunna also encourage the construction and maintenance of mosques, thus many authentic prophetic reports hadith mentioned its virtue. The two imams Al-Bukhari and Muslim narrated in the Sahihan a hadith from Othman Ibn Affan (may Allah be pleased with him) that the Prophet (PBUH) said: "Whoever builds a mosques for Allah, then Allah will build for him a house like it in Paradise"³.

Because hearing plays a vital role in transferring the religious teachings to the ear, thus the heart and mind of the Muslim, the Islamic law sharia full of rules and ethics that encourage reverence, respect, and keeping mosques free of anything that could disrupt or obstruct their ability to perform their mission. The examples that indicate this conclusion are many; the Islamic law has revoked the ineffective talks and clamor in mosques, as well as all irrelevant speeches which distract the heart and make it far from Allah.

¹يقول الله ﷻ [وَأَنَّ الْمَسَاجِدَ لِلَّهِ فَلَا تَدْعُوا مَعَ اللَّهِ أَحَدًا] الجن 18

²يقول الله ﷻ [إِنَّمَا يَعْمُرُ مَسَاجِدَ اللَّهِ مَنْ آمَنَ بِاللَّهِ وَالْيَوْمِ الْآخِرِ وَأَقَامَ الصَّلَاةَ وَآتَى الزَّكَاةَ وَلَمْ يَخْشَ إِلَّا اللَّهَ فَعَسَىٰ أُولَٰئِكَ أَنْ

يَكُونُوا مِنَ الْمُهْتَدِينَ] التوبة 18

³عن عثمان بن عفان قال: سمعت رسول الله ﷺ يقول [مَنْ بَنَىٰ مَسْجِدًا لِلَّهِ، بَنَىٰ اللَّهُ لَهُ فِي الْجَنَّةِ مِثْلَهُ]

It is also narrated that it is prohibited to sell, buy, and to look for the lost things in the mosque because of their noise. Moreover, the sharia forbade raising of the voice in mosques even by reciting the Holy Qur'an in order to maintain the calm necessary to provide the worshippers with reverence. Abu Sa'id al-Khudri (may Allah be pleased with him) narrated that while the Prophet (PBUH) retired to the mosque, he heard them [the people] reciting the Qur'an in aloud, he opened the curtain and said: "Lo! Every one of you is calling his Lord quietly. One should not trouble the other and one should not raise the voice in recitation [or he said in prayer] over the voice of the other"⁴. On the other hand, the Prophet (PBUH) enjoined "silence" during the Friday sermon and make it an integral part of the validity of the prayer. Abu Hurayrah (may Allah be pleased with him) narrated that the Prophet (PBUH) said: "If you said to your companion whilst the imam is preaching on Friday, 'listen', you have engaged in idle talk"⁵. These were few examples that show the keenness of the sharia to provide a very quiet environment inside the mosque. Such environment helps the worshippers to perform their rituals in quietness and humbleness.

Although Islamic law has been prevented the noise that may generate from the behavior of worshippers inside the mosque, our contemporary mosques are not empty from other new noise sources. In the era of innovation and technology, our mosques utilize many systems and equipment that help them to accomplish their lofty mission in the Muslim society. Perhaps the best-known examples of these technologies are: sound reinforcement systems (SRS) and heat, ventilation, and air conditioning systems (HVAC). Both are good examples for the utilization of the new technologies to serve the houses of Allah. However, using these technologies has also some drawbacks. At the head of these drawbacks is the noise resulting from the wide application of mechanical systems in the conditioning and ventilation of mosques. Generally, there are two sources that could generate noise inside mosques.

1. The first: internal, mainly represented by the HVAC systems in addition to other minor sources.
2. The second: external, represented mainly by the noise generated from roads and areas surrounding the mosque, and in some cases the noise generated from air traffic.

⁴عن أبي سعيد الخدري r قال: [اعتكف رسول الله p في المسجد فسمعهم يجهرُونَ بالقراءة، فكشف السترَ وقال ألا إن كلَّكم مُناجٍ رَبَّهُ فلا يُؤذِينُ بعضُكم بعضًا ولا يرفعُ بعضُكم على بعضٍ في القراءة أو قال في الصلاة].
⁵عن أبي هريرة r أن رسول الله p قال [إذا قلت لصاحبك الإمام يخطب يوم الجمعة أنصت فقد لغوت].

Definitely; the purpose is not merely to hear the teachings of Islam when you are in the mosques, but rather to understand them. This fact may highlight the difference between the two verbs “hear” and “listen”. Linguistically, it is known that listening is the highest level of hearing, where the listener harks completely to the speaker, willing to understand and think; Allah Almighty said: “So, when the Qur’an is recited, listen to it, and be silent that you may receive mercy”⁶ (Chapter 7, Verse 204). It is no doubt true that the noise generated from any source may limit the ability of worshipers to “listen” to what is said inside the mosques especially when this noise is excessive.

Researchers in the field of architectural acoustics early learned that noise, scientifically known as background noise, may extremely restrict the ability of the listener to understand the words of the speech. Thus, for every space and according to its function, they determine a certain limit for this noise so as not negatively affect the intelligibility of speech. It is obvious that the more important the intelligibility of speech in a room, the lower the level of background noise accepted within it.

This work suggests creating a framework that utilizes the use of state-of-the-art sound analyzers, to measure the background noise levels inside and outside the mosques. Then, the results will be compared to the standards to verify the compatibility between field measurements and standards. The framework should also emphasize the impact of applying the standards on the improvement of the acoustical environment of mosques, thus on the comfort of worshippers.

There are still no standards for mosques; so, researchers in this area rely heavily on the Western references that dealt with religious buildings in general. It is clear for every Muslim the strict privacy of the mosques, which makes it different from other religious building, and perhaps this is what makes this work important. The provision of an appropriate and comfortable acoustic environment will have a positive impact on the worshippers, which will benefit the entire Muslim society and may fall under the category of constructing and maintaining mosques. This includes equipped it with the necessary and appropriate facilities such as lighting, water, electricity, and good acoustical environment.

Following this framework; clear description for the nature of various noise sources in mosques, and which of them contribute more to this noise.

⁶يقول الله ﷻ [وَإِذَا قُرِئَ الْقُرْآنُ فَاسْتَمِعُوا لَهُ وَأَنْصِتُوا لَعَلَّكُمْ تُرْحَمُونَ] الأعراف (204).

This helps determine whether the noise levels in mosques generally meet the requirements and standards in this context. Based on this framework recommendations and design criteria can be developed, through which:

1. the existing mosques can be acoustically evaluated; and
2. the new mosques can be guided.

MOSQUE ACOUSTICS IN LITERATURE

The acoustics of mosques have received a lot of attention during the last three decades. This interest started limited in the late 1980s of the past century and increased gradually and rapidly within the last ten years. The work of Hammad [1] "RASTI measurements in mosques in Amman, Jordan" is perhaps one of the early, if not the earliest, work that investigated the intelligibility of speech in mosques. The work has been first published in Arabic early in 1989, then republished in 1990 in English version. The interest of researchers in mosques acoustics increased rapidly in the first decade of the second millennium and becomes booming in the second decade. The researches covered almost every aspect related to mosques acoustics, from the historical to contemporary mosque, from field investigation to laboratory work, from real measurements to simulation, and from the objective to subjective studies. The harvest includes dozens of scientific papers, two research projects, and several conferences. The works of Khaiyat [2], Karabiber [3], Karabiber and Erdogan [4], Fausti et al. [5], Kayýlý [6], Oldham and Elkhateeb [7], Gül and Caliskan [8], Elkhateeb et al. [9], [10], and Prawirasasra and Mubarak [11], are good examples for the efforts exerted in this research area. The following sections present in brief some important examples from these works.

Mutbul Kayýlý [12] showed the effect of cavity resonators systems, well-known in the ancient societies, on the acoustics of the medieval mosques and church buildings. Elkhateeb and Refat [13] studied the acoustics within the main iwan (hall) of the madrassa (school) and Mosque of Sultan Hassan through field measurements and room simulation utilizing ODEON software. Although field measurements show high reverberation time and echoes at some of the examined points, it does not badly affect the ability of worshippers to follow and understand clearly what is said either in the mihrab or mimbar. On the contrary it adds the depth and width required for this kind of spiritual performance. Rafael Suárez et al. [14] utilize simulation tools and virtual-reality technologies to investigate the acoustics of the hypostyle mosque of Cordoba. Results showed

that although the successive enlargements of the mosque managed to maintain visual unity in its interior space, its sound perception has become divided. The values of the main acoustical parameters that characterize this acoustic perception support the hypothesis that spatial division occurs from the acoustic standpoint. Abdou [15] investigated the quality for speech intelligibility in 21 contemporary representative mosques of different sizes and architectural features in Saudi Arabia. Extensive field measurements were performed in order to characterize their acoustical quality and to identify the impact of air conditioning, ceiling fans, and sound reinforcement systems on their acoustics. The study also compares design goals to results obtained in practice and suggests acoustical target values for mosques design. The results showed that acoustical quality in the investigated mosques deviates from optimum conditions when unoccupied but is much better when the mosque is occupied. Elkhateeb et al. [16] compared the reverberation times measured in more than 25 contemporary mosques, of different areas and volumes, in Jeddah, Saudi Arabia, to the optimal reverberation curve suggested for mosques. Results showed that the reverberation in the case of occupation is remarkably under the optimal values. Results also showed that the background noise is excessive and exceeds the recommended values due to the existence of HVAC systems, this reflects a low speech intelligibility expressed in STI.

Oldham and Elkhateeb [17] investigated the absorption per person, A_{obj} , for the worshippers performing prayer according to the Islamic rules in the reverberation chamber of the Acoustic Research Unit, University of Liverpool according to BS-EN-ISO 354:2003. Results showed that at the mid and high frequencies the maximum absorption occurs for the standing position followed by the bowing position, the random sitting position, the sitting in rows position and finally the prostrate position which exhibited the minimum values. Elkhateeb et al. [18] investigated the absorption characteristics of eight types of carpets that are especially designed and manufactured for mosques and two types of carpets pads. Measurements were carried out in the reverberation chamber of the Acoustic Research and Tests Unit (ARTU) in the Faculty of Environmental Design, King Abdulaziz University, Jeddah, Saudi Arabia according to ISO 354. The results showed that the absorption coefficient is directly proportional to frequency and knot density. Najmul Imam et al. [19] investigated the acoustical requirements for intelligibility and liveliness in Bangladeshi mosques. Experiment is conducted to find the effect of reverberation time by making it a variable, while keeping other factors

as non-variable and fulfilling ideal conditions for maximum intelligibility. Results demonstrated that the optimum reverberation is proposed as 0.9s for an overall balanced acoustical performance for both recitation and speech for a mosque in Bangladesh.

To lead architects for a better understanding to the effect of early architectural design decisions on the acoustical environment within mosques, Abdou [20] studied the acoustical performance of common forms of mosques utilizing ODEON room-acoustics software. Simulations of sound fields in five simple forms (from the classical rectangle to the octagon-plan) were conducted for different religious activities and level of occupancy. Results showed insignificant differences between these shapes. Nevertheless, the octagonal shape possesses the fewest merits. Sü and Yilmazer [21] utilized ODEON software to investigate the acoustical characteristics of Kocatepe Mosque in Ankara, Turkey. This Mosque is a remarkable combination of 16th century Ottoman aesthetics and 20th century technology. Results showed that the acoustical quality of Kocatepe Mosque is not optimal when it is unoccupied, and closest to optimal conditions when fully occupied. Ismail [22] examines three common design topologies of mosques, that differ in size, shape, and finishing materials using geometric acoustics approach. A computer model employing the ray tracing theory was employed to investigate the three configurations. Different acoustic treatments were tested relative to the geometric disposition of each design. Finally, basic recommendations and design guidelines were presented.

THE FRAMEWORK

Following international standards and best practices found in literature, the formulation of the framework would be best composed in the following manner. A six-step procedure is outlined in a simplistic manner for easy application (Table 1). The framework work needs to consider the following objectives:

1. identifying typical internal and external noise sources in the mosque;
2. measuring the background noise levels inside and outside a selected sample of mosques;
3. comparing the results of field measurements with the international standards applicable in this context and identifying the degree of compatibility between them;

4. concluding specific recommendations aimed at reducing this noise in existing mosques and keeping it within its acceptable limits in the new mosques;
5. highlighting the role of acoustical standards in improving the acoustical environment inside the mosques, accordingly on the welfare of the worshippers;
6. proposing the appropriate mechanism to implement the research findings and recommendations; and
7. urging the concerned authorities to apply the national standards, if any, by clarifying the importance of these standards and its application based on the results of this work.

TABLE 1
Noise evaluation framework steps.

	Step	Procedure
1	Identifying acoustical environments	<ul style="list-style-type: none"> • quiet areas, middle and noisy areas, remote and close to high traffic areas ... etc.
2	Identifying ventilation, air conditioning, and/or composite systems	<ul style="list-style-type: none"> • Fans only (if applicable) • Packaged systems (window type or split type) • Packaged systems (window type or split type) with fans • Central air conditioning systems • Partially centralized system with packaged units (either window or split) with or without fans
3	Determining major and typical sources of noise in mosques under consideration, to be isolated for measurement in Step 4	<ul style="list-style-type: none"> • Listing of indoor noise sources • Listing of outdoor noise sources within the fascinate of the mosque
4	Conducting a set of comprehensive noise measurements using sound analyzers (class 1 measurement accuracy)	<p>Within the mosques under consideration and in accordance with standards [23], [24], [25]. Various indicators of noise, such as: L_{Aeq}, L_{AFMAX}, L_{AFMIN}, L_{APeak} in the unoccupied mosques should be measured in the one-third octave bands applying the following approach:</p> <ul style="list-style-type: none"> • the HVAC system is off, in this case the road noise is the predominant and the main cause of the background noise

		<ul style="list-style-type: none"> the HVAC system is on, in this case the background noise is a mixture of the internal noise and road noise conducting a set of extensive noise measurements outside and around the mosque using the same equipment as the previous ones. The indicators include, but not limited to: L_n and L_{Aeq}
5	Analyzing the results	<ul style="list-style-type: none"> Analysis of the field measurements Comparison of the analysis result with the NC-curves to determine the compatibility between the measurements and standards, Assessment of worshippers' survey satisfaction to be evaluated.
6	Conclusions and recommendations	<ul style="list-style-type: none"> Listing of recommended acoustical treatments

CONCLUSION AND RECOMMENDATION

In conclusion, although there are many studies that cover the different acoustical aspects of mosques; there is no detailed study that assesses explicitly the background noise levels inside and outside the mosques, a study that identifies the sources of such noise and establishes reference frameworks to reduce it. This study has concluded to a form a nucleus six-step procedure framework. The steps have been applied successfully in several actually studies and summarized in the framework. The framework is simplified to be potentially adapted by standards for mosque acoustical design evaluations. Perhaps, this is the most important characteristic of this work.

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The image shows the exterior of a mosque. The main wall is a warm, earthy brown color. It features a series of white, arched niches. Two of these niches contain windows with black metal grilles. To the right, there is a doorway with a dark, patterned door. Above the doorway, there is a small, square, white structure that appears to be a minaret or a call to prayer tower. The sky is blue with some white clouds. The ground in the foreground is a light-colored, sandy or dusty surface. A white, rectangular, low wall or platform is visible in the lower left foreground.

DIGITAL MOSQUES AND ENVIRONMENT

REVIVING THE MISSING HISTORY
OF MOSQUES USING THE VIRTUAL
USER INTERFACE OF ISLAMIC
CIVILIZATION-VUIIC

Osama Elrawi

REVIVING THE MISSING HISTORY OF MOSQUES USING THE VIRTUAL USER INTERFACE OF ISLAMIC CIVILIZATION-VUIC

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INTRODUCTION

KNOWLEDGE can be defined as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experience and information. Participation in a culture means that one knows how to use its symbols through perception (experience) and representation (expression). The history of architecture describes the development and use of the architectural symbol systems. It therefore forms part of the history of culture, which in general can be defined as the history of meaningful or symbolic forms. Thereby it also becomes a history of existential possibilities. Architecture form is a concretization of a particular set of existential meanings, which is ultimately defined in terms of cultural, social and physical objects forming the character and identity of any civilization.

The VUIC is based on a conceptual model that brings to the fore key properties of Islamic Civilization in order to guide a specific pattern of actions showing how things hold together in an immersive illustrated and integrated relationships creating reality in a sense of collective understanding. The contents of the VUIC are understood as contingent and contextualized intensions illustrating a wide range of interrelated properties and postulating specific (causal) relationships.

In the field of architectural heritage, there is an actual situation which force WH questions that highlights the original situation of these historical structures, their time line and telling the untold story that clarifies the information and knowledge on which those structures were based-on. That includes bringing together various aspects of social life that immersed this architectural heritage. Within this scope of vision, the VUIC is a live

documentation of Islamic cultural heritage that integrates the tangible and intangible factors of formation in Islamic urbanization within a friendly immersive 3D user interface.

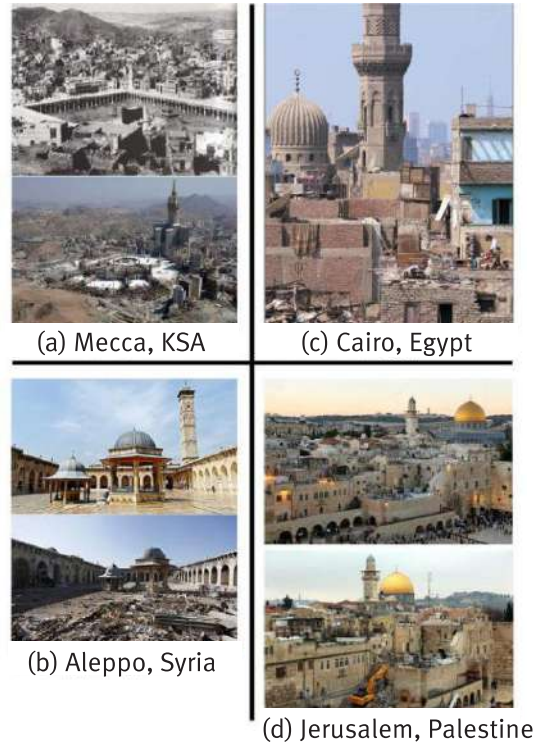
To put this idea into implantation VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality) technologies shall be used to represent, show, explain historical and architectural object to a wide range of users in the fields of heritage preservation, VR education and cultural tourism. Nowadays MR can be considered the most powerful “knowledge tool” developed at the beginning of this millennium. The VUIIC attempts to maximize the implementation of this tool for the sake of meaning-making and interpretation of tangible and intangible heritage. It shall be possible to simulate the process of the various layers of aspects which formulated those buildings through the operation function designed in this interface. These function contain analytic and comparative analysis tools besides the functions related to documentation and explanations. Life is lived forwards, but understood backwards. Within the heritage and historical disciplines, the past is no longer only the domain of specialized scholars, but is also seen as a resource for the future development of local communities and regions, a medium for re-creating cultural identity.

THE PROBLEM DEFINED

Each community, passing through its history and its collective memories, has the duty to conserve, identify and properly manage its own heritage that unfortunately, is often susceptible to transformations due to time, anthropogenic factors or damages. Four main defects had affected Islamic cultural heritage.

1. The disappearance of historical cities caused by urban development and de-historicalization – the case of Islam’s two most holy cities, Makkah al-Mukarramah (Mecca) and al-Madinah al-Munawwarah (Medina) in Saudi Arabia.
2. Demolishing by war – the case of Aleppo in Syria and Samarra in Iraq historical cities.
3. Deterioration under severe strain from inadequate development control – the case of historic Cairo.
4. Falling under religious or political conflict and thus causing systematic chaos for history – the case of Jerusalem.

Thus, decay caused by natural phenomena had gone behind in the hierarchy of factors affecting the deterioration of tangible cultural heritage. For these facts we need a comprehensive multiple documented knowledge structure for the history of Islamic architectural and cultural heritage, otherwise it will be impossible to either preserve or retrieve – respectively – the decayed or lost cultural heritage. We are facing a three-dimensional problem in this concern, first, a demolishing urban and architectural heritage, second, scattered cultural heritage, and finally losing any of private or public awareness with this cultural heritage (Figure 1).



Intangible cultural heritage.



*Hanging lamp, Cairo, Egypt, early 14 century.
Berlin, Museum für Islamische Kunst.*



*Andalusi carpet, signed by Mahmud Kadizli, north-west Iran,
1820-40, silk and wool, 10.5 x 12.5 m.
London, Victoria and Albert Museum.*

Tangible but scattered cultural heritage.

FIGURE 1

Demolition of architectural heritage in Islamic cities, scattered and non-integrative cultural heritage content.

PRESERVING THE MEMORY OF HISTORY: RECREATING AND UNDERSTANDING THE PAST

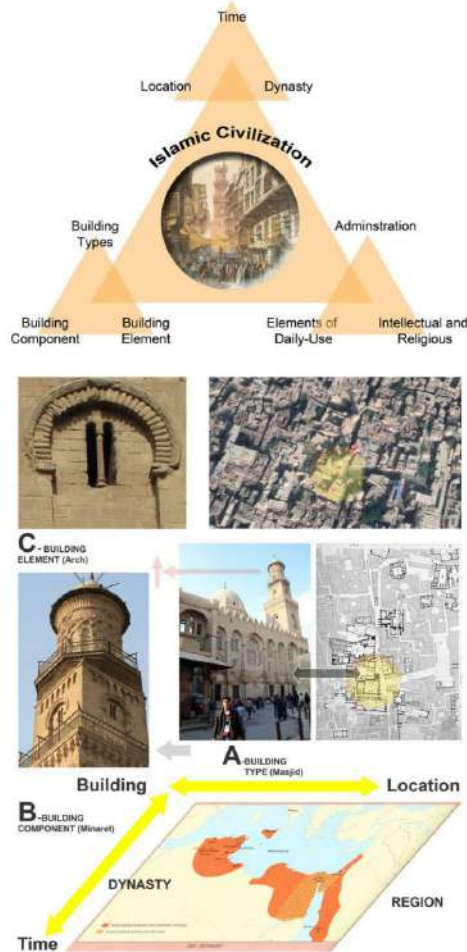


FIGURE 2

Multi-dimensional representation of architectural data concerning time, place and dynasties of architectural heritage in Islamic cities.



FIGURE 3

Ontologies and vocabularies play an important rule to build a conceptual model and to draw the relations between them. A model is a representation of all or part of a system that is constructed to study that system.

In recent years, digital heritage has begun to transform the process of re-creating and understanding the past. This new field, which integrates the traditional expertise of heritage management, museology, history, and archaeology with the powerful new tools of digital information technologies, has tremendous potential for addressing the new challenges and concerns of the heritage sector in the 21st century. Within the heritage and historical disciplines, the past is no longer only the domain of specialized scholars, but is also seen as a resource for the economic development of local communities and regions, a medium for cultural identity and cross cultural communication, an edifying destination for cultural tourists, and a focus for educational enrichment. At the same time, the digital information and communications technologies have produced a wide range of applications for collecting and processing historical data, documenting and monitoring the physical conservation of objects and monuments, visualizing historic structures and environments, and creating interactive information networks that can link professionals and scholars with students, museumgoers, and interested amateurs. The integration of heritage with digital technology has already shown the potential for greatly enhancing many aspects of the research, management, and public involvement in the material remains of the past. Participation in a culture means that one knows how to use its symbols through perception (experience) and representation (expression). The history of architecture describes the development and use of the architectural symbol systems. It therefore forms part of the history of culture, which in general can be defined as the history of meaningful or symbolic forms. Thereby it also becomes a history of existential possibilities (Figure 2).

Based on this vision, the objective of the “Virtual Cube of Islamic Civilization”, is telling the untold story of Islam’s cultural and intellectual history, as well as its relationship with the West. It is a history full of invention, creativity, great ideas, tolerance, and coexistence. This culture seeded the European Renaissance and enabled many aspects of the modern Western and global civilization. The impetus for “Integrated Visual Representation Platform” came from the need to share this forgotten, ignored, misunderstood, suppressed, and even rewritten history with the wider community. A Different Approach for Cultural Heritage Cultural research provides methodologies that allow a consistent analysis of cultural texts so that they can be compared, replicated, disproved and generalized. Examples of approaches to the interpretation of cultural texts are: content analysis, semiotics and discourse analysis (Figure 5). The meaning of the term “cultural texts” has been broadened

from that of purely literary works to that of the many different forms of communication, both formal such as opera, TV news programs, cocktail parties etc., and informal such as how people dress or converse. The digitization of cultural heritage is important as it helps to preserve it and make it accessible for a wider audience in a more appealing and contemporary way. VCIC and its implementation in VUIC – is a new approach for Islamic architectural and cultural documentation in the digital era. The concept for VUIC rose from the extreme importance of having a deeper comprehensive understanding to Islamic civilization with a coherent analytic methodology in dealing with its various dimensions that forms, one of the most important phenomena's in human history and civilization (Figure 3).

METHODOLOGY: KNOWLEDGE CONTINUATION, INTERACTION, AND INTEGRATION

In this research, the conceptual view of knowledge rejects static, organized and defined information by historians to be replaced by a more dynamic and multi-faceted view (multiple soil layers) (Figure 4). We need tools to store contextualized knowledge. We need tools to retrieve knowledge when needed (and in other cases, to bring it to our attention when we do not know that it is not needed).

Building up upon this vision this type of applied research shall follow a mixed research method – investigation-collecting and analyzing data, integrating the findings, and drawing inferences using both qualitative and quantitative methods within one entity that will be accessed through the VUIC as a program of inquiry. Quantitative and qualitative methods are used together to enhance and understand the complexity of Islamic Civilization as a human phenomenon containing technical and epistemological levels of discussion. Quantitative methods leads to using, involving and combining different (data) sources in order to show that similar results have been produced to reflect upon several facts simultaneously. Quantitative research is often regarded as being purely scientific, justifiable, precise and based on facts often reflected in exact figures. Conversely, qualitative research is often regarded as “messaging around”, being “vague” not scientific and not following a structured plan. On the other hand qualitative methods tends to be reflexive and process-driven, ultimately producing culturally situated and theory-enmeshed knowledge through an ongoing interplay between theory and methods.



FIGURE 4

VUIIC, a new system interface with 3D overlay in which we can jump from a function to another directly in VR mood directly from inside VR. We can also connect with colleagues for research discussion purposes. The 3D overlaying plus multi-tasking can be implemented within multi-modal environments – infinite working spaces.

For this purpose, a conceptual model is introduced trying to represent Islamic Civilization considering it as a phenomena in the history of mankind. This model is a representation of an integrated comprehensive system with six main stages.

1. Data collection from various source of information: (a) available drawings; (b) paintings and photos; (c) descriptive documents-endowment documents – Hogga –; (d) poetry – historical manuscripts; and (e) novels and literature survey.
2. Multi-dimensional analysis, content analysis, classification system, and multi-layered data structure. Metadata for reality-based and source based models. Linking information to a descriptive model.
3. Data model, linking information to a descriptive model, Knowledge Cube of Islamic Civilization – KCIC – organizing and managing linkable digital content, for a double function that makes this cube also serve visually as a 3D virtual menu for selections – VCIC – (Figure 5).
4. Building 3D models for historical buildings using LiDAR (Light Detection and Ranging) and aerial photography (remote sensing).
5. Virtual reconstruction: (refer to VUIIC user manual). Feed and feed-back the VUIIC in a sustainable life cycle. The virtually reconstructed buildings shall be located using GIS applications in order to be accessible using Google earth VR.
6. Building immersive multi-dimensional and knowledge interactive User Interface. Virtual knowledge representation based on the new Oculus Dash Interface empowering the user to take maximum advantage of the 360 environment. Oculus Dash is a whole new user interface that allows the user to customize his VR home space and replace the traditional computer monitor with nearly unlimited VR screen space.

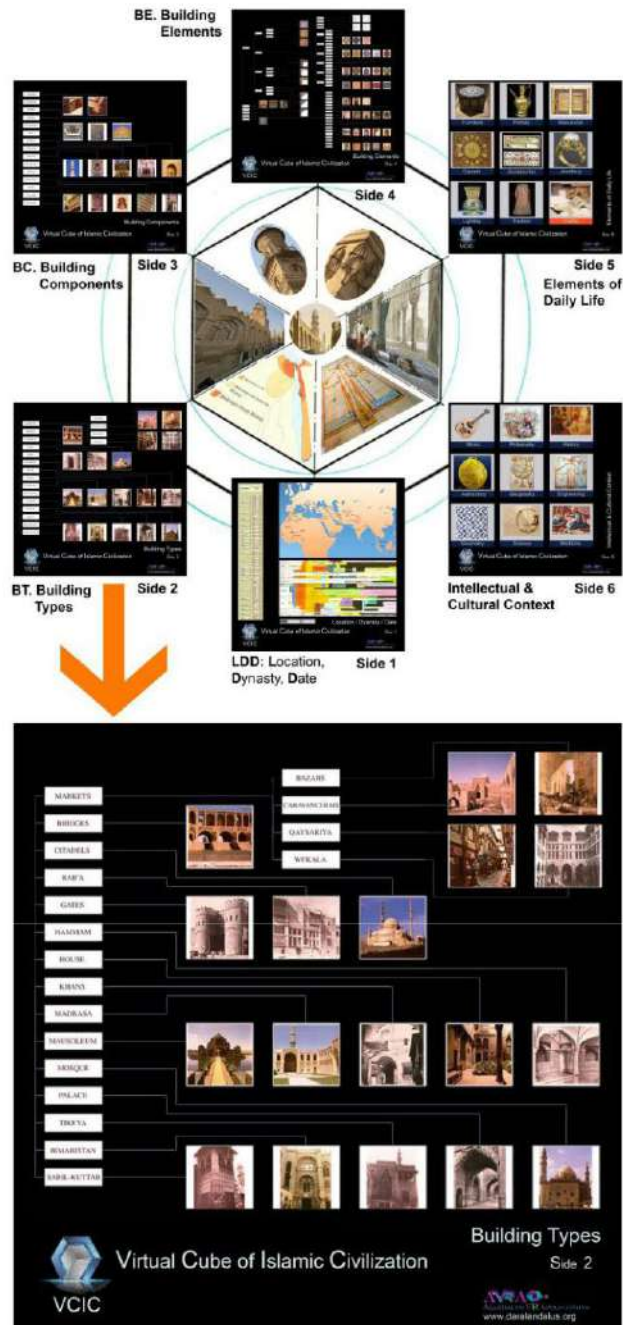


FIGURE 5

Formation of the Knowledge Cube of Islamic Civilization. Hierarchical classification systems and structured vocabularies do not lend themselves easily to rich interlinking of conceptual “trees”. A major step further in this direction is the object-oriented conceptual “Knowledge Cube”.

KNOWLEDGE CUBE OF ISLAMIC CIVILIZATION (KCIC)

The conceptual model behind the VUIC is derived from a positivist tradition and hypothetical causal relationships that are depicted, operationalized and currently tested and verified. The impact of this model provides a “characterized theory” with regard to how people in a particular situation perceive and make sense within a certain configuration of acts and interactions. Thus the VUIC contains multiple knowledge structures that are integrated in a Knowledge Cube of Islamic Civilization – KCIC (Figures 5 and 6).

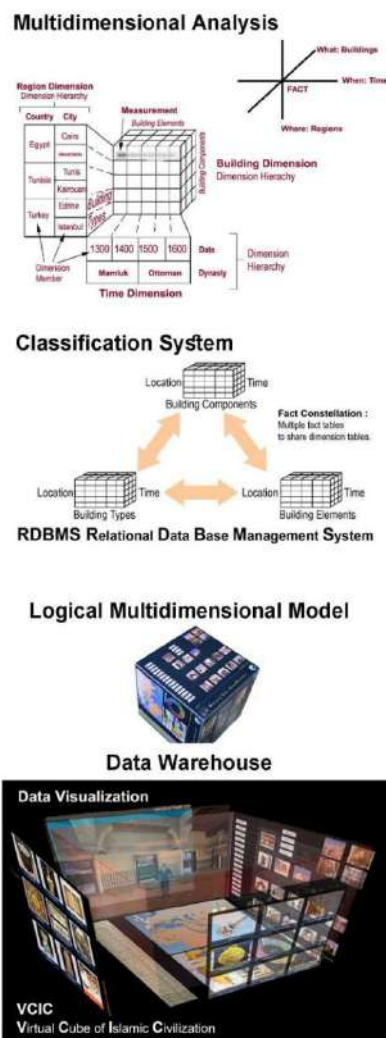


FIGURE 6

Transforming data in the Knowledge Cube of Islamic Civilization to an Integrated Visual Representation System.

The knowledge cube – the core of this integrated visual representation platform – is an information model containing modules of self-contained components of information that are interchangeable and has a well-defined interface to the other components. Architecture, elements of daily use and the intellectual roots of Islamic civilization are all integrated in one comprehensive immersive entity to tell the untold story of this cultural heritage.

The Knowledge Cube of Islamic Civilization (KCIC) is a knowledge based information system invented to put the multi-layered data structure into a descriptive model seeking collecting linking and sharing information and events, in a global dimension, taking into account the different approaches that scientific, humanistic and artistic culture have to the digital age, with metadata for reality-based and model-based models. The KCIC shall be linked with visualization system to manage and create a useful tool for overcoming the segregated divisions of this Islamic civilization, getting it into one integrated entity.

The Knowledge Cube of Islamic Civilization (KCIC) is an open repository of 3D cultural heritage models, providing standard mechanisms for preservation, updating, and dissemination, and urban development construction planning, to promote the historical cities, cultural heritage conservation planning scientific and technological such as data acquisition and data deep processing. Six modules have been established in urban data including architecture (building types, building components and building elements), the architectural features (construction structure, roof form, decorative materials, and traditional elements), information concerning intangible cultural heritage, affiliated cultural relics. Large amounts of data such as text, graphs and images of architecture, interiors, public spaces, urban pattern, and demographic information, socio-economic can be stored. The KCIC shall expand the traditional information analysis functions such as search, retrieval, filtering, document summarization, and data presentation methods to address the need of the users through customization of knowledge visualization management systems. The KCIC shall be transformed to be a VCIC – Virtual Cube of Islamic Civilization – in order to fit into the immersive environment of our proposed VUIIC – Virtual User Interface of Islamic Civilization.

Through this customization we can provide for Islamic architecture and civilization a foundation for future research in information design activities, generation of cognitive design concepts and the tools needed for the evaluation of shared architectural vocabularies.

THE VUIIC: VIRTUAL USER INTERFACE OF ISLAMIC CIVILIZATION

The VUIIC is built up on the Knowledge Cube of Islamic Civilization, a database platform system having the capability of getting back to life elements of cultural heritage (Figure 7). The functions set up on this platform are to support determine the conservation elements through the objective analysis of the database elements combining relevant information screening. The platform can also generate the spatial graphs quickly and conveniently. Meanwhile these operations need to undertake some special data analysis addressing the complete development of Islamic Architecture through its different Regions and Dynasties. This range of capability allows the Virtual Cube of Islamic Civilization (VCIC) to be an application platform in a wide variety of institutions dealing with architectural design, architectural education and fine arts. VCIC provides characterized-driven modeled classification for elements of design in Islamic Architecture and can also provide standardized data structures and communications protocols for objects and cross-system workflows. VCIC can provide an effectively designed system that will address the functionality requirements of each category of end-users (Figure 8).

On this basis, the VUIIC is introducing a completely new concept platform that can add an in-game overlay wish, that is, the Virtual User Interface for Islamic Civilization (VUIIC). This interface is reminiscent of a minority report-style interface, where windows dangle in the air and can be moved around with the wave of hand. VUIIC will let us code inside VR, and also bring along favorite desktop experience, making the screen all around the user spending whole work inside VR.

The proposed VUIIC is currently under development to run as an overlay inside the existing Oculus Rift's VR software, so that it can be possible to quickly switch from one application to the next, open the libraries, connect with colleagues, and use the rest of the pc without extra steps (multi-tasking). For this purpose developers working on VUIIC can debug these VR applications while inside them using – in our case – Unreal Engine.

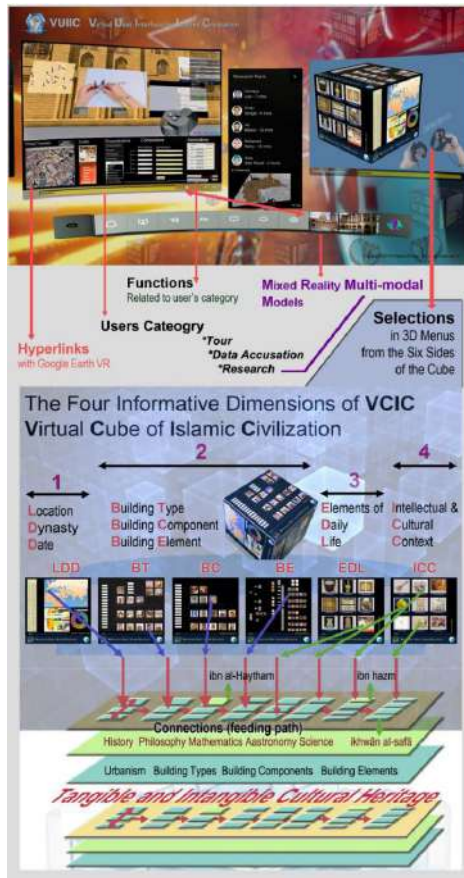


FIGURE 7

An integrated VR/AR/MR platform with multiple technologies and applications to let the concept of VCIC exists and implemented for a wide range of users categories.

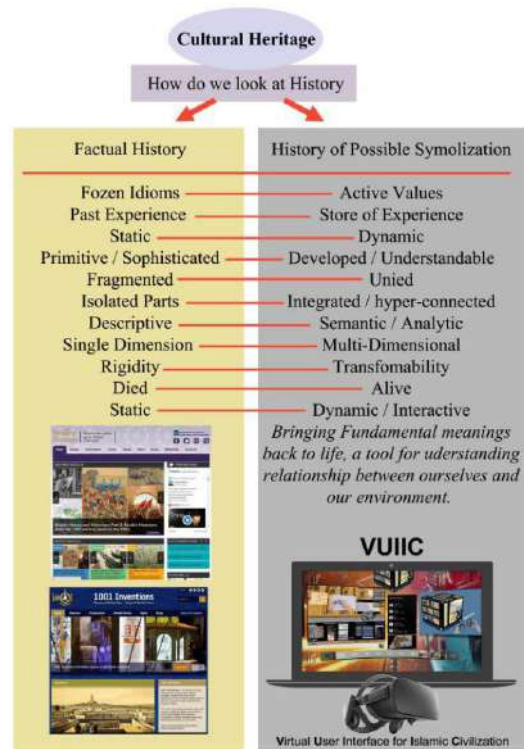


FIGURE 8

Comparative analysis showing the basic differences between the current systems dealing with cultural heritage and the proposed system in this research.

Typically in most applications you will want to communicate some information to your users through this proposed application i.e.; the VUIIC. The Oculus Rift/S is a Head Mounted Display (HMD) that will allow users to deeply immerse themselves into the digital heritage content. With Unreal Motion Graphics (UMG), you can create a Widget Blueprint to handle the display of VUIIC. This shall be connected with the database of Islamic civilization Knowledge Cube of Islamic Civilization (KCIC) and consequently with the Virtual Cube of Islamic Civilization (VCIC).

The VUIIC shall be implemented within the environment of Oculus Dash which is a whole new user interface that allows the user to customize his VR home

space and replace the traditional computer monitor with nearly unlimited VR screen space. The VUIIC shall be using a three-dimensional displays and interactive user interface to explore real-time computer-generated environments that provides a structure through which new technical, aesthetic, and scientific standards can be defined and implemented through the functions of Identifications, Characteristics, Comparisons, and Associations. The graph visualization and the 3D construction in this virtual geometry together with various interactive scenarios help user to analyze and gain better knowledge and understanding. The VUIIC is targeting three main fields of specializations (users): heritage preservation, VR education and cultural tourism.

HERITAGE PRESERVATION: VIRTUAL RECONSTRUCTION OF SULTAN QALAWUN MOSQUE IN EGYPT – A CASE STUDY

Reviving the Missing History of Mosques Using the Virtual User Interface of Islamic Civilization (VUIIC)

The system aims in educating the visitors about artefacts and their history. This project could develop 3D multimedia tools to record, reconstruct, encode and visualize archaeological ruins in virtual reality. These tools could be applied to buildings, building parts, pottery, terrain geometry, textures and texture materials.

VUIIC can be exploited to provide several different and interesting types of virtual heritage exhibitions. The novelty of the technologies employed is that they allow users to switch between three different types of visualization environments. VUIIC can link collections and distinct types of heritage information contribute to the sustainable management of even fragile heritage sites and involve local communities in the creation of historical narratives and exhibitions as active participants rather than as a passive audience. The watchwords for the future of heritage are place, network, memory, identity, and communication. VUIIC can provide the context and tools for these new approaches to heritage not merely by recording, data processing and visualization, but by helping to shape the meaning and direction of the entire enterprise.

VUIIC is using up to date tools and techniques for acquisition, arrangement, analysis and management of all kinds of data in concern with Islamic cultural heritage. It is also used to realize archaeological and cultural heritage data management and storage, and establish archaeological and cultural

heritage GIS database, which is one of the most popular application in archaeological and cultural heritage conservation field.

The VUIC Data-Base system has the capability of comprehensive and complete virtual addressing for the development of Islamic Architecture and Civilization through its different dynasties and through virtual reconstructions and virtual knowledge representations (Figure 9). Within this platform, we can be able to facilitate true collaborative research operations across the multi-disciplinary extended enterprise including style and form design, historical background and the definition of detailed characteristics of this interactive knowledge.

Digital preservation, according to Conway (1996) is the “acquisition, organization, and distribution of resources to prevent further deterioration or renew the usability of selected groups of materials”. This definition provides an indication of the various efforts involved in preserving digital materials so that they find extended use, but it leaves a key piece of the preservation process unacknowledged. The importance of preserving the descriptive and explanatory information that accompanies digitized materials fails to appear in this definition, except perhaps through intimation. This situation is not surprising given that preserving digital content is the principal goal of digital preservation.

The digitization of cultural heritage plays a determinant role in the preservation, promotion, and development of cultural heritage and even in the economic growth of the countries.

The proposed navigation system – VUIC – in this research is based upon three-dimensional periodic spatial tiling and this could be an important contribution in the direction towards more topological and less compositional grammars. We could readdress theoretical issues (e.g. “formal knowledge”, “models”, “representation”, etc.) that preoccupied the cultural and educational community for many generation, and also readdress the process of “the trans-valuation of values”.

CASE STUDY: The Complex of Sultan Qalawun, Maristan (General Hospital), Mausoleum, and Madrasa (School), 683-4 H, 1284-5 AD. Year of inscription on the World Heritage List 1979 – Historic Cairo (Egypt) (C 89).

LOCATION: El-Moezz Le-Din Allah Street, Cairo, Egypt.

RECENT SITUATION: According to UNESCO report – World Heritage – 41 COM – WHC/17/41.COM/7B – Paris, 19 May 2017 – <http://whc.unesco.org/archive/2017/whc17-41com-18-en.pdf>.

Factors affecting the property identified in previous reports (a part of that is): overcrowded areas and buildings, uncontrolled development, absence of a comprehensive urban conservation plan, absence of an integrated socio-economic revitalization plan linking the urban and the socio-cultural fabric of the city core.

Draft Decision: 41 COM 7B.77 – The World Heritage Committee, item #six:

“Given the challenges to be faced to halt and reverse the decline of the property, urges the State Party to take all needed measures to halt the rapid deterioration observed at the property, while the new administrative and management measures are being put in place, and closely monitor the situation;”

The complex of Sultan Qalawun comprises a masjid, a mausoleum, a madrasa (school), and maristan (general hospital). This remarkable group of buildings was begun and completed in only a year by the first of the Bahri Mamluk sultans: Al-Mansur Qalawun; it is the earliest of a series of foundations built by successive sultans on the western side of Bayn al Qasrayn. The mausoleum is remarkable for its size, its unique facade, and the wealth of ornamentation in its interior. It is approached by an imposing corridor that also gives access to the madrasa and used to lead into the maristan.

Virtual reconstruction, visualization, documentation and digital preservation of the Complex of Sultan Qalawun. An AR/VR and MR representation can put historical heritage into a new context, in order to help users/virtual visits and navigations link history with present day life. AR/VR/MR technology allows comparing current environment with the past which can enhance both experience and understanding. Practice has shown that users prefer to interact with digital content over being just passive observers/viewers of a movie or pre-rendered installation. We have been exploring whether digital storytelling could also be implemented as interactive, and up to what amount of interactivity, without the user losing the context and thread of the story.

In the case of The Complex of Sultan Qalawun which consists masjid, madrasa, mausoleum, and maristan (general hospital), so much of the Maristan was destroyed in 1910 to make room for the ophthalmic hospital, which has been planted in the very center of the old Maristan, the drawings made by Costa 1818 and 1825, and the plan of the Committee published

by Hertz, enabled us to realize that the building was planned on two axes at right angles to each other (Figures 9 and 10).

In this project we had this maristan virtually reconstructed bringing back to life the original situation of its spatial configuration, which were in great significance and influence as at that time (1285 AD), as these rooms were wards for sick men, others for sick women, others were for convalescents, male and female, others again were store-rooms, latrines, mortuaries, etc. In the north corner of the complex were two courts surrounded by cells, the larger, which still exists almost intact, being for insane men, the smaller, which has disappeared, for insane women.

The function of Associations in the VUIC helps in retrieving the missing/demolished hospital in 1911 AD, when at this date it was replaced by this existing building. Full details could also be retrieved together with the life scenarios that were going on at the original hospital built in 1285 AD. The function of Associating the missing spaces and details follows a criteria with the following parameters:

Function and duration near around the same dynasty, tracking the historical background to refer to similar building function (building type) but in a different location within the same dynasty. Within these criteria, in the case of Sultan Qalawun Hospital in Cairo, Egypt the associated building is the Hospital of Nour el-Din el-Zinki in Damascus, Syria. The justification of this result came from the historical/geo-political historical fact that Sultan Qalawun had been staying in Syria for treatment at Zinki hospital before moving to Egypt and getting to be the ruler of a the regions of Egypt and Syria.



FIGURE 9

Linking 3D models with its actual location on earth, enhancing the capabilities of cultural tourism as well as various types of research concerning architecture and urban design in historical cities.

(Software: Revizto)



FIGURE 10

VUIIC can link collections and distinct types of heritage information contribute to the sustainable management of architectural heritage linking scattered and non-integrative cultural heritage content.

This results are achieved through the meta-data inserted at the data-base system in the KCIC. For missing details, associations function is seeking reference items to start research investigations in order to relocate the missing building components, building elements and details. Users are informed with all possible selections in reference and interrelation with the input ordered parameters. The currently missing Shadharwan (a kind of wall fountain) at Qalawun Complex in Cairo, Egypt has an associated one at Aziz palace in Palermo, Italy. Fatimids ruled Egypt and Palermo, Sicily, in Italy 12th century, both located at the iwan (Figures 11 and 12).



FIGURE 11

VUIIC contains tools to record, reconstruct, encode and visualize archaeological ruins in virtual reality.



FIGURE 12

A virtual world is something more than a visually “realistic” geometric models, it is a dynamic model that explores material properties, lighting and viewing deep characteristics of cultural heritage.

VR EDUCATION

VR/AR and MR does not have to replace the classroom and the teacher, but rather can provide the teacher with a tool to enhance the classroom experience for his or her students. For this paper we are adopting advances in information and communication technologies that have been transforming education and research. Computer-Mediated Communication tools are emerging as a promising means of enhancing constructivist learning environments and have become ubiquitous in teaching, learning, and research praxis.

As an emerging technology, Mixed Reality (MR) not only supplements the dynamic notion of the instructional practices but also incorporates sensory modalities, such as, touch, sight and hearing. The term mixed reality means “the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time”. So augmented reality and augmented virtuality are both technically under the mixed reality umbrella because they are mixing the real world with digital content in some way or another.

By combining a state-of-the-art structure, pioneering technology, and cutting-edge teaching techniques, we will provide students with innovative tools for self-learning to lead in this new era (Figure 13).

Students whom had used these technologies reported increased motivation, improved confidence in their skills, and higher satisfaction with the course. Yet, one of the most important central considerations for educators is the dynamic means of content delivery through the enhancement of instructional practices. VR constructs provide contextual learning experiences that foster exploration of real world data in virtual surroundings, while AR’s responsive interactivity enables students to construct broader understandings based on interactions with virtual objects. These two flexible, immersive technologies spark similar educational outcomes, bringing learners to deeper levels of cognition as they attain new perspectives on underlying data. The use of MR applications is considered to improve students’ cognition and interaction which results in more effective learning.

**FIGURE 13**

Using Mixed Reality Multi-modal Models for self-learning especially in higher education: Engineering, Art, Architecture.

(Software: Fuzor, by Kallos Studios)

Within a wide range of VR platforms and simulations, complicated concepts shall be accessible to users of all ages. In the field of education the three main categories of visualization, virtualization, and immersion could making cognitive learning faster, more efficient, and effective.

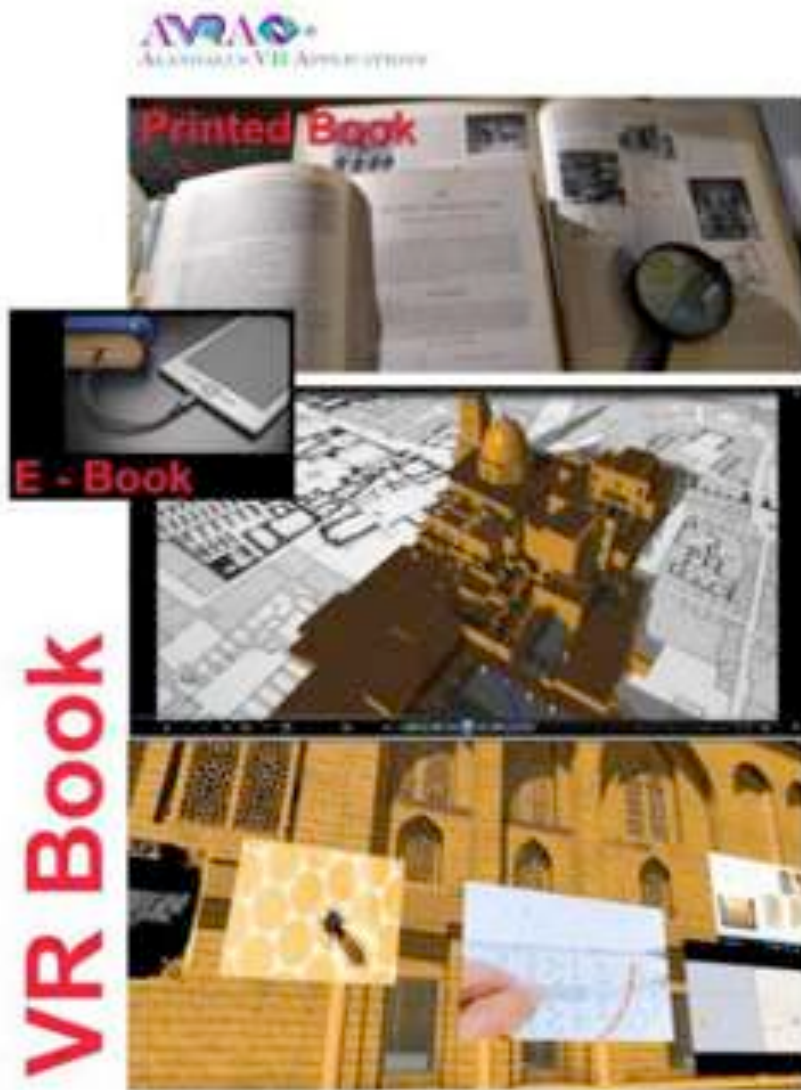


FIGURE 14

Using VUIIC to produce the first VR/AR book.

We therefore could engage students in topics related to crafts, music, and science by offering a deeply immersive sense of place and time, providing related topic for common courses or a development and deployment of a tailored solution according to course description, and course content of each teaching program. Students learn by a placed course in topics related to crafts, music, and science by offering a deeply immersive sense of place and time (Figure 14).

CULTURAL TOURISM

**FIGURE 15**

Virtual heritage makes the interpretations of history more accessible to the general public.

Those looking to explore historical sites and buildings Google earth VR to really experience the aura of a place, offer and provide visitors with surroundings for touring them in order to achieve knowledge (Figure 15). Virtual Reality and its concept of cyber-real space invoke such interactive digital narratives that promote new patterns of understanding. The word "narrative" refers to a set of events happening during a certain period of

time and providing aesthetic, dramaturgical and emotional elements, objects and attitudes. Mixing such aesthetic ambiances with virtual augmentations and adding dramatic tension, can develop these narrative patterns into an exciting new edutainment medium. Digital artifacts or cultural objects can, however, be presented all round. In a more interactive experience, users can select some cultural objects and observe their digital representations in the context of real artifacts. It is important that the use of MR technologies tours does not just present virtual objects and descriptions, i.e. a 3D replacement to the traditional book; they must be set in a story that reinforces the visitors learning and understanding of the cultural content.

The mixed reality system provides the users with advanced tools of knowledge and understanding. The navigation system is based upon three-dimensional aperiodic spatial tiling, and is an important contribution in the direction towards more topological and less compositional grammars. In order to achieve a coherent and historically meaningful virtual visualization of any heritage site, it is crucial not only to proceed to the preparation of a scientifically correct representation of its architectural qualities, but it is equally essential to present the relations that existed between the physical site, its social function and the people that used to live at the time in which it was still in use. VUIC representation tools can put historical heritage into the context of the modern landscape, in order to help visitor's link history with their own present day life. VR/AR/MR technology allows comparing current environment with the past which can enhance both experience and understanding. Moreover, the addition of historically consistent virtual humans into virtual reconstructions both allows for a better understanding of the use of the architectural structures present on the site, and permits the creation of more realistic simulations with the inclusion of specific ambiances, atmospheres or dramatic elements (Figure 16). Due to the hermeneutic need to revive the time-dependent context of the restored edifices, the need has arisen to reconstitute the buildings both as they were originally and as they have been modified.

**FIGURE 16**

Using Mixed Reality Multi-modal Models for self-learning especially in higher education: Engineering, Art, Architecture.

(Software: Fuzor, by Kallos Studios)

Interactive storytelling can also be implemented through the spatial movement of the user in the Mixed Reality environment, so that his/her position towards certain points of interest triggers corresponding parts of the story. The VCIC users can potentially experience their digital heritage in the physical sense, then explore further through the multimodal displays inserted into the MR model, visualize this heritage all round, take that 3D artefacts into the augmented reality domain.

CONCLUSION

VCIC had proved that it could overcome the four main defects described in part II of this paper. The proposed VUIC Virtual User Interface of Islamic Civilization can link collections and distinct types of heritage information contributions to the sustainable management of even fragile heritage sites and involve local communities in the creation of historical narratives and exhibitions as active participants rather than as a passive audience. The watchwords for the future of heritage are place, network, memory, identity, and communication. This VUIC can provide the context and tools for these new approaches to heritage not merely by recording, data processing, and visualization, but by helping to shape the meaning and direction of the entire enterprise.

Digital technologies offer new modern tools for cultural heritage preservation; they also play a leading role about key issues as providing access, interaction, and sharing knowledge. Furthermore, our society is unlike before accumulating a large amount of born-digital heritage, especially documents, art-works, software's, and the Web itself: keeping them for the future generation raises a specific range of demanding matters related to the preservation of the digital heritage. Worldwide, preservation – both the preservation of tangible and intangible heritage through the digital technologies and the preservation of the digital cultural content – is felt as a matter of the highest importance, being so strictly connected to the true essence of the human culture.

The novelty of the technologies employed is that they allow users to switch between different types of visualization environments including: the web in the traditional way, but including 3D, virtual reality, and augmented reality (thus mixing these different formats into the same architecture). Additionally, several different interface techniques can be employed to make exploration of this User Interface for seminars, presentations, and online lectures containing visualization environments in the virtual world.

The proposed VUIC is currently under development to run as an overlay inside the existing Oculus Rift's VR software, so that it can be possible to quickly switch from one application to the next, open the libraries, and connect with colleagues without extra steps (multi-tasking).

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INNOVATIVE ISLAMIC AESTHETICS AND PATTERNS

ARCHITECTURAL ORNAMENT
ON CONTEMPORARY MOSQUE
IN MALAYSIA

Siti Dalila Mohd Sojak
Raja Nafida Raja Shahminan
Fadhlina Ahmad @ Taufik

A STUDY TOWARDS THE
ORIGIN OF TERRACOTTA
DECORATION OF THE MOSQUE
ARCHITECTURE IN BENGAL: AN
ANALYSIS BASED ON SHAPE
GRAMMAR PRINCIPALS

Shafique Rahman
Redowan Kabir Kaushik

USING REPERTORY GRID
TECHNIQUE (RGT)
TO ANALYZE THE AESTHETICS
OF CONTEMPORARY
ARCHITECTURAL
IMAGES OF MOSQUES

Ahmed Agiel
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THE AESTHETIC OF DECORATION
IN MOSQUE: CASE STUDY OF
MOSQUE IN MELAKA TOWARDS
UNDERSTANDING ITS
TRUE FUNCTIONS

Norzalifa Zainal Abidin

BIOPHILIA FOR MOSQUES
DESIGNS

Mohamed Esmat ElAttar
Zainab Nasr Tahoon
Fatema Elzahraa Hany Abbas

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INTRODUCTION

IN most mosques that exist today, aesthetical value is actually a major factor compared to the functional purpose of the mosque. This can be seen from its very massive ornamentation and sometimes uses luxurious and expensive materials, such as genuine gold and silver (Putrie and Hosiah, 2012). Nowadays, ornamentation in most mosques has found imitation issues. The ornamentation just following the same form of the previous ones without having its essential meaning. (Utaberta, Handryant, and Wahab, 2014). Besides, the ornamentation is more likely copying the Middle Eastern influences and features such as arabesque, muqarnas, iwan, etc.

In an effort to promote a more modern approach in designing many future mosques, various suggestions are still being introduced using unnecessary elaborate embellishments commonly used to grandly express the mosque. The borrowed architectural styles and the architectural language or nomenclature have been used regularly over a long period of time, reaching a point where they need to be evaluated. It has come to a point where there is now an urgent need to redefine this approach of designing the mosque by taking into account past values, the surrounding environment and future expectations (Aziz, 2016).

Over the history of mosque architecture in Malaysia, the scenario of mosque architecture in Malaysia have gone a lot of evolution and transformation, by the influences of regional, colonial, and post-independence history. Johar (2010) reported traditional mosque architecture was simple with no clear

features compared to the mosques in the Middle-Eastern countries. The early mosque architecture was vernacular in nature and resorted to using many familiar materials.

The migration of merchants to Malacca during the pre-colonial era appeared vernacular mosque with more refined where local traditional architecture had infused with some influences brought from the patron who is Chinese and Indian, upgrading to the Dutch masonry technology. Moreover, at the beginning of the 19th century, the British who had colonized Malaysia brought in the exotic architectural nomenclature of the Moghul and Moorish to become part of the local architectural language (Aziz, 2016).

The legacy of modern architecture after independence represents a universal modern language, not racial and progressive aspirations symbolically liberating architecture from the colonialism (Mursib and Tajuddin, 2016). As a newly independent country, the state mosques build to portray national identity which can characterize the local culture and show that Islam is the religion of the state (Yeang, 1992). However, the trend of “re-Islamization” period which began around the 1980s has brought in Islamic architecture revivalism which had used elements and designs from an earlier mosque typology (Aziz, 2016).

Many critics have questioned the continuing use of these architectural elements for mosque designing in Malaysia. However, there are several efforts have been introduced to bring a new mosque typological in Malaysia. Thus, this study discusses the contemporary and Islamic ornamentation to bring the definition and understanding of the application on mosque ornamentation in terms of functionality.

ISLAMIC ORNAMENTATION AND PRINCIPLE

The definition of ornament in Islamic art as explained by Holod (1988) is a form of surface decoration. It can be represented by vegetal, figural or calligraphy. While, Mitrache A (2012) stated that ornament, defined as an element added to a work of art in order to enhance its aesthetic attributes and the depth and legibility of its symbolic connotations. Due to the prohibition of figural form in Islamic decoration, most of Islamic motifs derived only from vegetal or floral, geometric shape, and calligraphy taken from a Quran verse or hadith from the Prophet (PBUH).

According to Baer (1998), the purpose of Islamic ornamentation is not only embellishment, but also a language that can be learned, read, and

understood. The concept of Islamic ornamentation interprets spiritual beliefs, reflects the impact of local traditions and foreign influences and was subject to changes in taste in the Islamic world at large. Most scholar in Islamic art such as Critchlow, Golombek, Lee, Hossein, Grabar, etc describe Islamic ornament in its various manifestations is intimately linked and deeply rooted in religious and mystic concepts of the spiritual world of Islam.

According to Al-Faruqi (1986), the beautiful and intricate design one finds on art objects of every region, and in every century of Islamic history, fulfills four specific and important functions which is the reminder of tawheed, transfiguration of materials, transfiguration of structures, and beautification. The roles of Islamic decoration are manifold. They can be spiritual, educational, social, and psychological (Kassim, Abdullah, and Taib, 2014).

According to Jeanan (2014), she concluded five principles in Islamic ornaments; principle of unity and unity in multiplicity, eternity, abstraction, recurrence and rhythm, and symmetry. Islamic art is fundamentally derived from tawheed that is from an assent to or contemplation of divine unity (Buckhardt, 1967). This concept eternity represents by indefinite existence without a start or a finish (Baer, 1998).

CONTEMPORARY ARCHITECTURE AND ORNAMENTATION

The definition of contemporary architecture, according to Ellefsen (1927) is a new style, or a new architectural language should borrow its expression from technology. Ellefsen declared in 1927, a building should be a true reflection of the modern and technological-based era. According to Reidun (2009), contemporary architecture is a key concept in the architectural discourse and may be understood in two different ways, that is to say, both theoretical and empirical. Theoretically, the contemporary notion was originally seen in relation to the “zeitgeist” or spirit of the time. Empirically, contemporary could be seen to give paradigm inspired and relation to the need for interdiscourse.

A paradigm is characterized by the presence of something holding it together (ex: technology), at the same time as it is also changing. An interdiscourse means a relation to society, profession, and discourse. In a combination term, professional practice, tradition or paradigm is necessary to ensure quality, constructive critiques, and development according to commonly defined goals.

Since the beginning of the 21st century, it could be said that ornamentation strongly announces its return to the architectural scene (Mitrache, 2012; Picon, 2014). Ornaments have attracted attention in the last decade, almost since 2005, that is clearly demonstrated in art exhibitions, journals, and books (Balik and Allmer, 2016). According to Fairhurst, it is now functional (Fairhurst, 2007). According to Opincariu (2011), ornaments in contemporary architecture go beyond decorating, to be further tools for expression and cultural reflectance. Ornaments demonstrate themselves as communication tools while acting as facades layers. She stated that the technology and digital revolution contribute to linking structure with the aesthetic values. She defines modern ornaments as the mirrors that reflect the new materiality and the technical logic (Opincariu, 2011).

The return of ornaments in contemporary architecture is strongly attributed to the advanced technology (Mitrache, 2012; Pantazi, 2008; Balik and Allmer, 2016). According to Massey, while Le Corbusier rejected decorations in architecture as a hinder to societal progress, decoration has become today, a witness to technological progress (Massey, 2013). Ornament in contemporary architecture emerges as an elaborate medium of consumption and production by means of new tools, methods, and techniques (Balik and Allmer, 2016). So, the contemporary approach is about the spirit of the time, accordingly to the advance technology but not to forget the culture and history.

Reemergence of Contemporary Ornaments

Today, the symbolic aspect of ornament is widely-used especially in terms of representing the function of the building as an adaptation of the postmodern approach. The expanded vocabulary of ornament allows contemporary architects to define ornament according to their own design approaches. (Balik and Allmer, 2016).

Contemporary architects use advanced technology with an intention to demonstrate their virtuosity in designing and producing surface effects (Balik and Allmer, 2016). Figure 1 shows an arabesque cladding facade that produces surface effects to reflect the tradition and religious-symbolic values to make a city landmark. Jencks (2011) notes that symbolic architecture merges multiple meanings with functional and aesthetic dimensions, rather than dealing with signs. Ornament as the representation of culture has long been one of its primary applications.

**FIGURE 1**

Central Mosque of Pristina competition entry, Kosovo, 2013.

(Source: Maden and Co)

Contemporary architecture has long been an experimental ground for integrating ornamental elements as a part of load-bearing elements with an intention to construct structural ornament (Balik and Allmer, 2016). As Jencks (2011) further elaborates, ornament becomes necessary when it is integral to architecture as in the sense of structural ornament. Figure 2 shows the unique design of Al-Irsyad Mosque in that it uses stacked stones as the main facade to create a tectonic effect while embedding Islamic text or calligraphy on the facade as a graphic element and reminder prayer (Ridwan, 2010).

**FIGURE 2**

Al-Irsyad Mosque, Indonesia, 2010.

(Source: www.archdaily.com)

Current applications of ornament extend to media facades, or digital ornaments, which are activated as screens, and attract viewers' attention by rendering the buildings visible at night (Figure 3). Produced and presented in the digital medium, media facades merge electronics, different materials, and building facades. In this sense, technology helps the production of non-conventional ornamental elements, which cannot be produced by conventional tools and methods (Balik and Allmer, 2016).



FIGURE 3

Arcapita Mosque, Bahrain, 2010.

(Source: SOM)

The contemporary application of ornament proposes novel aspects, such as structural ornament and digital ornament, as much as it reinterprets the traditional applications of representing culture, function, brand, power, and context. In this sense, the advancement of digital technology becomes a tool, rather than a motive and a primary ground of justification.

According to Elrayies (2018), the contemporary ornament is associated with several important matters: aesthetics, culture, religion, history, society, and politics.





Through the above contemporary reviews of the different concepts of ornaments in architecture, it can be concluded that the reemergence of ornaments grounded from the advanced technology. The technology enhances the ornament through the application on surface, structure or media articulation and deals with the environmental and identity issues. Thus, contemporary ornaments have a new dimension of bridging history and culture, technology, religion, and society.





THE ANALYSIS ON CONTEMPORARY MOSQUE ORNAMENTS

The study consists of four contemporary mosques in Malaysia. First, the National Mosque was selected because it is the first mosque presented in a modernistic style and was regarded as the first indigenous Malaysian style mosque. Second, Tuanku Mizan Mosque in 2009 (also known as Iron Mosque) is considered as the most technologically advanced mosque in Malaysia, using 70% of the steel structure. Then, Ara Damansara Mosque and Raja Haji Fisabilillah Mosque were selected as they adopt green and sustainable design buildings. The selected mosques were based on the contemporary architecture design along with the application of ornamentation. The ornamentation analysis will focus on the exterior aspects as to relate within the buildings and surrounding context.

The method used for the analysis is the formal analysis. It focuses on form rather than subject matter or historical context; consist of the visual features of a work and analysis of their effects (Robert, 2017). A case study of four contemporary mosques in Malaysia is conducted to analyze its characteristics, principles, and functions using the formal observation. The analysis is presented in the comparative table below (Table 1).

TABLE 1
Comparative analysis of mosque ornamentation in contemporary mosque.

Mosque	National Mosque, Kuala Lumpur (1967)	Tuanku Mizan Mosque, Putrajaya (2009)	Ara Damansara Mosque, Selangor (2015)	Raja Haji Fisabilillah Mosque, Cyberjaya (2016)
Image				
Concept	Progressive Malay-Islamic aspiration	Simplicity, airiness and transparency	Minimalist	Simplicity and purity
Motifs of ornament	 Geometric	 Geometric	 Geometric	 Arabesque, calligraphy

Material	Precast concrete	Steel cladding with mesh treatment	Steel cladding	GRC panel and tiles
Principle	Recurrence, rhythm, unity, eternity	Asymmetry, rhythm, abstraction	Recurrence, symmetry, abstraction	Eternity, abstraction, symmetry, unity
Interior				
	Serenity	Openness	Transparency	Tranquility
Function	Optimization of daylighting, view outside, ventilation, sun-shading	Glare treatment, optimization of daylighting, view outside, ventilation, protection from sun and rain	Optimization of daylighting, visibility, ventilation, sun-shading, view outside	Optimization of daylighting, glare treatment, ventilation, sun-shading, view outside
Other aspect	Symbolize a modern interpretation of mosque deviate from traditional approach	Media facade ornaments establish at iconic vibrant nightlife presence	A pure form with double skin ornaments promotes visibility and saves energy	Calligraphic and arabesque pattern combines the essence and spiritual of Islam

RESULT AND DISCUSSION

The application of ornaments is undoubtedly contributed to the beauty of the buildings. Despite of these aesthetic roles, the influence of contemporary architecture sparked a new definition of the function of ornament on the architecture. The results of the analysis of this paper show that contemporary mosque ornaments act as a reflection of:

1. environmental;
- 2 history and culture; and
- 3 religious.

Environmental

Ornaments use as structure or facade treatment. Not only creating privacy in a space, but it also optimizes daylighting and cross ventilation. The

ornamentation acts as an ecological adaptive device which responds to the environmental issue. Therefore, it has become an integral part of a response to climate change to improve the performance of the building.

History and Culture

The ornaments did not use the arabesque motif or either Islamic geometrical pattern from the Middle East but assimilate with local elements. The integration between Islamic principle and the national history and culture makes the ornamentation gives a different outlook by not just imitating the Middle East elements and language but by interpreting to local identity expression.

Religious

Among the main character of Islamic art are its totality and harmony. The ornamentation on a contemporary mosque is linked to the religious and cultural context. Islam prohibited to use human, animal or goddess figures as it contradicts the Islamic law. The using of unfigured motifs in conjunction with the principles of Islamic ornaments. The principle of symmetry, eternity, recurrence, and unity reflects the concept of Allah and its creations. Every motif in ornamentation have its meaning and function, such as create the feeling of tawheed, to portray something very sacred and serene, gives the welcoming ambiance and tranquility. Thus, it can be said that the contemporary mosque retaining the spiritual essence of Islam while not imitating the conventional styles.

CONCLUSION AND RECOMMENDATION

Hence, it could be said that ornament is not only for the aesthetical or beautification purpose. It is more than functional. The ornamentation has become an expressive tool of the culture, beliefs, socioeconomic and the environment. It creates a more welcoming interface with the multicultural community at large. It added value to the beauty of the buildings by testifies to the surrounding, technology, and civilization. All of which are the factors that draw the identities of people, cities, and nations. Thus, in an effort to promoting a new definition of contemporary architecture and ornamentation, mosque design has to project an Islamic image by incorporating religious, traditional, and environmental value into the design of the mosque.

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A STUDY TOWARDS THE ORIGIN OF TERRACOTTA DECORATION OF THE MOSQUE ARCHITECTURE IN BENGAL: AN ANALYSIS BASED ON SHAPE GRAMMAR PRINCIPALS

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INTRODUCTION

MOSQUE architecture of Bengal has a history of about 800 years since it started to flourish in this region, with the initiation of Muslim rule in 1204 when Muhammad Bakht-yar Khalji, a general of Qutbud Din Aibak, took over Nadiya, the capital city of Sen Dynasty in lower Bengal. From that time, they marched from West Bengal to South and East until the entire Gangeto-Brahmaputra delta was under their rule¹.

And so they constructed numerous mosques to establish Islam.

So the influence of Islam in culture of a land like this, which had strong Hinduism and Buddhism roots, was gradual but definite that left a deep footprint in both history and landscape of Bengal.

Bengal is well known for its magnificent mosque architecture that reflects the deltaic characteristics in both structure and aesthetics. Land, water, bright humid climate of this deltaic locality, provided us with "climate responsive" building materials among which, clay was the most ancient and significant one that could be transformed into burnt or kin burnt bricks, suitable for building durable construction.

Terracotta bricks not only served structural purposes but also were used for decoration details on building surfaces. Even before the Mughal era terracotta details contributed to the enrichment of history of art and architecture of Bengal but the beautiful mosques were the most significant evidence of flourishing terracotta architecture in this delta. The prominent use of carved bricks in the ornamentation of these mosques dating from

14 to 15th century² replaced figurative representations previously used in temple architecture of animals and human life and activities; with abstracts, geometry, and floral patterns only.

New illustrations on these terracotta tiles added a new dimension to Islamic architecture of this region; also the functional and aesthetic use of terracotta as a building material represented a clear picture of deltaic features in mosque architecture of this region.

Figure 1 illustrates the figurative representation which was founded in Kantajew Temple, Dinajpur, constructed in 1674; Figure 2 is a floral pattern type terracotta, found in Atia Mosque, Tangail, built in 1609.



FIGURE 1

Use of terracotta, Kantajew Temple, Dinajpur, an example of figurative terracotta.



FIGURE 2

Use of terracotta, Atia Mosque, Tangail, an example of abstract terracotta.

The study, firstly, investigated the origins of these newly developed patterns of terracotta to search the relevance and influences of different contexts. Literature study has been conducted where similarities with the design patterns of surrounding countries and also with Mughal and Persian architecture were assessed.

LITERATURE REVIEW

(Towards the Origin of Terracotta Decoration in Bengal)

The rise of Islam in the Indian subcontinent was noticeable as the Muslims brought their own architectural skill and traditions with them from Persia and central Arabia¹, but the climate of this subcontinent had diversity

that influenced them and reflected in the Islamic architecture of this locality. The mosques in Pakistan, India, and the mosques in Bengal are the outstanding examples of gradual transformation (from their previous examples), influenced by the diversity in this region.

Due to the unavailability of stone in this Deltaic locality, Muslim builders had no choice than turn on bricks as building materials, which also extended to decorative elements in form of terracotta plaques. The main idea was to break the monotony of plain brick walls². The art of terracotta was practiced through early medieval to Islamic medieval (timeline) and even continued to mid-nineteenth centuries. Earlier terracotta plaques were used to tell stories of Hindu and Buddhist gods and goddesses but they also represented activity and life of common people whereas³, they were replaced by abstract, geometric designs, and floral motifs in Islamic architecture afterwards. The terracotta plaques made at the building site represented copious decorations that became a pattern and was used on the mihrab niches and qiblah walls. According to the production process⁴, there are two broad groups of terracotta that are noticed – group terracotta and individual terracotta. The group terracotta comprises of segments of terracotta that represents a single impression joined altogether (Figure 3 represents a group terracotta from Darasbari Mosque where the exterior wall was decorated with multiple tiles explaining a single floral pattern) whereas an individual terracotta plaque is a single piece of tile representing a single individual piece of art (Figure 4 shows a floral pattern used on the facade of Atia Mosque in Tangail, Bangladesh, where there was the only one terracotta plaque used to represent that single floral pattern).



FIGURE 3

Group terracotta, Darasbari mosque,
Chapai Nawabganj.



FIGURE 4

Individual terracotta,
Atia Mosque, Tangail.

The segmented pieces of a group terracotta has no individual meaning of their own, they are placed either as a vertical panel on the exterior or on the tympanum of the mihrab or in the curved wall in the mihrab niche. The terracotta in mosques, group or individual had similar floral motifs and repetitive shapes in decoration that created a pattern, which were used again and again in (typical) constructions.

If we look back into the history of Islamic architecture, Umayyad Caliphs (660 to 750 century) were the first to establish Muslim Arab monarchy in Syria, where they adopted the construction techniques from Sassanians and Byzantines empires. And so the vegetal and floral patterns derived from the same source in Islamic world⁵.

Later on Abbasid Caliphs (750 to 1258 century) used geometrical shapes in ornamentation⁶. Even then they had detailed geometrical patterns of carved brickworks and terracotta, having the earliest examples of rosette leaves to star elements of eight and 12-point geometrical patterns⁷.

These patterns were not only adopted but also developed during the Mughal period in the Indian subcontinent⁸ as shown in Figure 5, representing various types of geometric patterns in Mughal architecture on screen walls, building facades and other parts of the building. However, numerous examples of terracotta decorations have been found in Bengal that added a unique style to mosque architecture of this region. These terracotta decorations are not seems to be influenced from Mughal style.

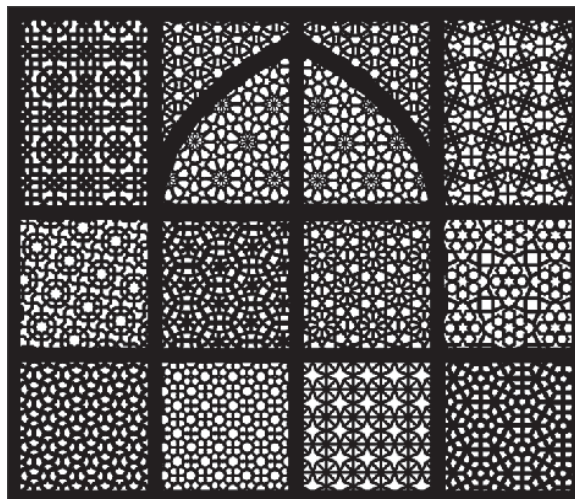


FIGURE 5

Various geometric patterns found in Mughal architecture.

There were no sufficient evidences of what influenced the creation of these geometrical patterns in the way they are. They developed from time to time into numerous shapes maintaining certain geometric patterns that were used in both individual and group terracotta depending on design and placements. Mosques in Bengal also showed evidence of interesting repetitive terracotta characteristics that had insufficient history of its origin.

While there is lack of resources to synthesize the roots of this new type of these terracotta patterns, a specific mathematical or grammatical study of these patterns might help understand the origin of these terracotta patterns in Muslim architecture. Therefore, this research will lead the way for further analysis of geometric grammar regarding terracotta patterns.

RESEARCH QUESTION

Since there are not enough evidences found, when it comes to the origin of terracotta patterns in mosques of Bengal; can geometrical analysis and shape grammar be used to define their characteristics?

RESEARCH METHODOLOGY

Since the research aims to analyze the terracotta patterns based on shape grammar, a clear understanding on the basic ideas of shape grammar has been discussed as the foundation of the analysis.

Afterwards, different types of terracotta arts have been categorized to identify the significant types, patterns, and styles that were prominent in the mosques of Bengal.

A few selected terracotta designs, then, analyzed and the simplified morphology of their shapes and geometry have been identified.

In the final step, a synthesis of those geometric formations has been conducted on the basis of the shape grammar principals and a pattern language has been developed.

ANALYSIS AND SYNTHESIS

Principles of Shape Grammar

A shape is a limited arrangement of straight lines defined in a Cartesian coordinate system with real axes and an associated Euclidean metric⁹. And the algorithmic systems that are used to analyze existing shapes or

create new ones are known as shape grammars. Even though there are representations of abstracts through texts or symbols, shape grammars help to analyze the existing ones and create novel designs through systematical effort with shapes and rules. Numerous possibilities of rule selections and applications of these rules may generate interesting design solutions or create new design objectives¹⁰. Shape grammars have been used to understand the design language, to analyze a design or a shape and to generate new designs from the same language, it is basically a rule-based design method that helps to solve the rule schema of a structure of a design¹¹. Thus, they can create a more efficient perception regarding architectural design facilitated by the formal understanding of historic patterns.

Shape grammars in the art and architecture include Chinese lattice designs¹², window designs of Frank Lloyd Wright¹³, traditional Turkish houses¹⁴, ornaments on ancient Greek potteries¹⁵, chair designs of Hepplewhite¹⁶ etc. These examples are the significant proofs that shape grammars can be used to develop new models based on historic styles.

Coming back to Islamic architecture, there are two noticeable characteristics that dominate the shape grammars of existing patterns. One is “repetition” – it is considered as the most effective and important theme for geometrical patterns¹⁰. Numerous patterns can be derived from one or two basic shapes, when they interlock and sit next to each other repeatedly. Also there is another important aspect – “symmetry” which is also a key factor in derivation of both geometric and floral patterns¹⁰. In bilateral symmetry that is found in human body¹⁷, figure is mirrored through vertical axis. Figure 6, as an example of identifying rules of shape grammar, shows how a circle can be transformed into an interesting pattern by repeating and intersecting symmetrically multiple times¹¹. This is a very significant rule when it comes to generating patterns in compositions. This rule schema generates almost all the Islamic patterns.

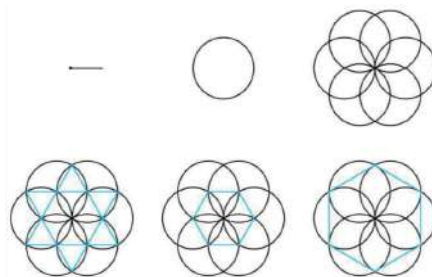


FIGURE 6
Creation of hexagon and 6-pointed star.

The floral and geometrical terracotta patterns in mosques of Bengal are no different than that, there were numerous examples surveyed and a few significant ones were selected for further shape grammar analysis.

Selection of Terracotta Patterns for Analysis

Bengal region is blessed with beautiful mosques that used terracotta plaques for decoration from time to time. Due to lack of proper maintenance and other resource limitations, most of the mosques were not conserved and eventually were destroyed because of natural and man-made causes. A few of the mosques were shortlisted and restored later on, many are still under the process of listing. So these beautiful terracotta plaques are the last remaining significant pieces of art and architectural history. They are mentioned briefly below. It is noticeable that some of the patterns and designs are used multiple times in different mosques.



FIGURE 7

Name: Sixty Dome Mosque
Location: Bagerhat, Bangladesh
Year of construction: 1442–1459

In the middle of the 15th century, a Muslim colony was founded by Saint-General, named Khan Jahan Ali. He preached in an affluent city during the reign of Sultan Nasiruddin Mahmud Shah, then known as "Khalifatabad". Khan Jahan adorned the city with more than a dozen mosques, Sixty Dome mosque is the largest of all.



FIGURE 8

Name: Darasbari Mosque
Location: Chapai Nawabganj, Bangladesh
Year of construction: 1479

The brick built mosque was constructed by the restored Illiyas Shahi, Sultan Shamsuddin Yusuf Shah. This piece of architecture reflects a beautiful blend of sultanate architecture with local influences.



FIGURE 9

Name: Atia Mosque
Location: Tangail, Bangladesh
Year of construction: 1609

The mosque was constructed during the reign of emperor Jahangir by Sayeed Khan Panni.



FIGURE 10

Name: Khania Dighi Mosque
Location: Chapai Nawabganj, Bangladesh.
Year of construction: 1490

The brick built mosque was ornamented with numerous beautiful terracotta plaques all over its facade and minarets.

So, for further analysis, four different motifs were selected for shape grammar analysis, selection was based on unique characteristics of different shapes and use of same motif on numerous mosques which makes them significant regarding their design and craftsmanship.



FIGURE 11

Khania Dighi Mosque.



FIGURE 12

Khania Dighi Mosque.



FIGURE 13
Darasbari Mosque.



FIGURE 14
Atia Mosque.

Synthesis of Shape Grammar

Shape grammar analysis is the key to define a rule for selected patterns, if we look at the analysis on the selected patterns.

Pattern 1

The first pattern analyzed was selected from the terracotta plaques of Khania Dighi Mosque, Chapai Nawabganj, Bangladesh. Figure 15(4) depicted the pattern which was used on the minaret facade of Khania Dighi Mosque.

The figure explained how the cross in the circle was developed by taking a square in the smaller circle placed inside the main circle, portrayed in Figure 15(1). Dividing that square equally in 16 squares (Figure 15(2) and Figure 15(3)) and then leaving the four squares on the corner out, thus the cross will appear within the circle as such.

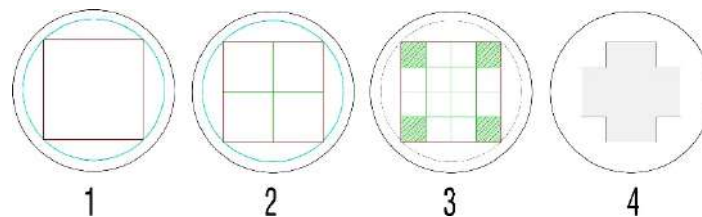


FIGURE 15
Analysis of Pattern 1.

Pattern 2

The second pattern was also selected from the same mosque terracotta plaques, since Pattern 1 and Pattern 2 were frequently used in other mosques

in that relevant time period. This pattern is also symmetric and repetitive and a square can be used to explain its shape grammar. Figure 16(4) is the pattern used on the mosque facades. If there is a square taken shown in Figure 16(1), with two axes, one horizontal and one vertical intersecting through the center of that square, the pattern can be developed. Four half circles were drawn inside the square from four midpoints of each sides taking the radius, which is half of each equal sides (represented in Figure 16(2) and Figure 16(3)). Then, they were placed side by side and thus the pattern was developed.

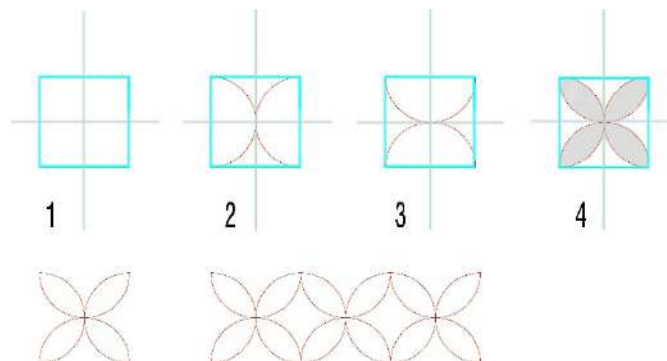


FIGURE 16
Analysis of Pattern 2.

Pattern 3

Pattern 3 was selected from the front facade of Darasbari Mosque, Chapai Nawabganj, Bangladesh that was built in 1479. The pattern itself was mirrored and repeated on the plaques. For proper analysis the pattern was divided in six parts (Figure 17) and then explained separately.

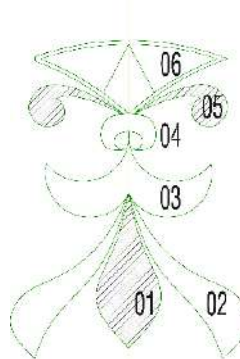
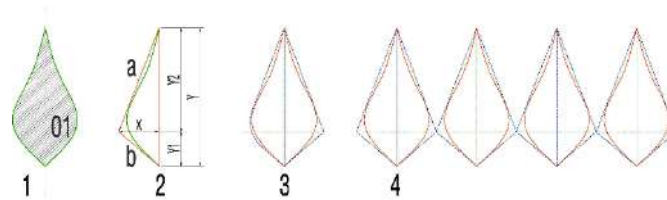


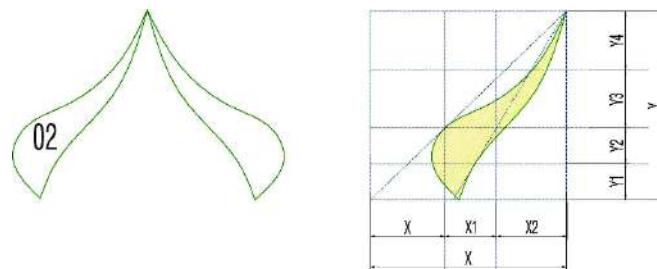
FIGURE 17
Pattern divided in six parts.


FIGURE 18

Analysis of part 01 from Figure 17.

If we notice Figure 18 where part 01 was explained, part 01 itself is symmetric (Figure 18(1)) that can be developed from a triangle of two sides (a) and (b), where the base is $Y = Y_1 + Y_2$ and height is X (Figure 18(2)). The sides (a) and (b) can be chamfered with a radius value X (Figure: 18(22)) and thus the shape can be developed and then mirrored (Figure: 18(3)) to create part 01.

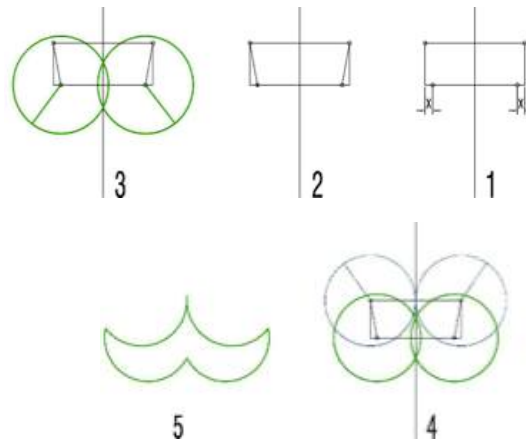
Part 02 is also symmetric (Figure 19), it can be explained through a square where equal sides are X and Y, and $X = x + x_1 + x_2$, $Y = y_1 + y_2 + y_3 + y_4$ (where $y_1 + y_2 = y_3 = y_4$), if we consider x-axis through X and y-axis through Y, and draw a curve by taking the relevant intersection points, part 02 can be developed.


FIGURE 19

Analysis of part 02 from Figure 17.

Drawing two circles that has two different centers can develop part 03. If we consider a rectangle with a vertical axis going through the center (Figure 20) and the base is reduced x from both sides, the altered rectangle of four points can be used to draw four circles that can develop part 03. The radius can vary to create similar pattern for various arches but the radius of the upper circle cannot be larger than the radius of the lower circle.

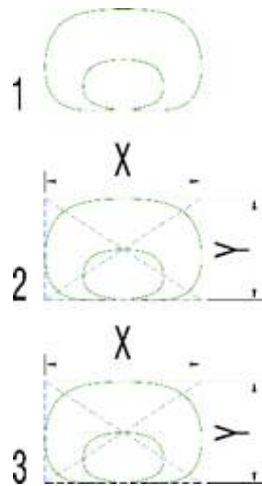
Thus, part 03 can be symmetrically developed by using same radius for upper circles and different but same radius for lower circles where upper circle radius has to be less than or equal of lower circle radius.

**FIGURE 20**

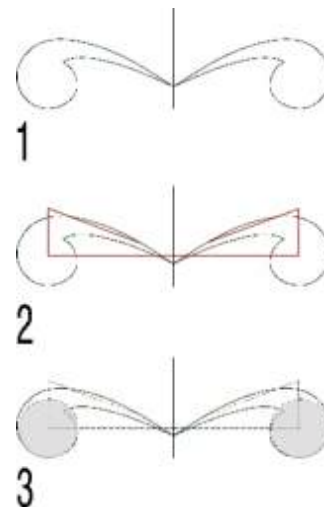
Analysis of part 03 from Figure 17.

Part 04 can be developed through chamfering the edges of two rectangles one taken inside of the other. The smaller rectangle taken inside is placed on the middle of the base of the outer rectangle and then all the edges of both the rectangles are chamfered. Thus part 04 can be developed.

Part 05 can be developed with a right triangle and a circle. If we consider a vertical axis through the point at the lowest angle and draw a circle at the right angle point where the radius of the circle should be equal or less than the height of the triangle, by chamfering the two upper sides of the triangle and connecting those with the circle can develop part 05 (Figure 22).

**FIGURE 21**

Analysis of part 04 from Figure 17.

**FIGURE 22**

Analysis of part 05 from Figure 17.

Part 06 is also symmetric as the other parts and it can be developed from a right triangle. If a vertical axis is considered through the height of a triangle (Figure 22(1)) and the base is divided in $Y1:Y2:Y3$. If the triangle is deformed in reference to the vertical lines $X1$, $X2$, and $X3$ drawn from the base of the triangle, part 06 can be developed.

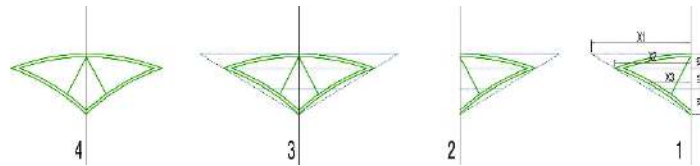


FIGURE 23

Analysis of part 06 from Figure 17.

Pattern 4

Pattern 4 was collected from the facade of Atia mosque in Tangail, Bangladesh that was built in 1609. This pattern is also symmetric and can be explained in the same way using various rule schemata of shape grammar as explained in Patterns 1, 2, and 3. Pattern 4 contains numerous details and major parts of this type can be explained through the rules already developed within the Patterns 1, 2, and 3. As an instance, the middle part of the terracotta highlighted in the Figure 24, where this part comes from various square and circle geometric combinations.



FIGURE 24

Pattern 4 selected from Atia Mosque, Tangail, Bangladesh.

RESULTS AND FINDINGS

Terracotta decorations found in the mosques of Bangle has a wide variety of patterns. In the selection process due to the analysis under the light

of shape grammar principals, two types were selected. Those are simple geometric patterns, which referred to Figure 15 and Figure 16. And the other type was organic geometric patterns, which is represented by Figure 17.

Shape Grammar for each typology has been analyzed and rules were developed. From the breakdown of simple geometric patterns, for example Figure 15, Figure 16, and Figure 20, it is seen that the nature can be characterized as pure geometric shapes, divisions, and fragmentations. Rules for these types have been generated successfully with simplified equations and prototyping can be done with accurate similarities with the original one. These patterns are axial symmetric and repetitive. The established rules can also be used in generative and parametric design process in order to develop new patterns.

On the other hand, organic terracotta patterns are visually seemed to be generated from curvatures, however, those can also be defined with divisions of pure shapes and rules can also be developed. For instance, Figure 17 portrays organic patterns, where those are analyzed and rules has been developed within the Figures 18, 19, 21, 22, and 23.

Therefore, it has clearly been established that terracotta decorations of the mosque architecture of Bengal can be characterized with the shape grammar principals. The patterns can be successfully generated using the rules in order to create new and existing designs.

RESEARCH LIMITATIONS

The shape grammar rules for several common patterns have been explained, however, there are still a large number of other types which have not been explained though the current study.

In addition, the developed rules have not been shown to create new patterns, only existing patterns were revealed.

In term of resources used in the study, the photographs were not documented from the field survey, rather those were taken from various online sources.

CONCLUSION

The study presents a thoroughfare analysis of the history, origin, background, and characteristics of the terracotta decorations of the mosque architecture

of Bengal. The research was initiated with the aim to understand the origin of terracotta for the scope of their prototyping and application in ornamented facade design, tiling, landscaping, and decorations in architecture.

Hence the origin has not been very certainly identified, shape grammar has been used to conceptualize the characteristics of popular terracotta patterns found in the mosques of Bengal in different periods.

From the synthesis of selected patterns the research has developed shape grammar rules which can be implemented in a simplified new generation to understand their applications. The shape grammar rules identified for the selected typologies of terracotta decorations can be used to regenerate prototype patterns which create further research opportunity within the arena. However, this study has not explored innovations and new pattern generation through the rules developed.

Thus, the current study provides most required methodology for prototyping and regenerating terracotta based on the shape grammar principals and thereby serves as a methodology and database to support future studies, reporting on terracotta and shape grammars in architecture and helps the relevant professionals to develop further knowledge in the field.

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USING REPERTORY GRID TECHNIQUE (RGT) TO ANALYZE THE AESTHETICS OF CONTEMPORARY ARCHITECTURAL IMAGES OF MOSQUES

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INTRODUCTION

SUSTENANCE of future societies is influenced and shaped by the cultural values evolved inherently overtime within people. "Cultural sustainability" through "cultural continuity" deals with the transmission of meanings and values of a particular culture throughout generations¹. As pointed out by Winer and Boos², slight change in the visual environment leads to the loss of culture and disruption of the chain of cultural continuance as a result of loss of meaningful values of a society. Therefore, cultural endurance in the visual built environment is possible by sustaining the preferred mental patterns of thought and performance that are valued by people as their cultural ideals³. Although people's culturally established perceptual images are developed overtime; analyzing the transformation and establishing a connection between the past and future creates the true meaning of culturally sustainable built environments³⁻⁴. In support, scholars and designers add that these cultural connections catalyze the psychological, communal, physical, and divine interactions to produce diverse, heterogeneous, and distinct building forms⁵⁻⁶. Empathizing with the cultural heterogeneity of built forms; we support the debate of planners, designers, and academics over the means by which visual diffusion of culture in the built environment needs to be undertaken.

Naturally humankind identifies with the built environment, such that this identity is not a matter of choice or preference rather it is a psychological process required to be addressed while designing new buildings⁹. Although, architecture is viewed as a cultural phenomenon, a major debate exists in the duality of architectural creative thinking. The former direction allows the architect to build a new architecture based on the past, culture and the brand images representing the literal meanings as communicated by

the people's inherent perceptions. While, the later direction, rejects the past architecture based on culture and promotes the abstraction of visual forms by reflecting the new intellectual movements, ideologies or theories in global architecture⁷⁻⁸. Exploring the context of Islamic architecture, the design and construction of the built forms are portrayed through the cultural practices and beliefs characteristic to a particular region¹⁰⁻¹¹. Expressed as a sacred cultural symbol of Islamic architecture, mosque has evolved since the foundation of Islam in the seventh century to reveal diverse visual forms that depend on the social, cultural, and environmental contexts^{6, 12}. Additionally overtime, the architecture of mosques have been shaped as a response to the various secular functions performed by the society at different times, in addition to its primary function as "a place of worship". Hence, articulated as an architectural product, the mosque strongly reflects the symbolic values of timeless regional or cultural traditions serving as a brand image of the Muslim communities. Reinstating the universal call for cultural sustainability, it's noteworthy to mention that the endurance of the mosque designs can be achieved by promoting and safeguarding the cultural beliefs, values, and practices characteristic to a particular region or people.

Within the sociocultural framework, scholars, planners, and policy makers (General Authority of Islamic Affairs and Endowments-Awqaf) have identified "stereotyping" of mosques as a means to bind the community functionally, emotionally, and visually. Stereotype mosque designs focus on the widely appreciated and simplified literal images of the elements with cultural, rather than functional significance. Among the two identified stereotype reference frameworks, the former approach, directs the architectural practices of designers to be biased towards a single practical and structurally stable design solution based on their individual ideologies⁵. On the other hand, the latter approach enables the designers to independently create visual and spatial works of art through theoretical perspectives. Although, these designs are easily recognized and predictable, the designer's personal creative thinking overrides the visual symbolic meaningful brand image communicated by the local end-users. In essence, we argue that the architectural innovations to the mosque design have to take into consideration end-user's emotional responses towards the symbolic visual brand image of the mosque.

Contemporary mosque designs highlight the high level of form experimentation, and design diversity in mosque architecture. In the 21st century, the mosque designs reflect multiple dimensional modules and

distinct forms. Some current practices depict important developments that attend to the time and place, while others reflect the contextual aspects including the local traditional practices and vision of the people⁶. Explicable in this context is the Imam Turki bin Abdullah Grand Mosque of Riyadh (1992) by architect Rasem Badran, where his contemporary architectural solutions are based on the expressions of historical precedents through building forms¹². Disagreeing with the former approach, the contemporary mosque designs such as the Abdul Rahman Siddique Mosque in Dubai (Yaghmour Architects, 2009), focus on creating new forms based on the abstraction of the symbolic elements⁸. However, the visual impression and cultural identity of mosque architecture is shaped by the composition of its vertical (minaret), horizontal (prayer hall) and central (dome) elements⁶. Hence, being recognized as an incubator for creative process by practicing architects, homogenization of these visual architectural elements of mosques is not worthwhile.

The symbolic visual impact of the mosques play an important role in sustaining neighborhood or city identities. Although, the mosque architecture has evolved over time in response to the changes in culture and resources, its visual identity remains protected in the inhabitants' mind. In other words, these traditional images evolved as the symbol of people's cultural background represents their brand image. Clearly, the perception and cognitive reasoning associated with their experiences reinterpret the emotional meaningfulness of the brand images⁸. However, the acceptance of the visual architectural expression of the brand image is recognized based on the perception of mosque's aesthetic beauty. Even though, contemporary approaches towards mosque design have been sanctioned by the Abdullatif AlFozan Jurors, these pose a considerable dilemma in satisfying the complex cycle of psychological, environmental, and visual aesthetic aspects perceived by the people. Likewise, people's dissatisfaction provokes controversies in adopting appropriate architectural discourses in mosque design. Within this context, AlFozan (2017) questions: "Do we follow certain stylistic historic approach or should mosque architecture be a true reflection of the essence of the modern times?" In an attempt to address this challenge, we stipulate that the architects have to uphold the past traditions and aesthetic perception of symbolic brand images meaningful to the end-users, while enabling innovations in the use of technology and construction material.

Unlike the traditional mosques, the emerging contemporary transformations in the mosque architecture have isolated the mosques visually from the

surrounding context. As a response to this scenario, the “Abdullatif AlFozan Award for Mosque Architecture” aims at promoting diversity and appropriate solution for mosque architecture. Acknowledging this direction of thought, the authors attempt to answer the question:

“How should mosque architecture be like in the future?”

Studies focusing on the visual aesthetics of mosques have been undertaken, however, empirical studies directed towards the evaluation of mosque’s aesthetic forms have not been investigated. Within this context AlFozan (2017) says, “Nonetheless we do not believe that we can establish one aesthetic or visual general rule for mosque architecture”. Respectfully countering the statement, the paper proposes to evaluate the aesthetic visual impact of the brand images of the mosques using the emotional, symbolic, and formal qualities as parameters for measuring the “brand aesthetics”. For this purpose, we uphold the influence of psychology in architecture to propose the theory of “The Psychology of Personal Constructs”¹³ for assessing the aesthetic visual perceptions of the people towards the brand image of mosque architecture.

THEORETICAL FRAMEWORK

Designing for a Brand and Brand Aesthetics

Product Brand

Generally, function of a product embraces both its utilitarian purpose and meaningful recollections for its users. Conceptually, recollection of visual image of a product identifies it as a brand⁷. The credibility of this brand image is deeply tied to the meaningful experiences with its end-users. Thus, retaining a self-sustainable image requires connecting the product to people’s emotions through visual symbolic elements. Therefore, branding serves as a strategy that directs the designers to comprehend, assess and develop a product based on its users’ visual perception.

Substantiating the “branding strategy”, Bernd, Lia, and Brakus¹⁴ adds that visual perception of a brand over an extended period of time imprints its image in the minds of its users. In agreement, Birch¹⁵ points out to “aesthetics” as the visual dimension of a product that enables the users’ to emotionally accept the brand. Significantly, assessing the visual aesthetics communicated by the people based on the brand images precedes the

product subsistence. Hence, aesthetics is clearly a subjective reflection of personal meaningful preferences influenced by people's continuous experience with a brand¹⁵.

Brand Aesthetics

Upholding the visual expression of a brand, semiotician Jean Marie Floch (1990), announces "brand aesthetics" to capture both the abstract and literal elements perceived by users' directly or mediated through cognitive reasoning of the structural and referential product qualities. Consequently, brand aesthetics articulates people's satisfaction in terms of the recognizable inherent qualities, symbolic features and meanings conveyed by the brand image¹⁶. Alternatively, "brand aesthetics" represents one of the modules of the creative mechanism by which brands produce meanings. This substantiates that "brand aesthetics" is not only a theoretical concept but also represents the symbolic values of a brand. Hence, it serves as an instrument to intelligibly understand the brand meanings perceived by the users¹⁷. Without doubt, it is noteworthy to mention "brand aesthetics" as a powerful evaluative, analytical, and propositive framework.

Previous studies by Schmitt and Simonson¹⁸, highlights aesthetics as a determinant of product rejections. Essentially, visual analysis of the brand images is undeniable for assessing brand aesthetics so as to clearly understand the symbolic visual expressions and user's impressions.

Architecture Brand and Aesthetic Response

Architecture Brand

Recognizing and identifying "mosque" as a brand, representing the cultural symbol of a locale is not new in architecture. Notably, the Ottoman mosque architecture is immediately recognized as "Ottoman" by the visual expression and composition of its elements – massive, pendentive domed-square units, semi-domes, arabesque-covered walls, and pencil-shaped cylindrical minarets achieving harmony of aesthetic and technical balance. Explicit in this context is the Süleymaniye Mosque in Istanbul (1550–1557) (Figure 1) and the Selimeye Mosque in Erdine (1569–1575), both by architect Mimar Sinan, focused on achieving unprecedented height and majesty through the domes, half domes, and the pencil minarets⁶. Similarly, a combination of the Abbasid, Byzantine, Syrian, Greek, and Mamluk architectural traditions is recognized and identified as the Fatimid mosque architecture. Consequently, each period of architecture serving as

a brand is clearly identified and its characteristics visually memorized by its inhabitants. Hence, mosques represent unique brand images upholding cultural symbolisms belonging to inhabitants of a locale. Therefore, the design of buildings needs to take into consideration the branding necessities and design “for” the brand image of the people’s locale.



FIGURE 1

Süleymaniye Mosque (1550) in Istanbul.

(Ggia, 2011)

Architectural character is defined by people who are in turn defined by architecture. A successful local architectural brand results from a history of uninterrupted human interaction with the visual built environment. Notable, in this context is the Great Camlica Mosque in Istanbul (2019), inspired by Ottoman and Seljuk architectural styles¹⁹. Designed by Turkish architects, Bahar Mızrak and Hayriye Gül Totu, the mosque achieves unprecedented majesty through the six pencil minarets, main dome and the half-domes²⁰ (Figure 2). Nonetheless, this “architecture with architects” resembles the mosque brand images designed by architect Mimar Sinan (Süleymaniye Mosque in Istanbul (1550–1557) and the Selimeye Mosque in Erdine (1569–1575)). In addition, the traditional architecture developed as “architecture without architects”, also represents a platform for understanding and establishing an architectural brand accepted by the local people. A notable evidence is the West African Great Mosque of Djenne in Mali (1907), exemplifying the Sudano-Sahelian architectural style. Dominated

by box-like minarets topped by cone-shaped pinnacles, the structure has responded to changes in culture and resources by visually protecting its architectural identity²¹. This adobe mosque is perceived as the model of Malian mosques, surviving as a dedication of the retention and practice of local people's skills passed down through generations (Figure 3). Hence, the vocabularies of traditional architecture, developed by "architects or non-architects", develops a unique brand image giving recognition and enhancing the emotional human connection to the place gradually.



FIGURE 2

Great Camlica Mosque (2019) in Istanbul.

(Ggia, 2011)



FIGURE 3

Great Mosque of Djenné (1907) in Mali.

(Meier, 2013)

Overtime, mosque architecture by “architects or non-architects” has evolved through both the substantive spatial organization and visual aesthetic classifications⁶. Based on the cultural and environmental aspects, progression of mosques as more than “places of worship” have led to further form transformations. Evidences of these visual transformations since the 12th century, as seen through the grand periods of Islamic architecture has greatly influenced the contemporary stylistic classifications of mosques today. Hence, the brand images of mosques have considerably vanished throughout the transitions from the Medina mosque to its contemporaries today⁵.

Although, the traditional mosques from the past serve major sources of inspiration, they create challenges for the contemporary architects. Having considered as a “representative of national identity”, the design of contemporary mosques at monumental scales highlight three distinct approaches.

1. Inspired from the local traditional architectural languages and principles, the contemporary mosque designs faithfully adhere and reproduce the symbolic elements from the past, while addressing the functional needs⁶. A literal version of this approach evoking the Ottoman practices with a central dome and four tapering corner minarets is portrayed by the Khatem al-Anbiyaa Mosque (2005) in Beirut⁶ (Figure 4). Another notable example is the Imam Turki Bin Abdullah Grand Mosque of Riyadh (1992), where the design explores, recreates and transforms the local Najdi architecture as a contemporary solution retaining a sense of cultural identity (Figure 5).

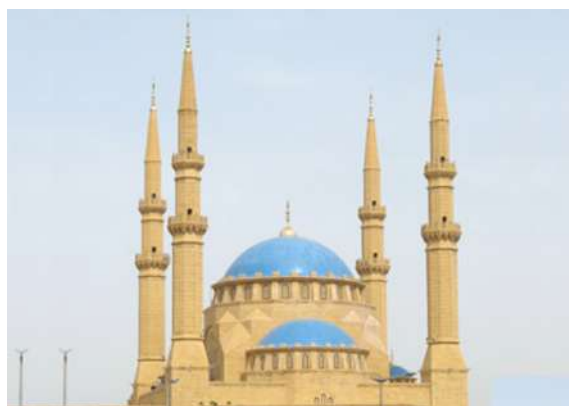


FIGURE 4
Khatem al-Anbiyaa Mosque (2005) in Beirut.

(Alamiri, 2017)

**FIGURE 5**

Imam Turki bin Abdullah Grand Mosque of Riyadh (1992).

(Alamiri, 2017)

2. Slightly deviating from this approach, practitioners' dedicate the new mosque designs to depict the blend of diverse historic architectural styles. An essential example is the Sheikh Zayed Grand Mosque (2007) in Abu Dhabi that combines the Indo-Mughal domes with the Moorish archways and Arab minarets (Figure 6). Prominent in this category are the mosque designs of Egyptian architect Abdel-Wahed El-Wakil, recipient of the "Life Time Achievement Award" for influences in mosque architecture beyond individual designs⁶. He adopts a "classicist" ideology through "image cloning" by reproducing the traditional architectural elements of the Mamluks or Ottomans within a single building structure.

**FIGURE 6**

Sheikh Zayed Grand Mosque in Abu Dhabi (2007).

3. Disagreeing with the former approaches, the modern contemporary mosque designs have accepted and interpreted the elements of traditional mosques within the creative open expressions of contemporary technologies. Ignoring the call for national identity, development of these traditional historic mosque prototypes is based on the context of contemporary idioms, deviating from representing the visual cultural identity⁶. Within this context, the existing mosque designs embrace creative and expressive open approaches demonstrating flexibility and accommodating the potential of other contemporary building technologies. A quintessential example is the Arcapita Mosque in Bahrain (Skidmore, Owings, and Merrill, 2010) and Kapsarc Mosque in Riyadh (HOK, 2014), where the designer refrains from classical stereotypes with manipulated simple cube-shaped geometric volume, in contrast to the complexity and detail of mosque ornamentation (Figure 7). Additionally, moderating the query of form, the delicate Sancaklar Mosque (Emre Arolat Architects, 2012) in Istanbul carved into the landscape emphasizes on only the spatial religious experience (Figure 8).



FIGURE 7
Arcapita Mosque in Bahrain.

(Skidmore, Owings, and Merrill, 2010)

**FIGURE 8**

Sancaklar Mosque in Turkey.

(Emre Arolat Architects, 2012)

Although, a distinct visual language uniquely identifies mosque architecture, contemporary design practices have resulted in the creation of diverse variations in the visual form of the mosques. These “creative innovations” develop new architectural languages resembling other buildings or monumental sculptures. Even though, architectural vocabulary in the mosques have accreted and evolved to highly meaningful symbols over time, researches have affirmed disagreement within the regionally bound users^{10, 22–23}. Consequently, new recognizable images or new brands are being created serving as a departure from people’s brand image. Hence, we envision enabling the local laypeople of a place to evaluate the aesthetic design quality of a new version of a local brand image so as to solve the dilemma of the most acceptable approaches to mosque design.

Aesthetics Response in Architecture

Evaluation of visual aesthetics encapsulates the “representational”, “decorative”, and “functional” finalities attributed to the aesthetic treatment of art works and brand aesthetics^{17, 24}. “Representational” finality of a brand articulates the literal expressions conveying meaningful emotions of “pleasure” and “interest”. The “functional” finality of a brand states the sensory or physical properties expressing the readability of perceptual composition rather than content, meaning or context. Correspondingly, the “decorative” finality of a brand depicts the emotional desire to beautify without the expressions of any idealistic content or a particular meaning.

Comprehending the co-existence of the three finalities for aesthetics in arts and brands, authors stipulate the necessity of aesthetic responses dealing with the qualities of any building's brand image.

Aesthetics deals with the structure and content of the building form^{25–26}. Formal aesthetics deals with the structure of forms, whereas the symbolic aesthetics represents the people's responses to the content of the form²⁷. Provided a set of variables; the personality, behaviors, internal constructs, and cultural backgrounds of the people influence the aesthetic response^{28–30}. However, people's affective responses to these variables are elicited through the building's visual characteristics³¹. Hence, "aesthetic response" is the satisfactory emotional appraisals or evaluations^{32–33} as a result of the perception of the physical architecture related to the tangible on intangible variables of the building qualities.

Some of the associated variables include the tangible aspects such as materials, color, and scale dealing with the direct visual physical features. As opposed, other variables include the intangible aspects related to the inferences drawn as a result of the interaction of people with the building. Consequently, we propose that the emotional, symbolic, and formal building qualities represent the aesthetic responses of people towards the building forms.

1. Emotional Qualities: Assessment of people's emotional response to different architectural styles is identified through the three variables of interest, pleasure, and desirability²⁵. Considerable debate has been noted on the influence of cognition on the emotional responses of the individuals. Empirical records by Lazarus³⁴ prove emotional responses to be influenced by cognition, whereas Zajonc³⁵ retorts that involuntary emotional responses to the built environment are independent of cognition. Hence, Agiel⁷, categorizes the variable of desirability to embody the distinctions of perception, cognition, and contemporary architectural features. These variables enable an assessment of the overall love or hate association experienced by the people towards the visual quality of building form. Within the applicability of PCP, empirical study conducted by Agiel⁷ substantiates the credibility of the constructs developed against each of the variables in assessing the visual quality of the brand image of the locale (Appendix A).

Furthermore, the symbolic and formal qualities provide a complete understanding of the architectural variables assessing visual aesthetics of the building.

2. **Symbolic Qualities:** Symbolic variables reflect the inherent perceptions of the people based on the meanings associated with the form of the building. The meanings depend on the interaction between the individual's knowledge structure of experience related to the architectural features and the physical attributes of the building form. Further, the different cultures, subcultures or regional backgrounds influence the interpretation of meaning and preferences across the content of the form. These preferences of the individuals' attach connotative and denotative meanings to the building's appearance.

As discussed by Nasar²⁵, preference of the architectural feature of the building form without evaluation leads denotative meanings. On the other hand, certain preferences depict the inferences related to the interaction between the user and the building's appearance. These are interpreted as connotative meanings. For example, an observer identifies an architectural style (denotative) and develops a fondness to the style (connotative). Salient variables of symbolic quality have been derived based on the denotative meanings^{27, 36–37}. Thus, the variables of symbolic quality are achieved by the connotative meanings associated with the form of the building. Aligning with Lang's²⁷ variables, Agiel⁷ discusses four variables to understand the connotative meanings attached to the building's appearance (Appendix A).

(a) **Material**

Significantly, the material variable determines the quality of the building structure and influences the appearance such that the meanings communicated to the people are not affected. Materials exhibit a unique function of improving the traditional building character without influencing its appearance. The visual attributes of texture and color govern the facade. Thus, the appropriate use of materials facilitates the architectural purpose of structural compliance and visual appearance of building's exterior facade⁷.

(b) **Color**

Easily recognized by the people, a sense of modernity in reference to the brand image of the locale is imparted by the variable color. Similarity in color to the traditional mosque architecture in turn enhances the emotional responses towards the building. As an example, the usage of simple pure white or contrasting color represents symbolic forms in architectural composition of the mosques.

(c) Architectural Character

Architectural character of the modern mosques is influenced by the form or shape of the elements such as the minarets, domes, openings, walls, and decorations. Enhancing the beauty of the existing elements or new additions to the architectural vocabulary during the design process, demands to be in harmony with the brand image communicated by the people. The architectural design of the form must insist on symbolic solutions so as to create imaginable images that contribute towards the enhancement of identity of the building³⁸. Hence, the operational definitions of the variables need to embody both the connotative and denotative meanings associated with the responses of the people.

(d) Illumination and Shadow

The interplay of light and shadow in the mosques serves as an identity of the city's image creating a divine identity in the people's minds. Recent trends in mosque architecture intend to enhance the perception of its abstracted, defined, and unified elements through light and shadow. Thus, shade and shadow serve as part of the architectural composition of the building that change the sense of place over the course of the day and time of year depending on the prayers.

3. Formal Qualities: Unlike other approaches in architecture, the formal design qualities are reinforced by the architect's imagination. The architectural expression of these formal ideas neglects the human experience²⁵. Research substantiates that the formal properties aid in the recognition of architectural styles related to the brand image of the people³⁹⁻⁴¹.

The formal variables deal with the fundamental principles such as point, line, surfaces, and various shapes practiced in architectural style of the built form. These variables are considered relevant due to their prominence and reference to the brand image of the place. Manipulating these visual ordering principles enable the design to coexist with the people's acceptable image. Thus, the key variables of shape, proportion – scale and order influence the people's aesthetic experience in the physical surrounding⁷ (Appendix A).

(a) Shape

The selection of architectural vocabularies of shape and its composition governs the appearance of form. Serving as a visual

property, shape enables the people to identify, recognize and categorize the forms. By enhancing the visual aesthetics of form, this variable strengthens the architectural identity in the minds of the people. Gestalt psychology sustains that people's perception of the shape of the building is reduced to the simplest and regular forms related to the architectural identity of the locale⁴².

(b) Proportion and Scale

Proportion refers to the harmonious relation of different architectural elements to another or to the building as a whole. The theories of proportion intend to maintain the traditional proportions of the mosque elements so as to retain a sense of continuity to the people of the locale. Individual's expectations are achieved if the design relates to the character of the locality. Of particular interest is the role of traditional forms in serving as the point of reference in creating mosque architecture that respects the place, people, and Islamic architecture. Additionally, visual scale does not refer to the actual dimensions of the building, but rather the similarity in people's perception towards their experience with the traditional form of the buildings^{7,42}.

(c) Complexity and Order

Complexity deals with the number and type of architectural features on the facade. Complexity depends on the visual comparison of quantity, diversity, and redundancy of the architectural compositions. Order refers to the degree in which the architectural elements are composed together or make sense⁴⁰. Emotional responses towards order depend on the symbolic variables due to the nature of organizing the building's appearance. More specifically, individuals prefer building forms that are involving or attempt to organize and make sense⁴³.

METHODOLOGY – PERSONAL CONSTRUCT THEORY

"The Psychology of Personal Constructs" proposed by George Kelly in the 1950's, describes the development of theory and associated techniques dealing with problems of personality and cognition¹³. This approach enabled his patients to "make sense" of the complex diverse patterns and actions influencing their behaviors. "Personal constructs" refer to the interpretations and meanings related to the objects in the environment communicated through words or short sentences. The process of construing

includes the interpretation of every day experience absorbed by the person. Additionally, cognitive appraisal of the forms positively influences the visual experiences⁴⁴. Hence, PCT (Personal Construct Theory) is built on the reality that perception and the ability to construe their ideas, is influenced by the previous experiences, anticipations and expectancies⁴⁵.

Three main components are central to the understanding of the Personal Construct Theory (PCT): Elements (images), constructs (responses) and rating scales (data collection)⁴⁶. The interpretation of these components is achieved by a non-invasive approach developed by Kelly, termed as the Repertory Grid Technique (RGT). The approach deals with reducing the human thoughts into basic understandable elements while perceiving any stimuli. Since, the verbal description of an object is difficult and confusing; selection of a visual stimulus such as an image enables assistance in the verbal responses, enhancing the respondent's cognitive abilities⁴⁷. Without a doubt, a rich combination of images and words. Considered as a mathematical matrix, RGT is viewed as a viable scientific and practical method to determine cognitive features of the participants, process and evaluate the assessment of individual's response to their visual environment.

Stringer⁴⁸, expresses his notion of "Man the architect" as being Kelly's¹³ impression of "Man the scientist". Hence, we adapt this method to examine the way participants perceive and "make sense" of the complexities in the building's appearance^{7, 13}. Conceding in the field of environment psychology, previous studies have explored and assessed people's response to building's visual appearance in terms of the inherent meanings or images from the three cities of Libya – Tripoli, Ghadames, and Yefren⁷⁻⁸. This PCT-based empirical study verified that a different architectural "brand image" existed in each locale, where, the inhabitants of each city had an "ideal image" of their built environment. Hence, a distinct ideal image was recognized by the inhabitants representing the local architecture unique to their cultural values. Furthermore, these studies proved consistent in identifying the differences in interpretation of architects and end-users in their understanding of a building's visual form⁷. Although, this method has been used to elicit people's inherent knowledge, this study reexamines the effectiveness of PCT in assessing the people's understanding of the visual impact of aesthetics towards the building's appearance using images. It is anticipated that the results of this examination will provide a reasonable base for theorizing building evaluation practices.

EMPIRICAL STUDY

Participants

Visual perception is a conscious or subconscious process involved in extracting information from the surrounding built environment⁴⁹. Apart from cognitive reasoning and user experience, cultural background of the individuals influences the responses⁷. People belonging to a particular cultural background or region, easily recognize each architectural brand due to their inherent visual characteristics. Accordingly, non-probability convenience sampling was used for the preliminary study so as to obtain respondents within close proximity and accessibility to the researchers. For the purpose of this study, 16 indigenous participants (8 males and 8 females) within the age groups of 20–70 years and belonging to different contextual backgrounds were selected from the city of Al Ain, in the UAE.

Elements

Jankowice⁵⁰, identifies elements as objects, people, products, images or events that are applicable to the research area being investigated. Researches based on the urban environment use images or photographs as elements to elicit the intangible aspects of the study⁸. As suggested by researchers, minimum elements for efficient RGT interview should not be less than 5⁵⁰. Consequently, seven images of similar dimensions were selected as stimuli including Sheikh Zayed Grand Mosque (M1), Al Muttareh Masjid (M2), Um Omar Mosque (M3), Sheikhha Salama Mosque (M4), Education City Mosque (M5), Arcapita Mosque (M6), and Ideal mosque (IM) (Appendix B).

Within the cultural context, authors finalized the selection of these brand images based on the contemporary approaches to mosque design in the Arab region as identified by the committee of “Abdullatif AlFozan Award for Mosque Architecture”⁶.

1. Sheikh Zayed Grand Mosque, UAE (M1) – The Sheikh Zayed Grand Mosque in Abu Dhabi, designed by Syrian architect Yousef Abdelky in 2007, is identified as a “classicist approach” to mosque design⁶. The mosque design adheres to individual or a combination of the great architectural traditional elements of the Islamic world. Overall, the mosque combines the Mamluk, Ottoman, and Fatimid styles of mosque design. Its architectural character expresses the consolidation of Persian, Mughal, Alexandrian, and Indo-Islamic mosque architecture.

2. Al Muttaredh Masjid, UAE (M2) – Al Muttaredh Masjid in Al Ain, designed by Al Ain Engineering Consultants reproduces the exact form and architectural motifs of respected secular buildings from the past¹². Drawing inspiration from the local traditional historical contexts, architectural features are faithful representations of the architectural language and principles of the region⁶. The visual architectural idiom of the watch tower and gateways of Qasr al Hosn (a secular national monument) has inspired, created, and transformed the mosque elements without exact replications. The visual symbolic impact of the mosques design has led to the adoption of its form as a stereotype reference frame for mosque design in Abu Dhabi.
3. Umm Omar Mosque, Saudi Arabia (M3) – Umm Omar Mosque in Saudi Arabia designed by Spine Architecture and Engineering in 2016, expresses an approach accepting the traditional mosque elements like the minarets within a contemporary interpretation of this architecture⁶. Balancing between the blocks and architectural surfaces, the mosque design is distinguished by unprecedented redefinition of the cubic form. Notable is the deviation from the traditional form of the minaret, absence of dome, and the transition of architectural motifs between the abstract and compositional formations⁶. Aesthetics of the mosque design is complemented by the access of light between the designated transitional spaces between the inside and outside⁶.
4. Sheikha Salama Mosque, UAE (M4) – The Sheikha Salama Mosque in Al Ain designed by Ja'afar Touqan in X represents a "contemporary expression of traditional prototypes of mosque architecture"⁶. With a slight deviation from the literal version, Sheikha Salama Mosque reflects the elements and principles of the historical mosque architecture of Al Ain. The mosque interprets Islamic traditional elements through the "mediation of modernist architectural vocabularies and aesthetic norms"⁶. Peculiarly, the abstracted iconic mosque depicts an honest expression of Islamic spirit through symbolism and composition of elements. The design depicts unconventional modular cubes by the modern interpretation of minaret, and the domes influenced by Moroccan Islamic architecture⁶.
5. Education City Mosque, Qatar (M5) – The Education City Mosque in Qatar, designed by Mangera Yvars Architects in 2013, serves as

a “creatively open approach”¹². The mosque design is identified to embrace the potential of sustainable technologies upholding the “modernist approach”⁶. As quoted by the designers: “QFIS is a symbol encapsulating the idea that Islamic architecture can be modern, progressive and inclusive but above all can act as a beacon of hope for positive change”.

6. Arcapita Mosque, Bahrain (M6) – Arcapita Mosque in Bahrain designed by American firm Skidmore, Owings and Merrill (SOM), depicts the “modernist approach” expressing abstraction of the classical stereotypical mosque elements. Serving as an innovative cubic sculpture, the design is invoked by the manipulation of geometric surfaces using the vocabularies of modernism⁶. The mosque design representing a monolithic minaret and simple cubic form, refrains from the conventional elements of domes, typical minarets or motifs associated with traditional mosque architecture⁶.

Constructs

Based on PCT, the fundamental unit for describing or analyzing an object in the surrounding is called a construct. The act of construing projects a personal understanding of the object by conveying its meaning⁵⁰.

1. Developing the Constructs: Constructs reveal the verbal sentences signifying a specific meaning related to visual appearance of the built form. Fransella et al.⁴⁶, highlights that constructs form bipolar scales, with a definite range of logic, in order to evaluate the visual qualities of the elements or buildings. However, it is noteworthy to highlight that these constructs form part of a construing system that exhibit different meanings in different contexts.

Accordingly, the constructs were developed and coded to reinforce the operational definition of the variables for each type of quality⁷ (Table 1). The scales were developed so as to be easily understandable by the lay people, measurable and easy to rate or arrange the elements. These close-ended constructs were then supplied to the interviewee as bipolar constructs. As an example, bipolar emotional constructs against variable interest and pleasure has been discussed (Appendix A).

TABLE 1
The constructs of emotional quality.

Code		Construct
Interest	EQ-01	The building holds the attention
	EQ-02	The building does not hold the attention
Pleasure	EQ-03	The building is pleasant to look at
	EQ-04	The building is not pleasant to look at

Procedure

1. Executing Repertory Grid Technique: The RGT is used as a methodology to process the perceptions of people's response to their built environment. Jankowicz⁵⁰ describes RGT as a rating-scale procedure capable of documenting an individual's personal viewpoints. Within the context of PCT, technical innovations enable the use of rep:grid as an innovative RGT for conducting real-time online interactive interviews. Thus, the software augments the former RGT by serving as an advanced online system without deviating from the true theory.

Rep:grid software introduces a web based program for executing and analyzing the interviews based on the PCT. Rep:grid software has been used in market surveys so as to determine the subconscious or conscious meaning of brand products that they value, recognize, and purchase. The software contributes to efficient organization of the interviews to analyze, summarize, and compare the opinions and insights based on the Principal Content Analysis (PCA). Thus, rep:grid serves as an instrument enabling the three dimensional graphic representation of individual and group data analysis within a hexahedron space with high reliability of contents.

2. Conducting the Interview – Rep:grid: Participants were interviewed using real-time online standardized interviews. In this method, the rep:grid interview setup enabled the authors to monitor the progress of the interviewee. Each individual's perceptions of the aesthetics of the mosque architecture were tested using closed ended constructs for duration of 30 minutes.

RGT using the closed ended constructs enables the participants to arrange the elements of the buildings on the bipolar scale alone.

For the purpose of this study, the interview was conducted in real time where the task was monitored by the researcher as it was being undertaken. Within the interface, the right-hand and left-hand sides of the grid represent the bipolar of the scales. The images positioned outside the scale, prior to the interview, were dragged onto the scales as the tasks commenced. Although values or numbers were assigned against to weight the elements, the participants were encouraged to arrange the elements based on the similarities or differences in the mosques based on their inherent perceptions. All the images were compared with each other and positioned appropriately on the scale. After attaining a satisfactory arrangement, the participants were directed to position the element corresponding to the ideal mosque at the ideal location on scale.

3. Method of Analysis: Principle Component Analysis (PCA): The three-dimensional coordinates representing the multidimensional scaling constitute the principal components of repertory grids. These include two horizontal axes and one vertical axis. The constructs are represented by the two horizontal axes. Among them, one of the axis is read from the right (positive) to the left (negative), while the other is read from near (highly substantial) to far (less substantial). Additionally, changing values represented by the elements is depicted along the third vertical axis. The value lowers as movement progresses from top (greatest value) to bottom (lowest value).

Within the graphical representations, elements are identified as points in space, whereas the close ended constructs are represented by codes (Appendix A). Positioning of the elements from the center of the three-dimensional space reflect the degree of clarity and certainty of the participant responses. Elements closer to the outer edges represent clarity and certainty in the participant responses to these elements. Additionally, Euclidean distances represent the shorter dimension between the elements in the space of the principal components. More specifically, these distances between elements indicate the similarity in people's responses corresponding to these elements. The ideal building (IM) serves as the benchmark for understanding these distances. Accordingly, the shorter distances to the ideal building are regarded as more substantial in people's response, when compared to the elements farther away from the ideal building (less substantial).

Further, determining the semantic corridor (measured between angles of 0° to 90°) around any element (ideal building), identifies other similar or dissimilar elements and constructs appearing around the selected element in the RGT. A small semantic corridor angle facilitates similar and associated constructs. Thus, a smaller angle identifies the meaningful emotional associations of the respondents that are in close proximity to achieve the satisfaction of an ideal building appearance. In contrast, a larger angle identifies all the possible or associated meanings that may or may not achieve satisfaction.

DATA ANALYSIS, RESULTS AND DISCUSSION

Results of the empirical study are categorized and discussed based on the perceptions or responses of the participants towards the visual impact of the brand images assessed through the emotional, symbolic, and formal qualities of the mosque design using RGT. The 16 repertory grids each completed by the respondents were analyzed with other grids so as to obtain the responses to particular aesthetic qualities (Emotional, Symbolic, and Formal).

Aesthetic Response Based on Emotional Quality

As observed from the Figure 9, "IM" and "M1" clustered together in the upper quadrant represent elements of high emotional quality. The positioning of "M5" and "M6" away from the "IM", towards the lower quadrants, indicate that the respondents fail to connect emotionally with the modernist approaches of the Arcapita Mosque and the Education City Mosque. Although, the elements "M3", "M2", and "M4", draw high emotional attachment among the participants, meanings and values closely associated with "M1" need to be incorporated so as to emerge as an ideal image (EQ-05, EQ-10, EQ-12).

Angle between "IM" and other elements within a semantic corridor angle of 90° , reveals the meaningful emotional associations of the respondents, close to achieving the satisfaction of an ideal mosque appearance. A small angle of 26.3° between the elements "IM" and "M1" indicates the close proximity of "M1" to people's acceptable visual mosque forms (Table 2). The shorter distance between M1 and IM ($M1 = 9.40$) depicts high substantial relationship (Table 4). Larger distance of "M6" with "IM" ($M6 = 43.60$), suggests less substantial relation and people's emotional disconnection. Thus, the close grouping of "M1" with the "IM" suggests the high emotional satisfaction of the respondents towards the building's

appearance. Hence, in case of “IM”, responses point out towards an approach of mosque design that is attractive, pleasant to look at by considering the local traditional elements recognized to the people so as to embark a sense of pride (EQ-03, EQ-07) (Table 3).

TABLE 2

The elements inside semantic corridor of angle 90° (emotional quality).

Element	Length	Angle
IM	21.1	0.0°
M1	19.0	26.3°

TABLE 3

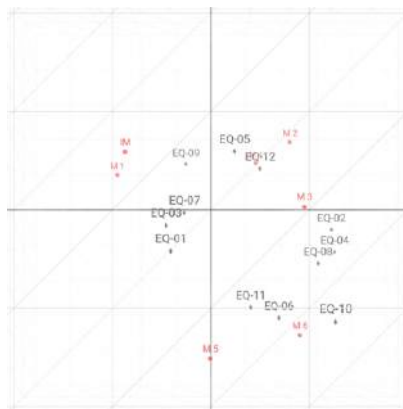
The constructs inside semantic corridor of angle 90° (emotional quality).

Construct	Length	Angle
EQ-03	12.8	42.50°
EQ-07	10.3	39.50°

TABLE 4

Distance of IM element to other elements (emotional quality).

Element	Length
M1	9.40
M4	28.00
M2	29.60
M3	31.90
M5	38.10
M6	43.60

**FIGURE 9**

The principal components of repertory grid (emotional quality).

Aesthetic Response Based on Symbolic Quality

As suggested, symbolic visual quality examines the participant's response to the cultural aspects of their local architecture. As observed in Figure 10, elements "IM" and "M1" express high symbolic values associated with the positive meaningful attached by the people. In contrast, elements "M5" and "M6" representing "modernist approach" fall in the lower quadrant, suggesting that the participants do not observe architectural character of their local brand image of the mosque. However, farther distance and close proximity of "M5" and "M6" to the outer boundaries, highlight that the participant responses miss to mark and perceive the architectural character witnessed in their local brand images (SQ-01, SQ-04, SQ-06, SQ-08, SQ-10, SQ-11). Respondents attach highly meaningful symbolic quality towards "M2", "M3", and "M4", due to expressions of visual materials, color, shape, and texture representing traditional mosque identity (SQ-03, SQ-05, SQ-07, SQ-09).

A small angle of 26.80° between the elements "IM" and "M1" indicates the symbolic meanings associated with "M1", related to brand image of the locale (Table 5). The symbolic quality expressed by "M1" is substantial to the brand image ($M1 = 12.70$). In contrast, "M6" is not valued as having important symbolic quality in the participant's response ($M6 = 32.50$) (Table 7). Hence, respondents favor an approach to mosque design based on the texture and interplay of light and shadow (SQ-02, SQ-12) (Table 6).

TABLE 5

The elements inside semantic corridor of angle 90°
(symbolic quality).

Element	Length	Angle
M1	23.60	26.80°
IM	14.20	0.00°

TABLE 6

The constructs inside semantic corridor of angle 90°
(symbolic quality).

Construct	Length	Angle
SQ-02	16.9	14.90°
SQ-12	11.2	25.40°

TABLE 7
Distance of IM element to other elements
(symbolic quality).

Element	Length
M1	12.70
M2	14.20
M3	28.40
M4	29.40
M5	31.60
M6	32.50

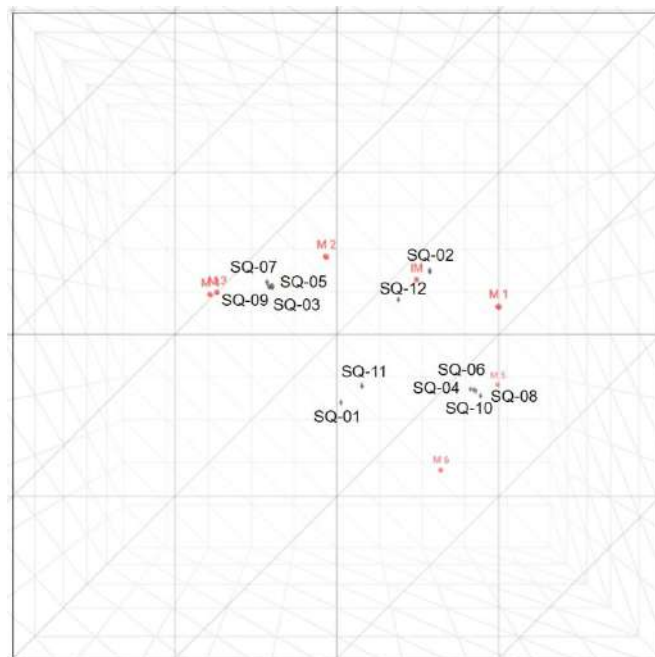


FIGURE 10
The principal components of repertory grid (symbolic quality).

Aesthetic Response Based on Formal Quality

Being located in the lower quadrant close to the center, representation of “IM” suggests that there is inconsistency in construing meanings attached to the formal quality of the ideal mosque image (Figure 11). As these formal qualities deal with the basic architectural compositions, meaningful references to the brand image of the place is obtained by manipulating these visual ordering principles.

Sharing similar characteristics in the upper right quadrant, "M2", "M3", and "M4" represent mosque designs both high in value and formally meaningful to the respondents. This confirms that the formal architectural characteristics of the mosque designs are combatable with the local practices and recognized by the people. The architectural elements are similar in size and proportion to the local mosques (FQ-03, FQ-05, FQ-07, FQ-10).

Even though, semantic corridor of 90° around "IM" failed to generate the related elements of constructs, the shortest distance of "M1" with "IM" is substantial (M1 = 14.00). "M5" at greatest distance apart is deviant from "IM", in terms of the complex details of the mosque design, and non-similar proportion and composition of the architectural elements from the traditional practices of the locale (M5 = 35.40) (Table 8).

TABLE 8
Distance of IM element to other elements (formal quality).

Element	Length
M1	14.00
M2	23.60
M6	25.00
M4	28.10
M3	30.50
M5	35.40

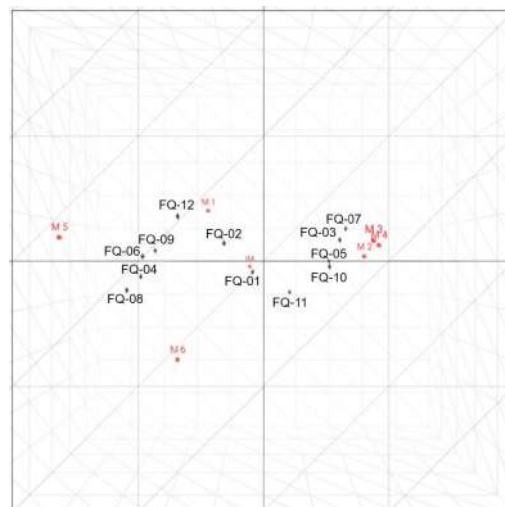


FIGURE 11
The principal components of repertory grid (formal quality).

In summary, these results suggest that the participants are emotionally connected to the visual symbolic design of mosques portraying traditional cultural practices and beliefs characteristic to their particular region (M1). Furthermore, the inhabitants seem emotionally disconnected towards a unique modernist approaches of abstraction to mosque design (M5, M6).

CONCLUSION

Contemporary approaches to mosque design explore extensive form experimentations and design diversity isolating the mosques visually from the surrounding context or inherent images of architecture. Commenting on the initiative of the planners, policy makers and “Award” committee – for design diversity and innovation, we instruct that a balance of modernity and traditional practices can only be achieved by considering the evolution of traditional mosque images as a symbol of people’s cultural backgrounds. The traditional practices should be viewed as sources of historic references alone. Adapting the principle of “cultural continuity”, contemporary approaches to the mosque designs must stress on transmitting the visual symbolic elements (minarets, domes, and aesthetics), meanings and values of a particular culture throughout generations. Therefore, we recommend the approach to visual cultural sustainability of mosque architecture based on evidence-based decisions centered on the psychological responses of the inhabitants of the city. Therefore, the user’s emotional attachment to visual aspect of architectural cultural heritage needs to be emphasized as part of the mosque design.

We initiate a “brand design strategy” approach that transmit the architectural mosque traditions without replicating historic forms or trusting creative foreign models by exposing the aesthetics of brand images as a mechanism for mosque design. PCP is introduced as a methodology to evaluate and understand the aesthetics in terms of the laypeople’s emotional attachment. Hence, PCP serves to understand inherent constructs of the product end-user’s related to the architectural meanings, opening an evaluation platform upholding the end users meaningful constructs for the assessment of mosque design.

We envision an “inclusive and culturally profound city” through future practices that consider the end-user (inhabitants’) in the creative process of mosque designs.

APPENDIX

APPENDIX A

The constructs of emotional quality, symbolic quality, and formal quality.

The constructs of emotional quality with codes		
	Code	Construct
Interest	EQ-01	The building holds the attention
	EQ-02	The building does not hold the attention
Pleasure	EQ-03	The building is pleasant to look at
	EQ-04	The building is not pleasant to look at
Desirability and perception	EQ-05	The character of the building fits within my city
	EQ-06	The character of the building does not fit within my city
	EQ-07	I would be proud to have this building in my city
	EQ-08	I would not be proud to have this building in my city
Desirability and cognition	EQ-09	I know a lot about this building
	EQ-10	I do not know anything about this building
Desirability and contemporary	EQ-11	The use of technology in this building is exaggerated
	EQ-12	The use of technology in this building is not exaggerated

The constructs of symbolic quality with codes		
	Code	Construct
Texture	SQ-01	The surface texture of the building is rough
	SQ-02	The surface texture of the building is smooth
	SQ-03	The exterior materials are like the other old buildings in my city
	SQ-04	The exterior materials are not like the other old buildings in my city
Color	SQ-05	The color of the building is similar to the color of the old buildings in my city
	SQ-06	The color of the building is not similar to the color of the old buildings in my city

Culture	SQ-07	The shape of the building is similar to the old buildings in my city
	SQ-08	The shape of the building is not similar to the old buildings in my city
	SQ-09	The vocabulary of the building is similar to the vocabulary of the old buildings in my city
	SQ-10	The vocabulary of the building is not similar to the vocabulary of the old buildings in my city
Illumination	SQ-11	The contrast is strong between light and shadow on the buildings
	SQ-12	The contrast is soft between light and shadow on the buildings

The constructs of formal quality with codes		
	Code	Construct
Shape	FQ-01	The shape of the building can be seen everywhere
	FQ-02	The shape of the building cannot be seen everywhere
	FQ-03	The architectural composition of the building is compatible with the pattern of the old city
	FQ-04	The architectural composition of the building is not compatible with the pattern of the old city
Scale	FQ-05	The size of the building fits in with the city
	FQ-06	The size of the building does not fit in with the city
Proportion	FQ-07	The building elements are similar in proportion to the building heritage of the city
	FQ-08	The building elements are not similar in proportion to the building heritage of the city
Complexity	FQ-09	The details in the building are complex
	FQ-10	The details in the building are simple
Illumination	FQ-11	The facade is mostly symmetrical
	FQ-12	The facade is mostly asymmetrical

APPENDIX B

The elements used as stimuli for the repertory grid technique.

M1



M2



M3



M4



M5



M6



IM

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THE AESTHETIC OF DECORATION IN MOSQUE: CASE STUDY OF MOSQUE IN MELAKA TOWARD UNDERSTANDING ITS TRUE FUNCTIONS

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INTRODUCTION

THE true roles of decoration in mosque are manifested in these decorations. The true usage of Islamic art decoration seems to be still lacking in the current contemporary mosque. Through investigating and identifying elements which contribute the successful of decoration in emanating the Divine Awareness, further improvements could be made to further enhance, generating conducive and appropriate environment in mosque interiors. Any negative elements which hinder or lessen this conducive environment should be reduced or even discarded to ensure the achievement of the contemplation and Divine Awareness feeling.

The function of decoration as an aesthetic expression is to remind us of the Muslim faith and belief. It is very important and crucial to investigate the effectiveness of using decoration as perceived in. The idea of decoration is to reflect on the inner and outer beauty and relating it to Allah Attributes of Beauty, Unity and Transcendences. This should be clearly reflected in the decoration which is applied in any Islamic buildings particularly in mosque.

The link between the theory of Islamic art and the practical usage of decoration should be established in order to achieve the main goal and function of decoration in the Islamic arts. Without doing this, the possibility of misuse and ineffective usage of decoration will materialize, which can contribute to wastage or creating a non-conducive environment, without considering the need and importance for contemplation toward Allah. Improvements need to be made to reduce and further eliminate these negative elements within the Muslim built environment particularly in the Islamic religious institutions such as mosques.

Without any understanding of the actual functions of decoration in relation to the mosque, one could not fully utilize and apply these decorations to achieve the main goal of Islamic art – which is to accentuate and generate the feeling of the Divine Remembrance.

This paper studies the criteria of the physical attributes of the decoration design such as the location, size, usage of color for decoration can be formulated as indicative elements to improve the current community mosque environment. By identifying the decoration elements within the interior environment, further understanding on their usage can be achieved. The usage of these decorations should be in parallel with the main functions of mosque – in creating better and more conducive environment for contemplating and remembrance of Allah. Both functions should complement each other, the decoration and mosque, in creating the environment which any true and obedient Muslim would like to be in and performing their acts of worshipping – “ibadah” as the “khalifah” or vicegerent to Allah.

THE MAIN FUNCTIONS OF DECORATION IN MOSQUE

The main functions of decoration in Islamic art are not only to beautify but also to act as a reminder to Allah and His Attributes. These functions should be the ultimate goal and main criteria for any application of decoration in general and particularly in mosques. The concept of inner and outer beauty in Islamic arts decoration should be the key factor to applying and using decoration.

The purpose of using decoration in mosque must be coherent and parallel with the true functions of mosques. The activities for all Muslims’ should be focused and centered on the functions of the mosques. A mosque, as the most important center for Islamic propaganda and teachings, need to be well designed. The design of mosques should also incorporate the usage of decoration with the purpose of creating more conducive environment for contemplating and remembering Allah. The traditional functions of mosque during the Prophet-hood period and after that can be carried out and revitalized. As mentioned by Prochazka and Mohamad Tajuddin, the traditional functions pertaining to the mosque as the community center, should be revived to cater the Muslims’ social needs.

For example, the interior lighting in a mosque could also affect the way people perceive Islamic art decoration. The impact of lighting on decoration

can also affect the users' awareness of the decoration. The awareness should be in a positive manner so as to accentuate the "Feeling of Taqwa" and remembrance of Allah. On the other hand, decoration is not only to express the physical aesthetic appearance – outer beauty (which was commonly assumed by non-Muslims), but also "to express the inner beauty", as explained by Al-Ghazzali, whereby, whenever anybody sees the decoration, it helped remind him/her of Allah and obtain the "Feeling of Taqwa" and "Serenity". Therefore, it is hoped that through this survey some of these elements and issues can be identified and evaluated in order to improve and ensure proper usage of decoration to generate the correct ambience in sense of remembering to Allah.

The conceptual framework for this paper is shown in the following Figure 1.

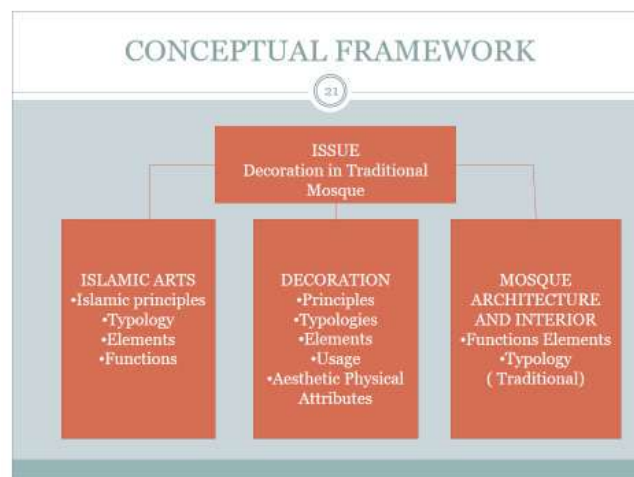


FIGURE 1

The overall conceptual frame works for this study linking the issue of the decoration with Islamic arts and mosque architectural and interior elements.

MOSQUE AS COMMUNITY CENTER

Community centers are public sites within vicinity where people gather around to perform social events, religious events and even sport events. Community centers most definitely play an important role in communities as they are places provided where people from various generations, old and young, from a variety of backgrounds, from a range of cultures and traditions and interests can all come together to interact and be sociable,

to learn and be educated and to help each other and be supported and grow.

As Yasmin and Parvin (2008) stated, "A community center provides spaces for people with similar interest but often vary from social, religious and political backgrounds who come to play, to learn, or to work together for personal satisfaction and or community improvements".

Present day community centers in Malaysia are not fully functioning to the extent of those in overseas. Spalie & Wahab, (2014) have conducted a review on the community center designs in Malaysia and stated there needs to be a change as it has "long passed its time of usefulness".

A clear idea and concept of a community center needs to be at a certain level for it to be more vibrant in its social context. A very big part of it has to do with the design and space planning of the center.

"...the design process must focus on the role of the social environment and how the physical environment may be structured to support learning and assist facilitators and learners in their work. This calls for research to examine existing settings so as to understand how they function, as well as to identify the social patterns that emerge from the activities that occur in learning environments. By conducting research, these activity patterns can be identified; they may then be used to inform the designer who then can recommend what the appropriate spatial arrangements might be."

(Lippman, 2010)

To fully grasp the concept of the community center one needs to first understand the community that surrounds it and its setting. Getting to its people, the culture, the needs, their concerns, and the relationships the hold toward each other and their social context. From there only then can be a development to build stronger ties between the people. Yasmin and Parvin indicate in a study which they conducted that:

"Community center should be self-dependent and maintained through the fund of its earning. The CCs will generate income by providing facilities for different age groups, leisure time activities, training and workshop, disaster management operation, community development initiatives by public participation, religious functions, adult education, and motivation and awareness building programs."

(Yasmin and Parvin, 2008)

The importance of understanding the true functions of decoration in mosque must be in line with the actual function of mosque as a community center. Two case studies are discussed in this paper to show how the physical decoration attributes of the case studies: Masjid Tengker and Masjid Kg. Hulu in Melaka, in demonstrating the important functions of decoration as a Zikr element, in reminding to Allah's Beauty, and Cultural diversity. The concept of unity in diversity is reflected in these decoration elements. They are applied with abundant cultural expression without comprising the Islamic teachings and not against the Islamic principles.

There are three main typologies: the Arabesque, Calligraphy and Geometric patterns. In the following case studies, the Arabesque and Calligraphy patterns are most significant in both Masjid Tengker and Masjid Kg. Hulu. These two mosques are of the traditional mosque, with a three-tiered pyramidal roof, similar to the oldest Masjid Agung Demak in Java Island, Indonesia.

The following Figure 2 shows the built era of the traditional mosques in Demak and Melaka.

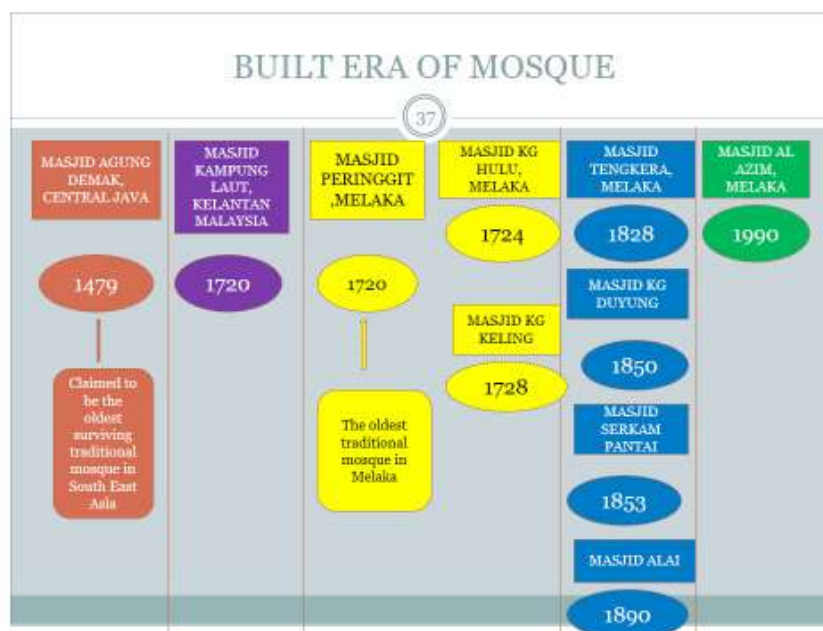


FIGURE 2

The built era of the traditional mosques in Demak and Melaka.

The architectural form of Masjid Agung Demak is similar to Masjid Tengkerah and Masjid Kg. Hulu in Melaka, Peninsular Malaysia (Figures 3, 4 and 5).



FIGURE 3

Masjid Agung Demak in Java, the oldest pyramidal traditional mosque in South East Asia.

(Source: Authors visit to Masjid Agung Demak in 2017, drawings taken from the museum gallery at Masjid Agung Demak)

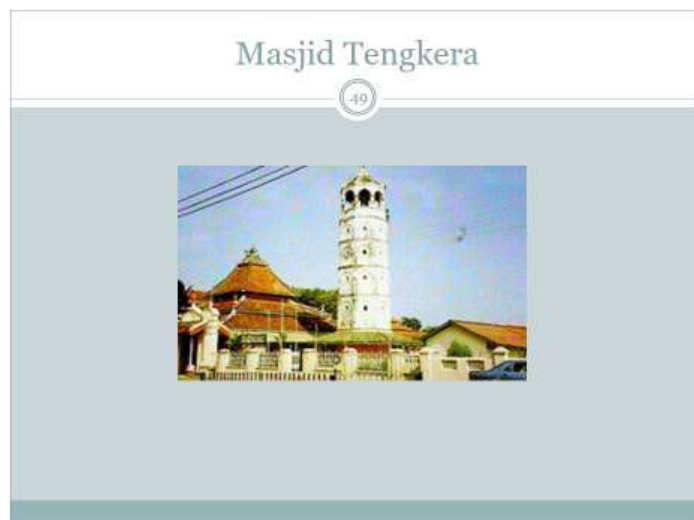
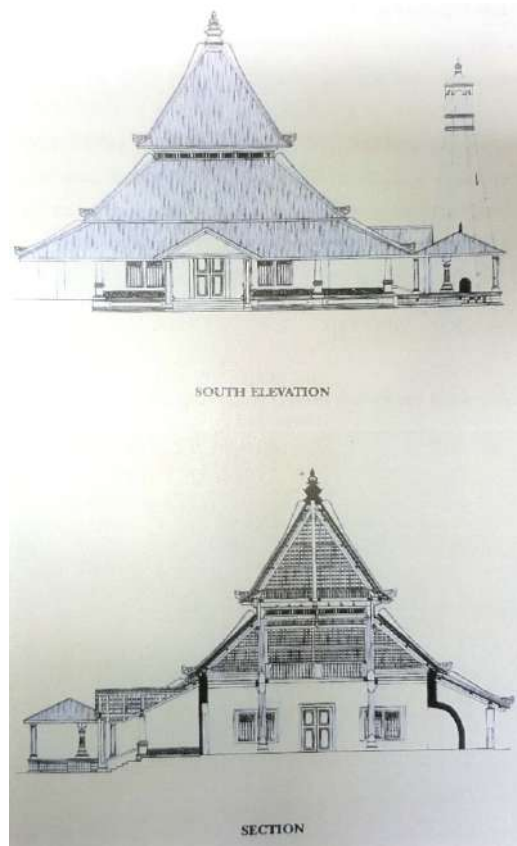


FIGURE 4

Masjid Tengkerah, Melaka is located at the Chinese Muslim village in Melaka. The built era is 1828.

**FIGURE 5**

The side elevation and section of Masjid Kg. Hulu, Melaka.

This mosque was built in 1724. However, the overall physical architectural form is within the traditional mosque typology with Masjid Tengker.

CRITERIA OF ANALYSIS

The analyses were made through observing and recording the design of the motifs. This contributed to further understanding of their typologies and design characteristics of the motifs which were applied in the three traditional mosques as mentioned earlier. The following were the criteria for the analyses:

1. the design formation and motifs typologies;
2. the material used for the decoration;
3. the color of the decoration motifs; and
4. the approximate sizes and dimensions of the motifs for each decoration.

The criteria were mainly the obvious physical characteristics which contributed to the aesthetic features of the decoration which were applied in these mosques. These characteristics were found to be the ones which are obvious to the users. These characteristics were also been referred through assessing the users perceptions and reactions. These assessments were also being made through the survey which was earlier done in the form of questionnaire. However, in this chapter, the focus would be the design characteristics of the motifs.

Tabulations of summary for the decoration motifs were also shown in this chapter. This is to record the types of motifs, names and approximate dimensions of the motifs applied in the three mosques. With these tabulations, the overall characteristics of these decorations were successfully recorded and displayed. Thus, any motifs could then be applied onto any surfaces within any mosques interiors. The analyses of the different decoration typologies were done. The main focuses were the Arabesque since these motifs were the most intricate and complex motifs used in these traditional mosques. Their unique formations were displayed through analytical sketches which were shown in further detail in the following sections. However so, the other two typologies, the Geometry and Calligraphy were also shown in these tabulations.

The analyses of the Arabesque motifs were done to show the derivation of the different motifs which were mostly of the local flora and fauna motifs. These motifs have their own names which were quite unique. As for the Geometrical patterns, the derivations of the basic geometrical shapes were done. Most of the local decoration motifs were derived from the Malay artworks. The explanation on the Malay art motifs were explained either in Chapter 3. It can be seen that in each case study of the traditional mosques, these Malay flora and fauna motifs were quite dominant and popularly applied. The analyses of the formation of the motifs were derived for further understanding. Also, the Calligraphy was mostly identified through naming the type of writings, the al-Quran verses which were used, their dimensions and translations. With that, it is hoped that these summaries can be used for future references to generate better usage and application of the appropriate decoration motifs. There were 4 (four) criteria which were used for the analyses of these decorations. As mentioned earlier, these criteria were generated to simplify the process of the analyses. They were the design formation and typologies of decoration, material used for the motifs, the color of motifs and approximate sizes and dimensions of the decoration motifs.

THE DESIGN FORMATION AND TYPOLOGIES OF THE DECORATION MOTIFS

This analysis was done on each mosque, Masjid Kg. Hulu, Masjid Tengker and Masjid Al-Azim. There were three typologies of decoration motifs which were being applied in these three mosques. The three typologies were the Calligraphy, Geometrical and Arabesque patterns. All the three typologies of decoration are linked to the same approach and typologies of the Islamic arts decoration. The different is more obvious in the usage of the Arabesque motifs. In these traditional mosques, the Malay arts motifs are used and applied as part of the decoration. There are eight categories of motifs which were commonly used in the Malay arts decoration. There are:

1. Motif from the petal of flowers (putik bunga). This petal referred to the early stage and innocence of the maiden female.
2. (a) Motif from the blossomed flowers (bunga kembang). This symbolizes the maturity of the maiden.
 (b) The bunga buluh or bamboo flower symbolizes the strength and endurance.
 (c) The bunga caperdik symbolizes the village maiden who is protected by the family. This flower is also used for medicinal purpose.
 (d) The bunga melur symbolizes cleanliness and purity.
3. Motif from the leaves:
 - (a) Motif daun bodi symbolizes the protection.
 - (b) Motif daun dukung anak symbolizes the spiritual healing, and also used for medicinal purpose such as high blood pressure.
4. Motif from fruits.
5. Motif from sulur or foliage. This motif represents the humility of nature toward the divine and this is shown with the formation of the curves which are coming down toward the bottom (on earth); also symbolizes the innocence of the teenagers.
6. Motif from the trees and plants:
 - (a) The ubi symbolizes the main source.
 - (b) The bunga kiambang or lotus symbolizes productiveness and fertility.
7. Motif from nature and earth.

8. Motif from the human made objects or other traditional utensils:
 - (a) Kendik represents status.
 - (b) Pasu or vase, represents the seeds whereby the beauty and power, jamal and jalal.
 - (c) Swastika.
 - (d) Andam-Andam (the reverted triangle) as the symbol of faith or "iman" (Nakula) but it also related to the female fertility, the actual upward triangle is referred to the male.
 - (e) Kala Makara. This motif is located above the door frame, which divides the verandah and the main prayer hall, it symbolizes the earth and the afterlife (Mohamed Najib, 2002, pp. 13-14).

The Malay arts concept is emphasizing the uniqueness, complexity, intricateness and the tremendous effort given by its artisans. The Malay people had inserted the Islamic values in their artworks by following the principles in Islam and its arts. This assimilation and effort can be seen, for example, in the omission of the figurative motifs which were earlier applied and designed during the Hinduism influences.

VISUAL ANALYSES OF DECORATION COMPOSITION

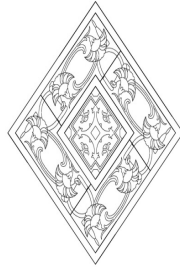
Case Study 1: Masjid Tengker, Melaka

In this mosque, selected decorations motifs are shown to show the various usage of materials whereby the Arabesque patterns are applied in many ways. The tiles and word paneling frame at the doorframes and windows are used and applied differently, this is shown in the following Figure 6.



FIGURE 6

Sample of the Arabesque motifs on tile which can be found at Masjid Tengker.



The analysis diagram of the Arabesque pattern on the wood panel.

(Source: Author analysis diagram, 2017)

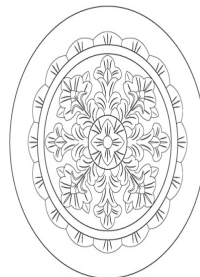
This tile decorations are with some European flower: Morning Glory flower motifs, painted on tiles, showing the influence during the Dutch Empire. However, tiles are commonly used since Masjid Tengkeru had influences from the Chinese Muslim communities in Melaka.

As for Figure 7, the wood panels are decorated with carved flower motifs: Bunga (Main Flower), Siba Dayang Pengasuh motifs at the corners.



FIGURE 7

The wood panel carving of Arabesque motif on the door panel showing *Bunga* (at the central) and corner motifs: *Siba Dayang Pengasuh* motif.



*The analysis diagram of the Arabesque pattern on the wood panel.

(Source: Author analysis diagram, 2017)

In Figure 8, the Arabesque motifs are of the carved Tebuk Telus as window ventilated openings.



FIGURE 8

The wood panel carving showing the Arabesque motif on the window panel.



The analysis diagram of the Arabesque pattern on the wood panel.

(Source: Author analysis diagram, 2017)

In Figure 9, another flower motif “The Winged Flower” or “Daun Sayap” is applied onto the wood surface on one of the columns in Masjid Tengker.



FIGURE 9

Another Arabesque motif “*Daun Sayap*” which is applied on the panel in the mosque.

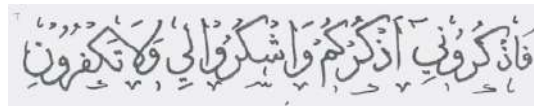


The analysis diagram of the Arabesque pattern on the wood panel.

(Source: Author analysis diagram, 2017)

The Calligraphy motifs were quite effectively applied in this mosque. There were five types of Calligraphy used. The followings were four Qur'an verses which were used and one doa or religious messages to remind the users of Allah. The types of Calligraphy used were mostly of Thuluth writings. Thuluth is one of the decorative scripts used for architectural and small object decoration. It is one of the most important rounded script to be developed, used in all regions of the Muslim countries (Al-Faruqi, 1921, pp. 361). In this mosque, the Calligraphy motifs were applied on top of the main door entrances.

The first Qur'anic verse was:



Surah Al-Baqarah: 153.

Then do ye remember Me, I will remember You, be grateful to Me, and reject not Faith.

(Translation by: Abdullah Yusuf Ali)

This surah was used to remind the users (who entered the main prayer hall) to be reminded of Allah and Islam as Faith. The direct usage of this Quranic verse was much appropriate. However, there was no translation given as part of the Calligraphy design panel. Only those who could read Arabic and those who were very familiar with this verse could understand and obtain the benefit of being reminded. Therefore, there were not many users who understood the meaning of this verse whilst entering the main prayer hall. But most users were able to read the Calligraphy effectively. This Calligraphy is of 500mm in height of the front size. The length of the panel is depends on the length of the surah. In this Calligraphy motif only one ayat or sentence is used for the surah.

Case Study 2: Masjid Kg. Hulu, Melaka

For Masjid Kg Hulu, the analyses are shown in the following figures. Some of the Arabesque motifs are similar to Masjid Tengker. However, for Masjid Kg. Hulu, most of the motifs are on wood and timber paneling. The color applied in these motifs is of natural wood color.

The materials used in this mosque were of wood panels, ceramic tiles and iron cast metal work. The major material which was used in this mosque is timber. The simplicity and usage of timber or wood panels showed the beauty of the Malay arts wood carving works. Examples of the wood carved works are shown in Figures 10, 11 and 12.



FIGURE 10

The wood window paneling in Masjid Kg. Hulu.
This is a common feature in the traditional mosque in Melaka.

In Figure 10, one of the prominent decorative elements is the wood paneling near the main prayer hall. This is a significant decorative window panel which can be seen in a few mosques in Melaka. In the next Figure 11, another wood carved window can be seen in the mosque.



FIGURE 11

The top panel of the wood carved window shows the intricate floral design which is of a Malay design pattern. The window decorative panel was designed to ensure the natural ventilation to cool off the main prayer hall. This photo was taken by the researcher.

Another usage of wood can also be seen in the next Figure 12. In this figure, the wood decoration is seen at mimbar design which is located in the main prayer hall.



FIGURE 12

The complexity of the floral or Arabesque design in its wood decoration is reflected from the top panel till the body and footing of the *mimbar*.

The second material used for the decoration in this mosque was iron cast metal works. The examples of this are as follows:



(a) The iron cast lamp design.



(b) The iron cast lamp design.

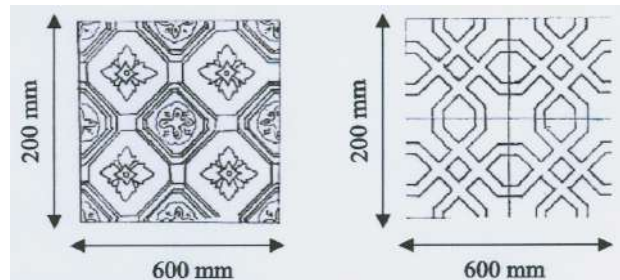
FIGURE 13

The iron cast balustrade and the lighting.

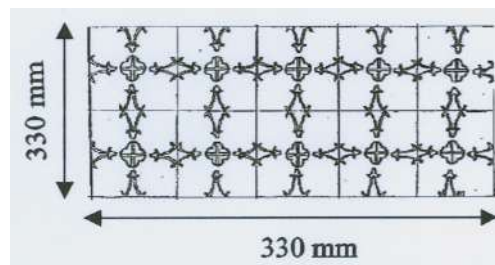
(Source: Author's photograph taken during visit in 2018)

The above metal works design were introduced during the colonial era whereby the European art motifs were applied as part of the decoration motifs in this mosque. The flower patterns used in this design are unique. Another material which is commonly used in this mosque was ceramic

tiles. The ceramic tiles were applied generously in the traditional mosques in Melaka. They became the identity of the old traditional mosques for its decoration. The examples were shown below:



(a) The floral pattern composition. (b) The geometrical pattern.



(c) The wall tile pattern with flower motif.

FIGURE 14

The patterns applied onto the ceramic tiles in Masjid Kg. Hulu.

(Source: Author's analysis diagram 2018)

Taking note of the various usages of materials of the decoration in this mosque, we can actually see the evolution of the different decorative influences throughout the era of the mosque.

The rich and diverse decorative elements create the rich diversity of the semantics of the floral designs in different materials. The compositions can be seen in the usage of Arabesque and Geometric patterns within the different surfaces of the wall and floors.

Case Study 3: Masjid Tengker, Melaka

In Masjid Tengker, the Arabesque patterns were mostly of woodcarving works. There are some patterns which were applied with the usage of metal works, for example, the balustrades and the compound lighting design.

The other Arabesque patterns were applied onto the ceramic tiles. The motifs were painted traditionally but in modern technology era, these tiles were put into oven to be curved (Figure 15).



(a) The color of the geometrical and floral pattern used.

FIGURE 15

The ceramic tiles with different decoration motifs applied onto the tiles.

(Source: Author's photograph taken during visit in 2018)



(b) Another *Bunga Eropah* motif.



(c) The geometrical floor tiles motif.

The different usage of Arabesque and floral pattern.

(Source: Author's photograph taken during visit in 2018)

In this mosque, the usage of ceramic tiles was extensive compared to any other traditional mosques. Some of the decoration motifs were also carved onto the timber columns to create embossed effects. Arabesque patterns at the timber columns within the main prayer hall were painted gold to create contrast color of the columns (Figure 16). As for the Arabesque patterns which were carved onto the door leaf and the external columns at the verandah, the embossed patterns were painted with the same color as the background color (Figure 17). This creates different effect to the whole composition of the Arabesque patterns.



FIGURE 16

The gold colored embossed Arabesque pattern at the internal columns.

(Source: Author's photograph taken during visit in 2018)

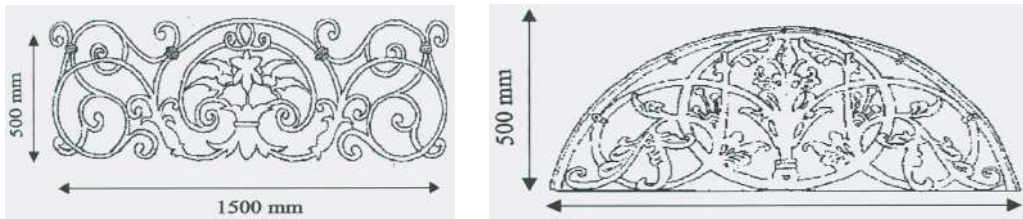


FIGURE 17

The embossed Arabesque patterns carved onto entrance door leaf.

(Source: Author's photograph taken during visit in 2018)

There were also metal works applied in this mosque. The examples are shown below:



(a) The Arabesque motif used at the balustrade design.

(b) The metal Arabesque motif design on the top panel door frame.

FIGURE 18

The different metal work designs used in Masjid Tengker.

(Source: Author's analysis diagram, 2018)

The metal work railings or balustrade was designed and used during the colonial era whereby the forms of the metal work motifs were applied with simpler Arabesque pattern. The same approach was applied onto the lighting design. The other material used was plasterworks on ceiling and the stump of a column (Figure 19).



FIGURE 19

The plasterworks design on the stump of a column.

(Source: Author's photograph taken during visit in 2018)

These various materials were used to apply different decoration motifs. More innovative materials are used in the contemporary mosques. Therefore, different materials are applied according to the current available materials which can be used for decoration. These materials were seen applied as part of the decoration motif in this mosque.

CONCLUSION

The roles of decoration should be in line with the function of the mosque. It is important to understand the function of decoration which should be in line with the Islamic principles whereby the inner and outer beauty of the decoration is important as an enhancement to the appropriate worshipping ambience for the mosque users and visitors. The traditional mosques in Melaka have these unique characters. Thus, create the deeper appreciation and good ambience in the interior of these mosques.

The various usages of materials are also reflecting the diverse heritage characteristics to all users who come to the mosques. The "Unity in Diversity" principle in Islam can be clearly seen in these mosques.

These transformation and usage of the different typologies of decoration in the traditional mosques in Melaka are considered unique and diverse. The beauty of decoration creates good attractions to all Muslims who are from diverse background and thus show how Islam is actually uniting everyone under one religion. Thus, the author has formulated the design recommendations using the key identified as follows:

1. typology of decoration;
2. location of decoration;
3. material of decoration;
4. color of decoration;
5. size of decoration;
6. effects of interior lighting to decoration; and
7. understanding of the function of decoration.

This formulation of design recommendations are for better usage of decoration in mosque interiors. They are intended to improve the application of decoration, as perceived and preached in Islam and with the basic principles of Islamic arts decoration. The application should tie back with the true functions of mosques as a place for worshipping and also as a community center for the adjacent community of the surrounding areas.

The various stylistic of decoration motifs are identified and with that, better understanding of the different typologies of decoration is obtained. The above recommendations can be used for any designers,

in promoting and applying the rich and different decoration motifs with better design compositions, in enhancing the beauty and the quality of the interior spaces to all users. The harmonious color compositions of these decorations need to be highlighted to recommend various suitable color compositions for the various applications of decoration particularly in mosques.

Another consideration which can be of helpful input is the current trends of the usage of modern materials such as the ceramic and homogenous tiles, metal works, glass panels with Islamic patterns such as Calligraphy, Geometrical and Arabesque patterns are quite common and popular nowadays due to the cost effectiveness and less expensive materials. Woodcarving decoration at wall or door or window panels or mimbar designs is now considered as quite expensive depending on the quality of woodcarving works be it of hand carved or machined works. The combination of the traditional materials and modern materials can be controlled depending on the overall budget which is considered as non-wastage.

The main aim of decoration as perceived in Islam is much important and should be met, particularly to enhance the feeling of remembering Allah within the man-made built environment and buildings, particularly in mosque since this building is considered as one of the most important buildings in the Islamic world. Thus, the understanding of its functions should be highlighted and realized by everybody particularly to those who are involved in applying decoration within mosques. Good applications of these decorations can be improved to the existing mosques and better usage of decoration can be applied in any new mosques. This will ensure and promotes effective usage of decoration within any mosque interiors and thus further be applied within our surrounding environment.

With the findings and recommendations formulated earlier, it is hoped that the outcome of this research study will benefit those who are involved in the overall development and construction stage in designing of mosque and its interiors. With the synthesis of these findings, more realization of the actual functions of decoration in promoting better and conducive worshipping environment for the mosque interiors is achieved. Careful considerations of the good selections and choices of decoration, as perceived in Islamic arts, will definitely help to enhance the true function of decoration and emphasized the importance of mosque as the main congregational and gathering place as the House of Ibadah.

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BIOPHILIA FOR MOSQUES DESIGNS

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INTRODUCTION

THE real role of the mosque is that it is a spiritual, cultural, open and life-enriching, human, and social enrichment. The mosque gradually becomes a closed entity separate from society and life, effective only during a few minutes when the prayers are held, then shut down with turned off lights and closed doors. Some of these mosques are more fortunate as their size and location are converted into large places that host the Friday prayers and thus extend the relative time space for using the mosque spaces¹.

Our neglect of the value of the space or place of prayer in the human, spiritual, architectural, and urban environment in the Middle East has developed to spread this neglect in the built environment around us. It is noted that many administrative buildings either turn an abandoned room into a so-called prayer room, which is often the store next to the toilets. And the continued neglect of the act of prayer and pushing it to the marginal areas, basements, roads, and dark rooms, even in Malls, is contrary to the values of spiritual action and of Islam.



Among the prayer experiences, it is even possible to find descents underground to dark wet spaces with the mosques name written on its wooden door, "Mosque of Light". Our neglect of the value of the space or place of prayer in the human, spiritual, architectural, and urban environment has spread to this extent not only in cases of private housing but also in

the public buildings. Gradually, the act of prayer becomes a work that emphasizes behaviors that contradicts the value of the spiritual act and the value of all Islam.

The mosque must go beyond the idea that it is a limited space, in which only rituals are practiced. Rather, the contemporary mosque must be transformed into a societal, enlightening dialogue forum, to maximize the culture of creativity, knowledge, dialogue, tolerance and acceptance of others especially at the level of cultural, cognitive and even spiritual.

There are examples in the Arab-Islamic context, in which the designers tried to focus on presenting a humanistic, spiritual, social, and visual experience that does not copy the above, and does not repeat a historical model on the pretext that the old is an expression of self and identity.

The research problem is, at the intellectual and creative levels, we are in need to restore the mosques to the value of vibrant hearts, advocacy, interaction and knowledge in a transparent, open-minded context that transcends the forms and starts a contemporary connection with the context in which the mosque was built. The mosque must be a spiritual space that has the ability to invite the rest of society to flow within it and to enjoy its activities not for their calling for Islam, but to remove all the fog from the balanced Islamic faith and the tolerant Muslim man who is distinguished in accepting peace, culture of dialogue, integration, and interaction.

The aim of our research is to enrich the diligent architectural designs to make mosque buildings resemble paradise, and resemble our perceptions of them; it is a place for the human spirit, mind and body to find shelter, happiness, safety and spiritual and emotional healing. This value does not produce a specific form and a rigid mold, but it is a qualitative value that creative minds can translate into infinite forms and very diverse spatial expressions. Therefore, Islamic beliefs form the logic and methods by which Islamic societies practice the development and construction while respecting the age and rhythm and requirements as well as respect the context and data and respond to the aspirations and ambitions desired by the humanitarian groups.

The research questions are: Why is the mosque not linked to a new visual form that makes it a beautiful forum at which hearts, souls, and minds look? Why would not the alternative mosque have a space for children to relax, play and come closer to religion and worship in a smooth way? Why

is the mosque not a meeting place for mothers, fathers and families and a place to spend a beautiful picnic in its garden in an upscale and civilized way and in a humane collective context? Why is the mosque not in a garden and gardens are not in the mosque with all the meaning of the sentence of deep organic overlap?

To reach our goal, the research hypothesized that biophilic design should be integrated in mosques designs and components to be exciting and attractive spaces capable of attracting all segments of society and creating a positive spirit and new levels of spatial belonging, and to gain acceptance and a new understanding of the mosque and its role in society, the features of its components and the language of its architecture.

SPIRITUALITY IN MOSQUE ARCHITECTURE

The main architectural models of the mosques throughout the Islamic ages have established a long tradition of design, construction, art and decoration of the mosques, and created forms, elements and details to distinguish each model from the other and to express the surrounding society and its cultural, technical and artistic conditions. The spirituality has been achieved in the mosque building in different ways, some of which are manifest in the sublimation of the minarets above in the sky, and in the contemplation embracing the domes with the skyline and the integration of the outer spaces around the mosque with its entrance and gaps and alleys, in reference to the apparent overlap in the interior and the unity of the decoration in detail and the harmony of abstraction with nature².

The mosques buildings, in their content, passed through the different ages in a direct physical form and an invisible spiritual one, which enabled the creation of a sense of visual communication. The mosque's architecture and arts have the meanings that reflect the value of space, the creation of a place of worship and the organization of spatial space to balance the functional needs with the deep spiritual dimension, resulting in the emergence of new architectural patterns and spaces expressing their function and symbolism and special spiritual dimension that inspires the need for contemplation.

For example, the fear and spirituality in the building of the mosque in the vanishing of the minarets in the sky, in the outer lines of the domes in which embrace the earth and the sky, in the containment of the mosque walls for its internal spaces, in the unity between the decorations and details,

in the integration of the outside inside, in contrasting the outward and the inside, in harmony with abstraction nature, and disappears dissimilarity and antagonism. The spirituality is manifested in the creation of the spaces of the mosque and the adaptation of characteristics of the forms to perform the rituals and the escalation of the prayers, the hymns of reverence, the presence of faith, and the expression of meanings when contemplating the essence of the interior and the disclosure of secrets.

To accommodate functional changes and the expression of local communities and context, the architecture of mosque expressing spirituality has passed through stages of development and experimentation³:

1. the diversity and multiplicity of architectural styles of mosques that illustrate the methods of spatial interdependence;
2. interconnection between the interior and exterior through the diversity of the composition of different spatial elements;
3. follow the design principles such as symmetry, duality and the contrast between forms and elements to emphasize perfection and idealism;
4. the versatility of natural lighting and the design of the relay of light sensations inside and outside the mosque;
5. audio processors for different spaces to isolate the place of worship from external noise to provide quietness and quiet;
6. emphasis on symbolism through signs and references to spiritual aspects and help to meditate and think.

The most important characteristics of spirituality and atmosphere of reverence formed and developed in the traditional mosques in:

1. the mosque is designed to be a focal point for the surrounding area, but it should be a place of worship;
2. ensure a comfortable general atmosphere as a result of the design of the environment with a safe spiritual environment;
3. finding a quiet place helps to worship and master, and helps to reduce lighting and decorations in the mosque;
4. celebrate the mosque as a cult house by designing interior and exterior spaces appropriately;
5. the use of materials, colors and touches of smooth homogeneous surfaces and harmonized elements are carefully selected.

BIOPHILIA

A concept first popularized by Edward O. Wilson in 1984⁴, describes the innate relationship between humans and nature, and concerns the need we have to be continually connected to nature. Plenty of research confirms this human preference for the natural, rather than built environment⁵. For example, in a 2004 study, when asked to describe their ideal city, people more often chose non-urban characteristics, greenery in particular⁶, and in other studies it has been shown that a pleasant and natural view can raise the price of a house considerably.

BIOPHILIC DESIGN

Biophilic design is a method of designing the places in which we live and work in such a way that satisfies our deep and fundamental need to be connected with nature. Biophilic design encourages the use of natural elements and processes as design inspiration in the built environment⁵. The idea behind this is that exposure to natural environments and features have positive effects on human health and wellbeing, which has been supported in a wealth of research⁷. According to the biophilia hypothesis, these positive effects of exposure to nature originate in a biological bond between humans and the natural world⁵. These ideas have been taken forward in two theories developed in the environmental psychology literature: attention restoration theory⁸ and stress recovery theory⁹. Both theories suggest that some environments are stressful, others are not and yet others can actively help people recover from stress and mental fatigue. Environments that evoke positive moods, have properties that draw people's attention without being stressful or demanding, can help people recover more quickly and fully from mental fatigue and stress are known as restorative environments. According to Kaplan and Kaplan⁸ and Ulrich and colleagues¹⁰ natural environments in particular contain elements that promote renewed attention by providing a sense of being away, fascination, extent, and compatibility¹¹; and by containing elements that promote survival and therefore positive appraisal. Urban environments, on the other hand, tend to be full of demanding, stressful, under stimulating or boring features.

Biophilic design then suggests that built environments could be made more restorative by incorporating natural elements in their design. Ulrich¹² suggests that biophilic design can be viewed as belonging under a larger restorative design umbrella. Much of the small but growing

peer-reviewed literature on biophilic design often cites research on restorative environments to support the health and wellbeing benefits of biophilic design^{13–14}. Although the concept of biophilic design is relatively new, the plethora of research on nature and restorative environments makes a strong case for the health and wellbeing potential of incorporating.

EXPERIENCES AND ATTRIBUTES OF BIOPHILIC DESIGN

The results of the psychological literature search on the three biophilic design experiences; some overlap exists between the independent variables (the 24 attributes) explored in research and this was mentioned in the overlapping attributes. For example, water will be seen as being highly restorative in the built environment from both direct and indirect nature experience.

Moreover, different natural elements often feature together in environmental design, making it difficult to distinguish clearly between different aspects of biophilic design.

TABLE 1
Experiences and attributes of biophilic design⁷.

Direct experience of nature	Indirect experience of nature	Experience of space and place
<ul style="list-style-type: none">• Light• Air• Water• Plants• Animals• Weather• Natural landscapes and ecosystems• Fire	<ul style="list-style-type: none">• Images of nature• Natural materials• Natural colors• Simulating natural light and air• Naturalistic shapes and forms• Evoking nature• Information richness• Age, change, and the patina of time• Natural geometries• Biomimicry	<ul style="list-style-type: none">• Prospect and refuge• Organized complexity• Integration of parts to wholes• Transitional spaces• Mobility and wayfinding• Cultural and ecological attachment to place

Figure 1 summarizes Biophilic Design Experiences and Attributes and Figure 2 explains the three main categories of the biophilic design.

THE BIOPHILIC DESIGN PATTERNS

While informed by science, biophilic design patterns are not formulas; they are meant to inform, guide and assist in the design process and should be thought of as another tool in the designer’s toolkit. The purpose of defining these patterns is to articulate connections between aspects of the built and natural environments and how people react to and benefit from them. Figures 3, 4, and 5 are the 14 patterns of biophilic design. Just as combinations of culture, demographics, health baselines, and characteristics of the built environment can impact the experience of space differently, so too can each design pattern. A suitable solution results from understanding local conditions and one space’s relationship to another, and responding appropriately with a combination of design interventions to suit the unique needs of a space and its intended user group and programs.

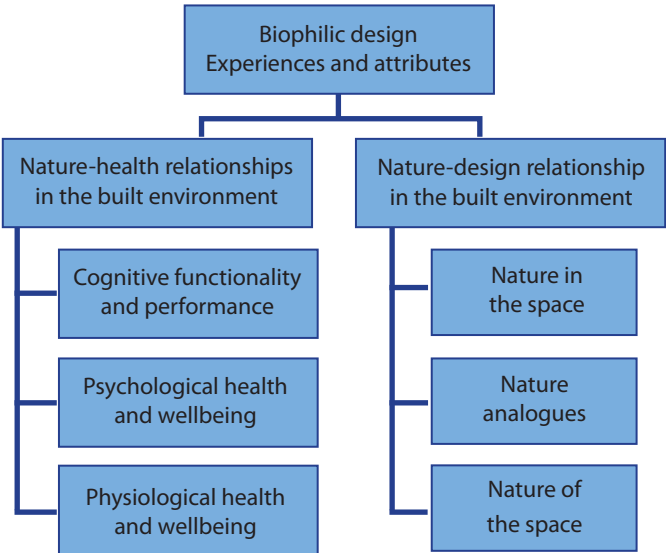


FIGURE 1
Biophilic design experiences and attributes (created by the Authors).

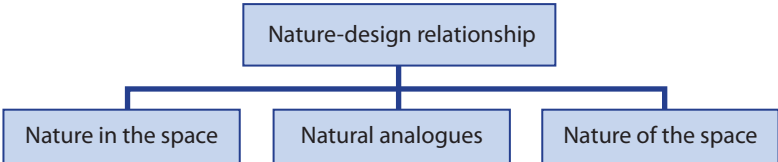


FIGURE 2
Main categories of the biophilic design (created by the Authors).

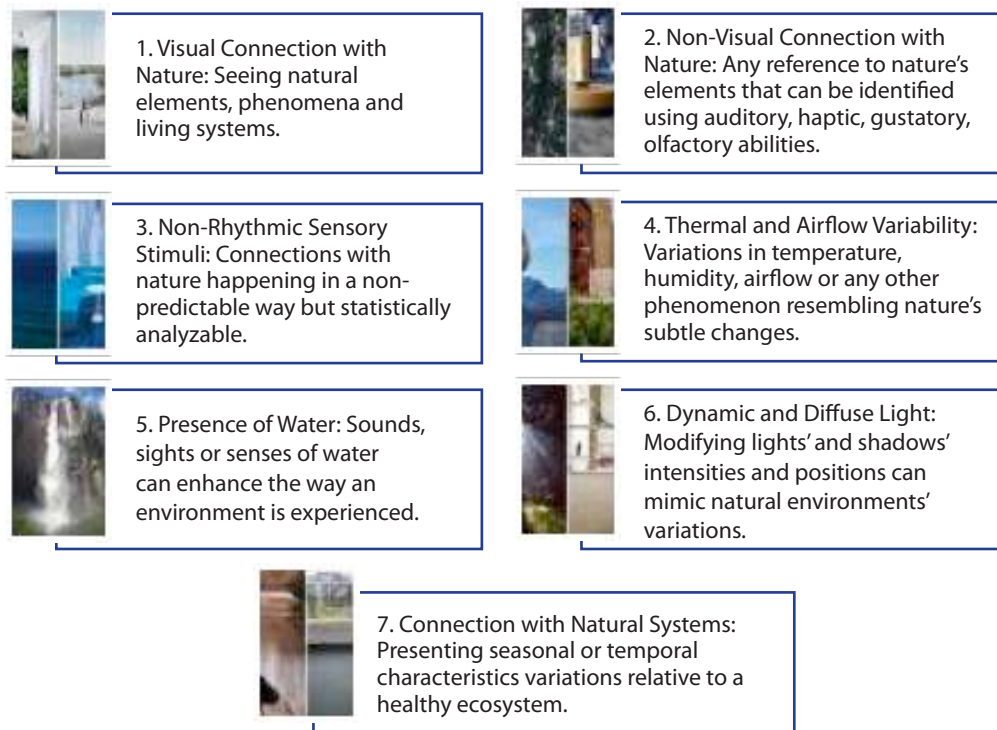


FIGURE 3

Natures in the space encompasses seven biophilic design patterns.

(Barton and Pretty, 2010)

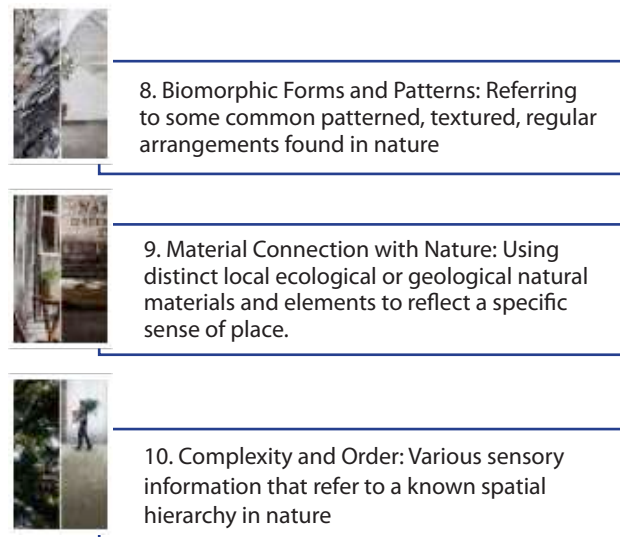
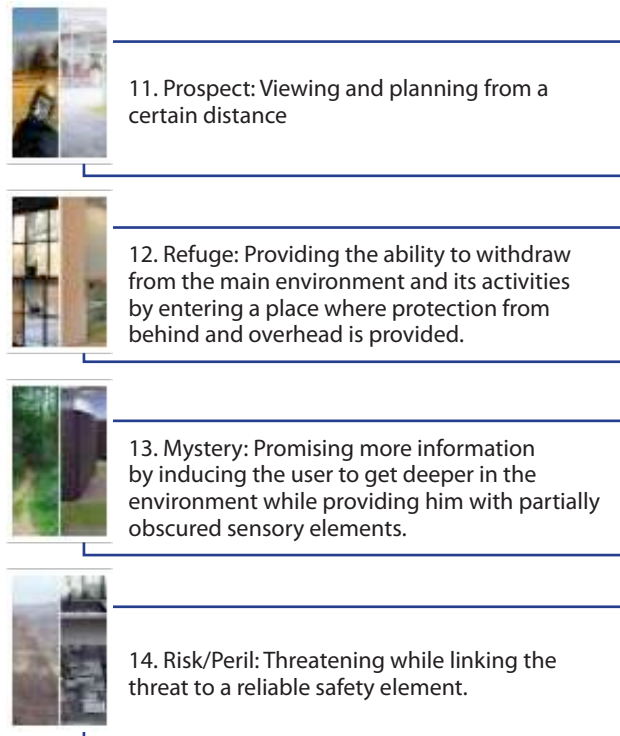


FIGURE 4

Natural analogues encompasses three patterns of biophilic design.

(Barton and Pretty, 2010)

**FIGURE 5**

Natures of the space encompasses four biophilic design patterns.





(Barton and Pretty, 2010)





Finally, each pattern has been assessed for overall potential impact and the strength of the research on which a pattern is built. Unless otherwise noted, all examples reported are based on data published in a peer-reviewed journal. We acknowledge that some studies are more rigorous than others and that some patterns have a greater body of research to support findings of significance.





In our paper only seven among the 14 patterns were selected according to their relevance with the context of mosque architecture. The 14 patterns have different impacts and contexts adapted to them. This leads to the identification of the patterns: Visual connection with nature, non-visual connection with nature, thermal and airflow variability, presence of water (particularly outside the mosque), dynamic and diffuse light, material connection with nature and prospect as being the best suited to the objectives of mosques environment design. Table 2 summarizes the seven patterns meaning, application, and examples (created by the Authors).

TABLE 2

Summary for the seven patterns meaning, application and examples (created by the Authors).

Pattern	Meaning	Application	Examples
Visual connection with nature	View of natural elements from within the interior	<ul style="list-style-type: none"> • Big windows or fully glazed walls are an amazing way to open the view to the outdoors and let plenty of natural light in • Adding greenery indoors is another strategy • Nevertheless, this means more than having few small potted plants here and there (although they can already bring life to the space and even clean the air in some cases) • In the scope of biophilic design, greenery must be a cohesive element in the space, like a garden wall design or diverse and substantial plants 	 
Non-visual connection with nature	Interactions with nature through other senses: sound, touch, smell, and taste	<ul style="list-style-type: none"> • Introducing natural sounds, both recorded and created naturally • This can be as simple as playing some natural sounds videos from YouTube • Using a variety of touchable natural materials like plants, wood, and stone • Introducing natural scents, preferably from flowers or plants • Allowing natural ventilation and preferring seamless connection between indoor and outdoor 	 

Thermal and air flow variability	Variability in air temperature and flow, changes in relative humidity and varying surface temperatures	<ul style="list-style-type: none"> Introducing temperature and air flow variations has the power to make an indoor space invigorating and alive, like a natural outdoor environment would be Access to natural light and ventilation will automatically make it happen, allowing the outdoor breeze to come in and creating sunny (warmer) and shaded (cooler) spots Another way to play with this pattern is using materials in the space. For instance, wood is naturally warm whereas stone is cold. Mixing them in a design can introduce some interesting temperature variability among surfaces 	 
Presence of water	Water as a design feature	<ul style="list-style-type: none"> Water is a powerful tool in biophilic design as it affects different senses simultaneously Naturally-moving water (like a waterfall or fountain) is preferable as it can be seen, heard and/or touched. But the movement should not be too violent either, as this could end up feeling uncomfortable and intimidating 	 


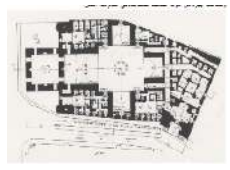
		<ul style="list-style-type: none"> • Even if it may not seem so, a wall fountain is not too hard to install, and would fit even in a smaller balcony. Just remind to incorporate a system of continuous water recirculation to prevent water waste 	
Dynamic and diffuse light	Leverages varying intensities of light and shadow	<ul style="list-style-type: none"> • Change over time to create conditions that occur in nature • Conveys expressions of time and movement to evoke feeling that buffered with a sense of calm 	
Material connection with nature	Materials and elements from nature	<ul style="list-style-type: none"> • Through minimal processing, reflect the local ecology or geology and create a distinct sense of place 	
Prospect	Uninterrupted view over a distance	<ul style="list-style-type: none"> • This pattern originates from research stating that we are naturally drawn to environments that recall African savannahs, i.e. the habitat where we evolved as a specie. Wide open spaces feel airy and give us a reassuring feeling of control • Open floor plans are the number one way to translate this pattern in interiors 	 


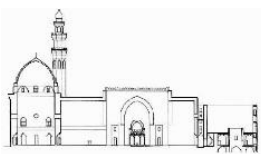
		<ul style="list-style-type: none"> • When a separation is needed, a good idea is preferring see-through partitions or glass mezzanines that also maximize the quantity of natural light in the space • Open bookshelves used like a room divider are another precious option, as they divide the space without blocking the view. Plus, they add storage • To maximize the available prospect, this pattern advises that views should extend from six meters (20 feet approximately) to 30 meters (100 feet approximately). Similarly, limiting the height of partitions to 1 meter (42 inches) is a good strategy to separate the space while keeping the view uninterrupted 	
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CASE STUDIES

TABLE 3

Case Study 1: Sultan Hassan Mosque (created by the Authors).

Pattern	Meaning	Application	Examples
Visual connection with nature	View of natural elements from within the interior	<ul style="list-style-type: none"> • The praying hall (courtyard or sahn), including the ablution fountain at its center. This is considered as the main mosque area, where prayers take place. Its huge scale, wide space, and high walls emphasize on spiritual feeling of meeting the Greatness of Allah, increasing the sense of humbleness of human being within God's kingdom. 	 

		<ul style="list-style-type: none"> • The courtyard is providing natural light and natural ventilation with for indoor environment of the different sections in the building. This enhances the quality of indoor environment along with improving it performance against the local climate conditions • Floral ornaments were used in different spaces across the mosque is a good representation of abstracting nature indoor environment. This has helped in connecting the uses of indoor spaces with nature through these abstracted nature elements. It shows how this mosque is characterized by natural elements in the wall 	
Non-visual connection with nature	Interactions with nature through other senses: sound, touch, smell, and taste	<ul style="list-style-type: none"> • The courtyard let the clear weather and nature ventilation come inside, the texture of wood as natural material, building with stones, greening outside the mosque and the sound of birds and the air flow let us hear the sound of wind 	
Thermal and air flow variability	Variability in air temperature and flow, changes in relative humidity and varying surface temperatures	<ul style="list-style-type: none"> • Natural ventilation is well distributed across the building because design took into consideration the flow of natural ventilation across the building. This can be seen in the existing differentiation on building enclosure and openness a good example of this could be the clear sighted difference between the 	
















		<p>entrance and courtyard and their proportions</p> <ul style="list-style-type: none"> • The courtyard (sahn) let the natural light and ventilation access to the hole, allowing the outdoor breeze to come in and creating sunny (warmer) and shaded (cooler) spots • Using natural materials in the whole mosque represented in using wood in windows and stones in walls 	
Dynamic and diffuse light		<ul style="list-style-type: none"> • Courtyard lets direct sunlight coming from the outside and daylight from multiple angles • Design created with varying between different space and its exposure to natural light between the courtyard and the entrance 	
Material connection with nature		<ul style="list-style-type: none"> • Represented in natural color palette and wood texture on mihrab 	 
Prospect	Uninterrupted view over a distance		 

TABLE 4

Case Study 2: The Great Mosque, Granada (created by the Authors).

Pattern	Meaning	Application	Examples
Visual connection with nature		<ul style="list-style-type: none"> • Represented in the view of Alhambra Palace, the natural light outdoor and indoor, water falling in the entrance of the mosque, the sky above, birds nestling on the trees, and water feature (pool) • The sunken garden of the mosque. It shows how this mosque is characterized by natural elements such as trees 	
Non-visual connection with nature		<ul style="list-style-type: none"> • Represented in the clear weather and nature ventilation, the texture of wood on the trees as natural material, building with stones, greening outside the mosque and the sound of birds and the air flow touching the body while letting its inhabitants hear the sound of wind 	
Non-rhythmic sensory stimuli		<ul style="list-style-type: none"> • Represented in naturally occurring such as cloud movement outside the mosque, waves of the surface of the water, and also movement of tree leaves 	
Thermal and airflow variability		<ul style="list-style-type: none"> • Represented in shadow and shades in the site space, place orientation and window glazing and window treatment 	

Presence of water		<ul style="list-style-type: none"> Represented in water feature in the entrance of the mosque in the center of the outdoor court 	
Dynamic and diffuse light		<ul style="list-style-type: none"> Represented in direct sunlight coming from the outside and daylight from multiple angles 	 
Connection with natural systems		<ul style="list-style-type: none"> Represented in the better weather as effect of using the architecture solution in the building to catch the cold air inside and using water features and garden to make the weather better especially in summer 	
Biomorphic forms and patterns		<ul style="list-style-type: none"> Represented in Islamic architecture elements in elevation, window details, the stand of wood, arches, and muqarnas as a type of corbel employed as decorative device in traditional Islamic and Persian architecture 	
Materials connection with nature		<ul style="list-style-type: none"> Represented in natural color palette and wood texture on mihrab 	
Complexity and order		<ul style="list-style-type: none"> Represented in harmonic relationship between form and function as well as lighting adjustment in interior space 	

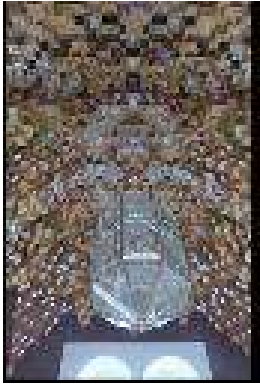









Refuge		<ul style="list-style-type: none"> Strategies include small windowless spaces enclosed by thick walls and less light penetration, more lighting, raised ceilings, wide views on surroundings spaces, larger floor areas, elevated buildings, also includes water features and decorative columns with natural motifs 	
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TABLE 5

Case Study 3: Hassan El Sharbately Mosque (created by the Authors)
located in the 5th Settlement, Cairo, Egypt (as an example for the combination
between traditional and modern mosque.

Pattern	Meaning	Application	Examples
A visual connection with nature		<ul style="list-style-type: none"> Represented in a good view to elements of nature, using natural light from the large glass areas in walls and ceiling, and many species of trees, palms, shrubs, and flower in the landscape around the building, the sky above, and birds nestling on the trees, all of that makes one feel whole, it grabs one's attention and can be stimulating or calming. It shows how this mosque is characterized by natural elements. It can convey a sense of time, weather, and other living things 	 
Non-visual connection with nature		<ul style="list-style-type: none"> Represented in the weather and nature ventilation coming from the windows and ceiling, the texture of wood and stone as natural material inside and outside the mosque and greening outside the mosque 	

Non-rhythmic sensory stimuli		<ul style="list-style-type: none"> Represented in naturally occurring such as cloud movement outside the mosque and birds 	
Thermal and air flow variability		<ul style="list-style-type: none"> Represented good air flow from the windows in the walls to the windows in the ceiling and shadow and shades inside the mosque because of the large windows, place orientation and window glazing and window treatment and preventing heat from penetrating the interior of the building represented in small windows in the south elevation 	
Dynamic and diffuse light		<ul style="list-style-type: none"> Represented in direct warm sunlight coming from the ceiling windows and daylight from multiple angles 	
Connection with natural systems		<ul style="list-style-type: none"> Represented in the better weather as effect of using the architecture solution in the building to catch the cold air inside and using water features and garden to make the weather better especially in summer 	
Biomorphic forms and patterns		<ul style="list-style-type: none"> Represented in the dome and its opening, window details the stand of wood and meazna as a type of corbel employed as decorative device in traditional Islamic and Persian architecture 	
Materials connection with nature		<ul style="list-style-type: none"> Represented in natural color palette and wood texture on mihrab 	

Complexity and order		<ul style="list-style-type: none"> • Represented in harmonic relationship between form and function as well as lighting adjustment in interior space 	
Refuge		<ul style="list-style-type: none"> • Strategies include small windowless spaces enclosed by thick walls and less light penetration, more lighting, raised ceilings, wide views on surroundings spaces, larger floor areas, elevated buildings, also includes water features and decorative columns with natural motifs 	

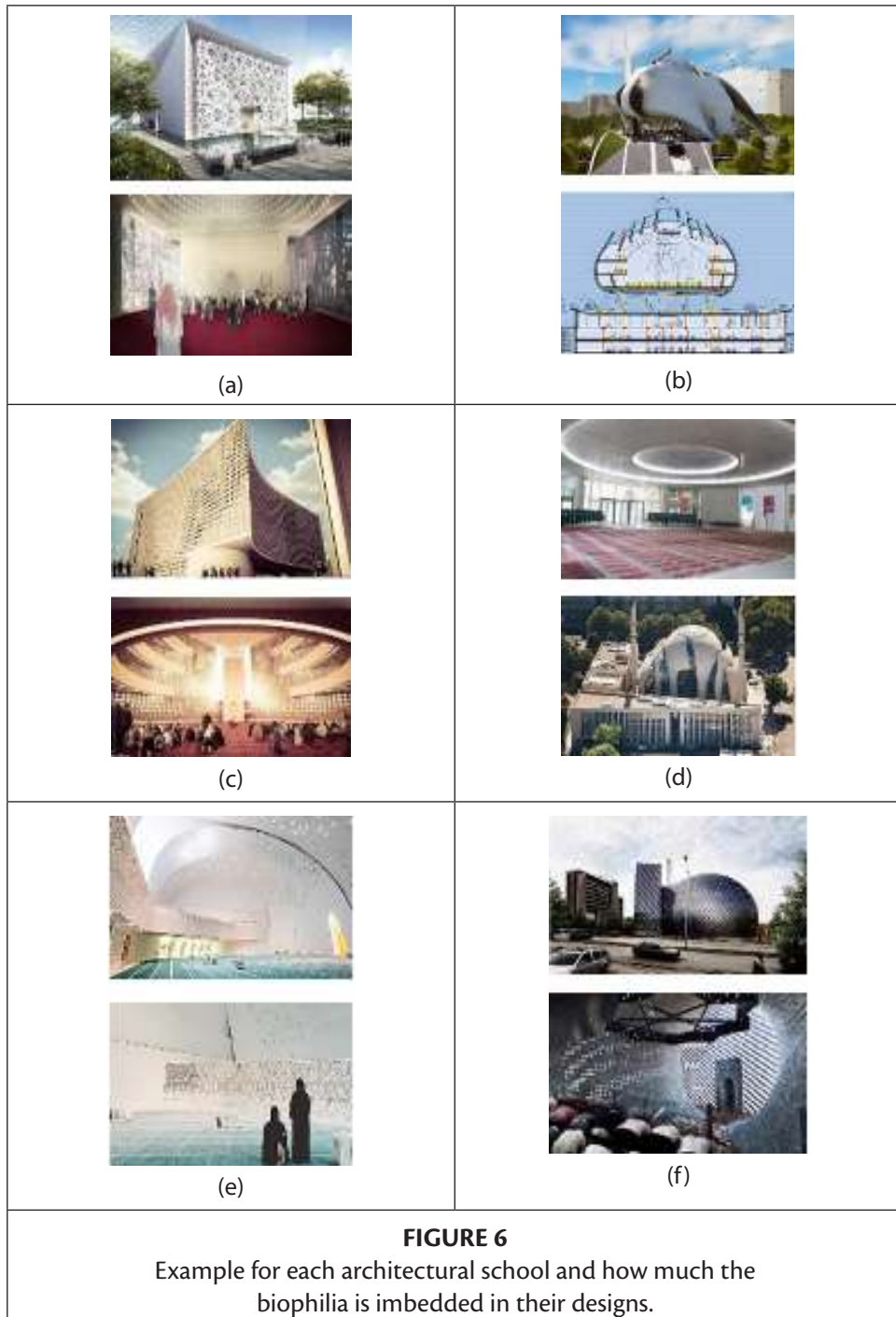
DISCUSSION AND CONCLUSION

Investigating old and new mosques examples confirms that applying biophilic design approach in new designs of mosques designs and can represent an architectural trend that achieves sustainability and helps in achieving the Islamic architectural identity.

The research dealt with the study and analysis of the possibility of applying the principles of biophilic design in most environments where mosques were built, and also helped to achieve high efficiency inside and outside these buildings, and achieved positive functionally interaction with the surrounding environment, and thus confirms the research on the possibility of application these principles in modern designs to suit most trends and different architectural schools.

1. Contemporary interpretations and the search for formulas adapted to contemporary variables represent an important development in the design of the contemporary mosque, resulting in many architectural schools such as:
 - (a) abstraction and symbolic minimalism;
 - (b) imaginative framing of traditional elements;
 - (c) conceptual proposition;
 - (d) deconstruction and recomposition; and
 - (e) innovative forms.

2. The following figure represents example for each architectural school and how much the biophilia is imbedded in their designs either in a direct or indirect way.



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INNOVATIVE CRAFTSMANSHIP IN CONSTRUCTION

READING GEOMETRY OF
TRADITIONAL MOSQUES:
SELF-SIMILARITY OF CENTRIC
ORDER EMPHASIZING
TAUHEED PRINCIPLE

Hatem Abdelrahman Fayed

READING GEOMETRY OF TRADITIONAL MOSQUES: SELF-SIMILARITY OF CENTRIC ORDER EMPHASIZING TAWHEED PRINCIPLE

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KA'BAH AS A CENTER REPRESENTING TAWHEED

TO what extent the Ka'bah as a center represents the principle of tawheed? Muslims are the first to turn to the first Qiblah and are distinguished among other people of other religions that they have a clear qiblah and no disagreement around (طشقندي, 1999).

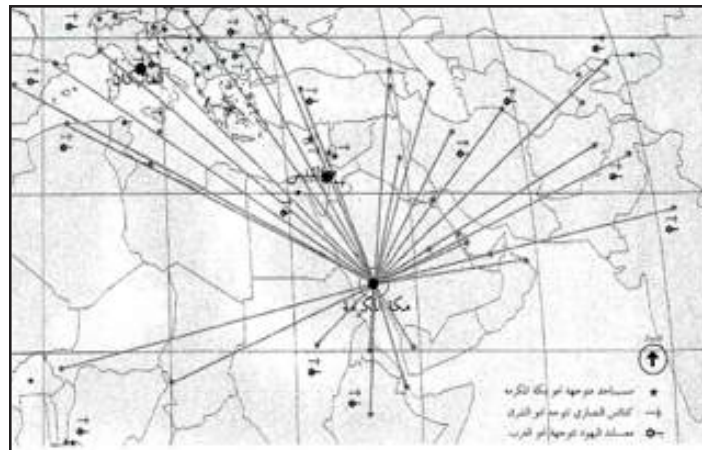


FIGURE 1

Ka'bah is a significant center for Muslims divine rituals, mosques all over the world are oriented to this center.

(طشقندي, 1999)

Allah Almighty said: "When We designated for Abraham the site of the House, [saying], 'Do not associate anything with Me and purify My House for those who perform thawaf and those who stand [in prayer] and those who bow and prostrate.'"

وَإِذْ يُوَئِنَّا لِإِبْرَاهِيمَ مَكَانَ الْبَيْتِ أَنْ لَا تُشْرِكْ بِي شَيْئًا وَطَهِّرْ بَيْتِيَ
لِلطَّائِفِينَ وَالْقَائِمِينَ وَالرُّكَّعِ السُّجُودِ

[Surat al-Haj (22):26]

In this verse, God Almighty guide his Prophet, Ibrahim to tawheed principle and guide him to know the place of Ka'bah and ordered him to purify it from polytheism, here is a remarkable link between tawheed principle and the place of Ka'bah. Literally tawheed means "unification" (making something one) or "asserting oneness". It comes from the Arabic verb, wahaada, which itself means to unite, unify, or consolidate. However, when the term tawheed is used in reference to Allah it means asserting and maintaining Allah's absolute oneness in all of man's actions which directly or indirectly relate to Him.

Some Muslim scholars divide tawheed into three categories: tawheed Rubbubiyah, this category is based on the fundamental concept that Allah SWT alone caused all things to exist, second category is tawheed in Uluhiyyah (al-Ibadah), it is the belief in the unity of Allah's worship. He is the one, who deserves to be worshipped. The third category is tawheed in al-Asmaa wa-al-Sifat, It is the belief that God has attributes and names. And one should worship Him and do supplication to Him using His names and attributes (Osman). In the three categories, Ka'bah has a strong presence, in the first category tawheed Rubbubiyah, Allah told us in the holy Qur'an, that Allah SWT creates Ka'bah for the people, Allah Almighty said: "Allah has made the Ka'bah, the Sacred House, standing for the people".

جَعَلَ اللَّهُ الْكَعْبَةَ الْبَيْتَ الْحَرَامَ قِيَامًا لِلنَّاسِ

[Surat al-Maidah (5):97]

In the second category tawheed in Uluhiyyah (al-Ibadah), Ka'bah has a very strong presence in Muslims divine rituals (al-Ibadah), like in pray, hajj, umrah, and many other rituals. In the last category tawheed in al-Asmaa wa-al-Sifat, Allah Almighty linked his name with the Ka'bah when Almighty said: "So let them worship Allah the lord of this house".

فَلْيَعْبُدُوا رَبَّ هَذَا الْبَيْتِ

[Surat Quraysh (106):3]

So, Ka'bah the main center of prayer appears as a representative of tawheed principle, since all mosques all over the world are oriented to this center. Self-similarity phenomena “recently emerged in different scientific applications” invites us to trace this significant centric order in other levels of traditional mosques’ geometry, according to self-similarity order the system repeats itself many times in many scales, so if we could understand the whole we can understand the part, and vice versa.

SELF-SIMILARITY ORDER

Self-similarity is symmetry across scale. It implies recursion, pattern inside of pattern. Mandelbrot’s price charts and river charts displayed self-similarity, because not only did they produce detail at finer and finer scales, they also produced detail with certain constant measurements. Monstrous shapes like the Koch curve display self-similarity because they look exactly the same even under high magnification. The self-similarity is built into the technique of constructing the curves – the same transformation is repeated at smaller and smaller scales. Self-similarity is an easily recognizable quality. Its images are everywhere in the culture: in the infinitely deep reflection of a person standing between two mirrors, or in the cartoon notion of a fish eating a smaller fish eating a smaller fish eating a smaller fish. Mandelbrot likes to quote Jonathan Swift: “So, Naturalists observe, a Flea/Hath smaller Fleas that on him prey, And these have smaller Fleas to bite ‘em,/And so proceed ad infinitum” (Gleick, 2008).

Mathematically, in 1916, Wraclaw Sierpinski developed two models of fractal forms in which the self-similarity is achieved: Sierpinski triangle and Sierpinski carpet (Mandelbrot, 1983).

In nature, the tree represents one of the most important manifestations of self-similarity, where the small branch represents a small version of the largest branch of it and so on until we reach the tree itself.

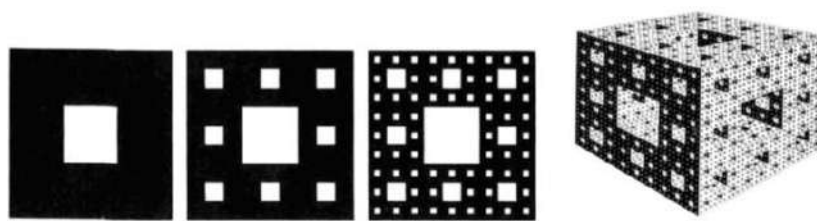


FIGURE 2

The three steps of generating the Sierpinski carpet.

(Mandelbrot, 1983)

TRACING CENTRIC ORDER IN TRADITIONAL MOSQUES' GEOMETRY

To trace self-similarity of centric order in traditional mosques, the research had to first classify the mosques into groups, classification varies according to the different levels of the study, according to organization of the mosque plan or according to the size of the mosque or depending on the architectural style.

Location within Urban Fabric

To study the location of the mosque within urban fabric it should be classified into two types according its size – the great mosque that serves the whole city and the relatively small one that serves a district or a neighborhood.

The mosque in the traditional urban fabric is the center of multifunctional core of the city. According to Bianca Structure of traditional Muslim city, the main land-use pattern focuses on the “multifunctional core structure enveloping or at least partially surrounding the central mosque by different layers of interconnected souks (the typical form of Arab shops and markets). Interconnected within, are commercial facilities in the form of caravanserai, other civic and educational buildings, and other religious and social structures”.

Together, the congregation of facilities and structures create a massive mosque complex with only the minaret and large dome of the mosque creating a break in the roofs cape. The central courtyard of the complex becomes the primary public open space of the complex and sometimes for the city as a whole. As the grand mosque becomes the center structure of the city surrounded by the markets, a number of main roads acting as spines running down to the outer walls and to the exterior of the city. Each of the spines are lined with shops that frame the pedestrian pathways and take advantage of all potential clients as they walk through the community. Connecting the central mosque to the outer rings of the city (Stefano, 2000).

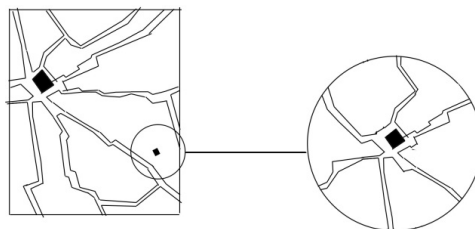


FIGURE 3

Centrality of mosques within urban fabric as a self-similarity pattern.

(By Author)

The location of the Grand Mosque as this centrality and connectivity to the city's fabric makes it look like a pulsating heart beating with repeated prayer times. People go to pray and return every Friday prayer or Eid or Taraweeh prayer in Ramadan. This pattern is repeated at the neighboring level. Since Prophet (PBUH) era, "there is a hierarchical structure of the mosques within the fabric", according to Waziry. At that time, the city was made up of two main parts – the main urban block and the tribal houses (or suburban). The main urban block included nine residential neighborhoods, while tribal houses were composed of number of houses and fields surrounding the whole urban fabric, Al-Samhoudi pointed out that the city had nine mosques where the prayer call of all prayers are heard except Friday prayer, while the rest of the (34 mosques), most of which were located in the suburbs. Muslims later followed the Prophet (PBUH) in their establishment of new camps or cities in the new countries, where he was building the mosque adjacent to the house of the emirate (government) in the center of the new city, surrounded by housing and plantations, that pattern has been applied in many of the first Islamic cities such as Basra and Kufa (وزيرى, 2004).

According to this hierarchical structure of mosques, small mosque represent a heart at a lower level at the neighboring level that pulse five times a day with the number of prayer times. These pulses create a special urban fabric pattern where people pass back and forth five times to the same central point within the fabric, this back and forth movements must create a small multi-use nucleus similar to the large nucleus of the city.

Layout and Structure

To trace centric order in layout and structure of old mosques, it will be classified into three types – hypostyle mosques, four iwan mosques, and dome-square plan mosques (Omran).

Hypostyle hall means having a roof supported by a large number of evenly distributed columns, it is planned according to basic unit or module of rectangular bay defined by four columns or piers, the result is usually a rectangular courtyard surrounded by regular composition of covered areas placed within a rectangular outline.

Hypostyle mosque plan was the original mosque form in early periods of Islam. It is a design born in the Arabian heartland and developed up to the middle Abbasid period in the 10th and 11th centuries. The origin of this plan goes back to the Mosque of the Prophet at Al-Madinah al-Munawwarah.

The four iwan mosque is also called Madrasa plan. It has four iwan organized around a central open courtyard, each iwan dedicated to one of the four main mazhab (a school of thought within fiqh). The main iwan contains the qiblah. The first four iwan type mosque was built under The Ayyubids (1169–1252.)

Domed square plan, mosques with a very large space which were often covered by a massive dome, that was provided by lateral support by weight of half domes. It mainly appeared during the Ottoman period (Fisherman and Khan, 2002).

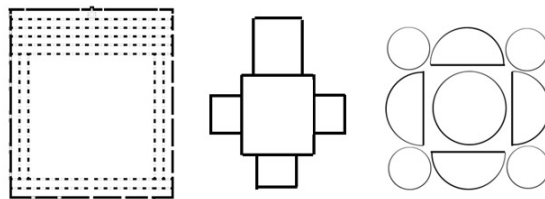


FIGURE 4

Centrality governs the layout in all mosque types.

(By Author)

So, there is always a dominant center that controls the plan of the traditional mosque, the study shows that as the layout of the traditional mosque changes, the control of the center remains clear. There is either a central courtyard surrounded by columns, or four iwans connecting with a central outdoor space or a central dome controlling the whole layout of the mosque.

Daylight and Shade

This level of study will follow the previous classification: hypostyle, four iwan mosques, and dome-square plan.

In hypostyle mosques, the central courtyard is the main source of light inside the mosque, a clear light distribution and atmosphere is drawn between the courtyard and the surrounding arcades containing the mihrab, the court is filled with flood light while the riwaqs are filled with reflected light from court, light entered covered spaces through the opening of the arcades or through a row of large windows with circular openings on the upper registers of the sahn walls, light fades out the more you move to the inside (Fisherman and Khan, 2002).

Many mosques followed this pattern – Ibn Tulun, Al-Azhar, Al-Hakim, The Great Mosque of Sultan Baybars, Amir Al-Mardini, and Mosque of El-Nasir Mohamed.

The second source of light in the hypostyle mosques is the windows placed in the outside walls, but their effect is minimal. In some mosque, the desire to emphasize the covered sanctuary was achieved simply by adding a dome like in Amir Al-Mardini Mosque. The dome was placed in front of the Mihrab with windows allowing direct sun rays to penetrate the space, actually adding this small dome has a minimal affect due to the scale of the shaded riwaq relative to the small scale of the windows of the dome, the issue here is not strengthening the light but adding another center of light, the main center of light in the whole mosque is the sahn and the small dome here is representing another center of light in the main prayer hall above the mihrab the most important point of the space (Hillenbrand, 2000).

Second type is four iwan mosques, in this type the main and almost the only one source of light is the central courtyard, the four iwan depend entirely on the illumination of this center of light, so light gets stronger as we move toward the central courtyard and gradually fade as we move into the iwan. In a very rare cases like in Emir Al-Safi Sarghitmish, a dome has been added over the mihrab iwan. It can be easily noticed that it has no significant impact on intensity of light in iwan but again it could be considered as another center of light in the main prayer hall emphasizing centrality.

Third type is domed square plan mosques, light planning had main influence on the design, because well-planned lighting is one of the unique features of this type of mosque, usually the central dome was a good chance for lighting the space from above which filled the space with rays of light (Goodwin, 1992). In the master piece of Ottoman architecture Selimiye Mosque, the existence of divine light in the mosque, there are 384 window openings in total, placed at elevations' heights from eye level to that of the drum. The windows are arranged on all sides of the mosque in five rows one after the other, and a total of 32 tall and narrow windows around the main center pierce all sides of the drum so that light pours down into the mosque (Takikawa, 2015).

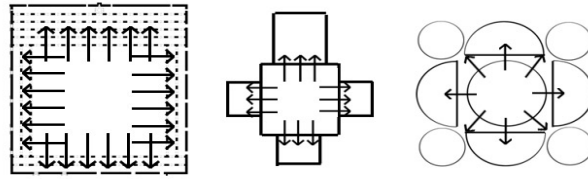


FIGURE 5

Main center of the mosque is the main source of light.

(By Author)

In Sheikh Lotfollah Mosque, known as one of the masterpieces of Safavid Iranian architecture, the most dominant feature is the central dome with sixteen windows around its drum, some with a pair of grilles, let the sunlight filter through the dome (Jahanshahi, 2015). The square plan helps in distributing the equally insides the space. Courtyard in this case was not used for lighting, as it is almost closed except the main entrance doors and narrow openings. As stated by Navaee, "Mosque is the house of light on the one hand, and the light of God on the other" (Navaee, 2000). An-Nur verse in Holy Qur'an, describes the light of God with a centric order signs, where it is described as a niche in the wall with a lamp inside, a description that holds the centrality status, where the lamp is located inside a frame and the repetition of the presence of the same lamp inside a glowing bottle emphasizes again in centrality.

اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ ۚ مَثَلُ نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ ۚ
 الْمِصْبَاحُ فِي زُجَاجَةٍ ۚ الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ
 مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ لَمْ تَمْسَسْهُ
 نَارٌ ۚ نُورٌ عَلَى نُورٍ ۗ يَهْدِي اللَّهُ لِنُورِهِ مَن يَشَاءُ ۚ وَيَضْرِبُ اللَّهُ الْأَمْثَالَ
 لِلنَّاسِ ۗ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ.

[Surat an-Nur (24):35]

Architectural Features

Mosques were built with different styles in Syria, Iraq, Egypt, North Africa, and Central Asia. To trace Centric Order in architectural features of different styles, three main architectural features have been chosen for this study – mihrab, minaret, and ablution "wudhu' feature".

First feature is mihrab. There are many theories discussed mihrab with its cavity form which was repeated in the mosques of different styles. There is a claim that this cavity appeared to strengthen the voice of the imam or as a vacuum that accommodates the imam to increase the number of rows inside mosque or is inspired by pre-Islamic buildings (نعناعه, 2016).

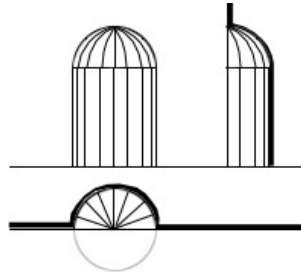


FIGURE 6

Mihrab geometry is governed by its internal center.

(By Author)

However, what matters in this study that the the mihrab in its traditional geometrical form as half cylinder body topped with half dome has been governed geometrically by a strong internal center. Mihrab has received wide attention in terms of decoration, all of which are in the context of strengthening the center and emphasizing it, through evolving Islamic styles mihrab became more complicated, in Mamluk period mihrab became a very complicated piece of art, like in Sultan Hassan Mosque and Qalawun Mosque in Cairo, as rows of tiny arches repeated all over the height of the mihrab Emphasize the centrality. So, mihrab is the element assigned to refer to the original center of the Ka'bah and in itself refers to another inner center.

Second is minaret which is usually considered to be one of the most distinctive features of the mosque, and the history of its origin is naturally of interest to students both of Islam and of the history of architecture (Gottheil, 1910). Minaret began as a square base on the ruins of the pagan temples in Damascus and then evolved into progressive floors, then moved to North Africa. The minaret of the Uqba Ibn Nafi Mosque constructed in Kairouan, consists of three square floors gradually decrease and ending with a segmented dome. The spiral minarets appeared in the Abbasid and Ibn Tulun in Samarra. In Egypt, the minaret was developed between the Fatimid, Ayubi, and Mamluk periods. It became three stages, square then octagonal, then cylindrical and ending with a spherical end. The Ottoman minaret spread in Asia Minor and Egypt. It is either cylindrical or polygonal with many segments slim and tall ended with conical pointed end. In Iran

and Iraq, minarets began octagonal shape then cylindrical minarets spread since the eleventh century, and in India mosques began without minarets, then cylindrical minarets were added narrowing up toward the top (العمارة, 1999). The minaret represents main visual center within the urban fabric of old cities, and it has an inner center that geometrically controls and governs all its components. As the minarets evolved and became more complex through different styles, the ovation of the inner center increased.

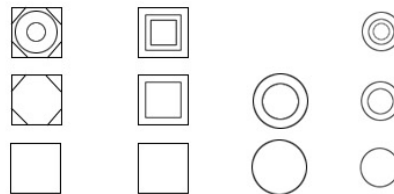


FIGURE 7

Minarets in all styles were organized around its internal center.

(By Author)

Third is ablution water feature. Water is part of the ritual in preparation for prayer as ablution. As water symbolizes purity and purification, in Islam, the ritual of purification or wudhu' is religiously conducted before the performance of prayers. It is a spiritual ritual act in itself, with a clear intention to conduct prayers before actually performing the physical act of prayer itself. Although cleansing of oneself in the absence of water is available in Islam i.e. in the form of stones and dust (taharah and tayamum), water is still the main medium and priority for cleansing. Access to water in the event of non-wudhu' state is, therefore, critical for the worshipper to remain clean and pure at all times. In Islamic architecture, the function of water is extended from spiritual and psychological to architectural functions in providing thermal comfort in addition to its cooling impact to the surrounding environment (Kassim, 2016).

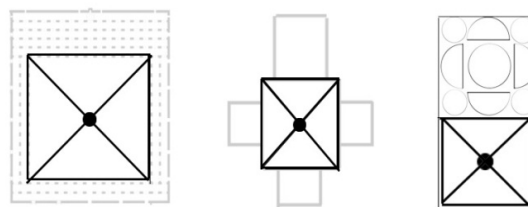


FIGURE 8

Ablution feature located in the center of the *sahn* in each type.

(By Author)

In all traditional mosques' classifications, according to their layout organization, their size, or their styles, the ablution itself has a well-organized form around a clear center in addition to that the location of the wudhu' is still constant in the main center of the sahn, where the sahn is a main center of light as discussed before in the previous parts, and the Prophet (PBUH) told us that: "On the Day of Resurrection, my followers (or ummah) will be summoned 'Al-Ghurr Al-Muhajjalun' from the traces of wudhu'. Whoever can increase the area of his radiance should do so", as this Hadith linked between wudhu' and light, on the other hand the Muslim architect put the ablution in the center of the sahn, that act as the main source of light in the majority of mosques.

Ornaments

Self-similarity order is one of the basic laws for Islamic ornaments, as early as the 9th century Muslim artists began incorporating multiple-level designs into their ornament. In time, this fascination found expression in each of the three principle areas of Islamic two dimensional artistic expressions: calligraphy, the floral idiom, and geometric pattern. In both the western regions of Morocco and Andalusia, and the eastern regions of Persia, Khurasan, and Transoxiana, during the 14th and 15th centuries respectively, previously established systematic methods, two dimensional geometric pattern constructions were used in the development of three distinct traditions of self-similar geometric design.

These innovations resulted in the last great advancement in the long history of Islamic geometric pattern making. Furthermore, these patterns are very likely the first, and among the most engaging, examples of complex overtly self-similar art made by man. What is more, for those with an interest in self-similar geometry, these designs are of special relevance. Evidently, many hundreds of years before the relatively recent discovery of this area of geometry.

Muslim designers developed and refined the geometric arts to a level that conforms to the modern concept of self-similarity: wherein "an object is said to be self-similar if it looks 'roughly' the same on any scale". Indeed, the 14th and 15th century Islamic traditions of multiple-level geometric design may well be the earliest human examples of sophisticated self-similar geometry (Bonner, 2003).

There can be one or two basic shapes in an Islamic ornament, but interlocking design of these basic patterns generate different and complex patterns at

the end (Cenani and Cagdas, 2006). So, centric order could be the easiest way to define the complex geometry in Islamic ornaments for example the interlocking of a group of stars generates a complex star shape, a main center could be defined in the simple state and the complex state.

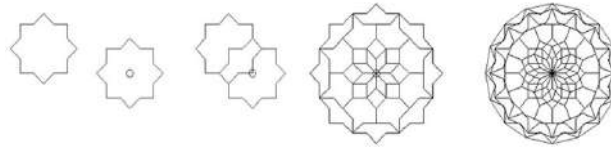


FIGURE 9

The main center could be defined easily in the simple state and the complex state.

(Cenani and Cagdas, 2006)

CONCLUSION

There is a hierarchical structure of centers ranging from Mecca as the center of all mosques around the world, to the centrality of the mosque within the urban fabric, which represents a heart beating the number of times of prayer, re-building the features of urban fabric and redefining the use of spaces around the mosque, this centrality extends to the structure of the mosque and its layout organization, centrality also governs the distribution of natural light inside the mosque, centrality extends to the architectural features of the mosque such as the minaret, the mihrab and the ablution and finally to the details of the fine ornaments. This hierarchy of centers exists in all traditional mosques' architecture despite their different styles, sizes, or internal organization.

If the centrality of the Ka'bah can be understood within the principle of tawheed, then repeating of this centrality and ovation of the centers within the geometry of the mosque many times at many levels can be understood as emphasizing the same principle of tawheed.

In the light of self-similarity concept, understanding the structure of a part helps to understand the structure the whole and vice versa, this principle was applied mainly in this study. And tracing the centric order help in the future studies to reveal more secrets of traditional mosque geometry.

Centrality as a ruling law is lost in most contemporary mosques in most of the studied levels. It is recommended that attention must be paid to this important centralization concept for constructing the framework for a new vision of the contemporary mosques.

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GREEN ARCHITECTURAL DESIGN STRATEGIES AND POLICIES FOR MOSQUES



ENERGY AUDIT FOR LOW ENERGY
MOSQUE IN HOT ARID CLIMATE
INSIDE ASSIUT UNIVERSITY CAMPUS

Amr Sayed Hassan Abdallah

EVALUATION STUDY ON THE
INSTALLED PHOTOVOLTAIC PANELS
AND THEIR EFFECT ON THE AESTHETIC
PERCEPTION AND EVALUATION
OF MOSQUE ARCHITECTURE IN
AMMAN; LOOKING FOR INTEGRATED
SOLUTIONS

Hikmat Ali
Anwar F Ibrahim
Wala'a Al-Qarra

REPLACING THE MOSQUE
STEREOTYPE TO DISPLACE THE
ISLAMOPHOBIA CONCEPT

Ameera Jaleel
Ban Mohammed Sultan

AN EMPIRICAL CLASSIFICATION OF
COST OVERRUN IN INFRASTRUCTURE
PROJECTS TO UNDERSTAND THE
IMPACT OF SAUDI BUILDING CODE

Fahad Saud Allahaim
Li Liu

ENERGY AUDIT FOR LOW ENERGY MOSQUE IN HOT ARID CLIMATE INSIDE ASSIUT UNIVERSITY CAMPUS

Amr Sayed Hassan Abdallah
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INTRODUCTION

CLIMATIC design is the approach that helps to reduce the energy cost of a building. This emphasizes the importance of building envelope design to reduce mosque cooling load especially in hot arid climate. In Egypt, air conditioning systems are commonly used inside the mosque of hot region for achieving prayer thermal comfort, in addition to that the electrical energy costs of Egyptian mosques are highly subsidized by the government. It is concluded that total energy consumed by lighting and ceiling fan is approximately one third of energy consumption in a field survey for 25 mosques in Assiut, Egypt. Also mosque with small area consumes a high energy for cooling due to the high number of air condition in mosque¹.

Many studies had focus on mosque architectural design and its impact on the energy consumption in hot regions, few of them discussed using the passive design and the environmental aspects of these design to achieve the thermal comfort for prayers with energy improvement. Abideen investigated the effect of using passive cooling strategies to reduce mosque cooling demand in Jeddah city. The results show that the proposed passive cooling strategy secures savings around 82% in air conditioning energy, 50% in money, 28% in CO₂ emission². Al-Najim and Al-Mofeez found that indoor mechanical air condition is decreased to 32%, when people used mosque courtyard as a prayer area in the eastern region of Saudi Arabia³.

Building envelope does not give visual comfort to worshippers to perform prayers in a spiritual environment only but it helps to control the flow of heat between outdoor and indoor environments and reduce the requirement of energy. It is concluded that one of the main constitutes of building

envelope is facade that acts as a boundary between external and internal environments. The results show that the facade affects strongly on the environmental conditions of indoor spaces, energy consumptions, and the user's satisfaction⁴⁻⁷.

Since the outer building envelop plays an important role for reducing energy consumption of the building, a major challenge is to design the building envelop for reducing energy demand for heating, cooling, ventilation, and lighting with effective shading^{6, 11}. Yang and Hwang 1995 concluded that using external shading in the outer building envelop can result in decreasing energy consumption by 25%¹⁰. Appropriate building envelope design can show optimization between natural lighting and thermal performance through passive solar techniques⁸⁻⁹. Abdullah et al. (2017) developed different design strategies for the building envelop of big mosques to reduce energy consumption in Saudi Arabia. The results concluded that energy conservation is achieved through the combination of using efficient electrical equipment, application of energy technology in buildings, such as insulation, ventilation, and solar energy¹². Ismail et al. (2013) investigated the effect of different strategies for mosque building retrofitting and air condition operational strategies in hot climate using numerical energy simulation. The energy consumption for cooling can be reduced to 48% due to combined A/C system and envelope retrofit measures¹³. Chidiac et al. (2011) concluded that the reduction of energy consumption is achieved due to use effectiveness of energy retrofit measures such as building location, size, building envelope, operation, and HVAC system. The optimum selection is dependent on climate¹⁴.

Understanding the impact of different design parameters on cooling demand help for choosing the most effective alternative and retrofit strategies for energy performance. A limited number of studies have dealt with energy conservation inside mosque due to building envelop optimization with achievement of good indoor thermal comfort requirements in mosques.

The main objective of this study is to investigate the application of a number of energy conservation technologies and building design modification in order to achieve a reduction of mosque energy consumption with indoor thermal comfort improvement strategies for existing and new future construction. This study focused on energy auditing and monitoring for existing mosque prototype built in Assiut University Campus (Teaching Staff (AUTS) western house sector) in order to develop the energy efficient mosque prototype using numerical model (building simulation) that can be applied in the future campus of Assiut University in New Assiut city.

CASE STUDY BUILDING DESCRIPTION AND LOCATION

Assiut University Teaching Staff (AUTS) Western House Mosque

The mosque building is located inside teaching staff western house sector of Assiut University main campus. Assiut city is located in Egypt with a latitude of $27^{\circ} 3' N$ and a longitude of $31^{\circ} 15' E$. The temperature in the summer months ranges from $41^{\circ}C$ to $46^{\circ}C$ for the maximum temperature and ranges from $16^{\circ}C$ to $21^{\circ}C$ for the minimum temperature.

New Assiut city is located in the east side of the River Nile. The mosque consists of two floors – the ground floor with ablution place sector and the first floor with entrance from the outside street as shown in Figure 1.

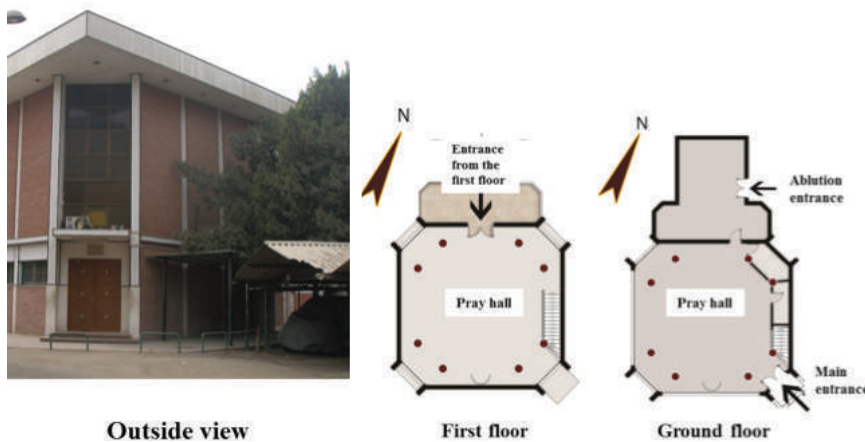


FIGURE 1

The outside view of the mosque and the geometric configuration (plans) of it.

Mosque is characterized by the unique operation schedule compared to other buildings. People usually come to the mosque from 10 to 15 minutes before the prayer times, as the mosque always closed between the prayer times. Therefore the maximum occupancy is expected to be during the actual prayer time. The mosque is opened between the Maghrib and 'Isha as people spend the time reading Qur'an. This would have a great impact on the demand for energy.

Also, people tend to stay longer time after the 'Asr and 'Isha during special occasions such as weddings or lectures. After prayer, they leave gradually except in Friday prayer and Taraweeh prayer. Based on data collected from field surveys, all lighting units and A/C systems are normally turned on in the ground floor with the first person come to the mosque and turned off with the last person leaving it.

Usually the first floor is used during Friday prayer and 'Isha prayer in the month of Ramadan and in special occasion such as wedding. A thermostat setting of A/C system is 26°C.

Building materials: concrete slab with insulation for roofs, two layers of brick with air cavity for walls, and single glazing with aluminium frame for windows were used as shown in Table 1. Table 2 shows the mosque building specifications and indoor equipment.

TABLE 1
Description of building material used in the existing mosque.

Building part	Material	U-Value (W/m ² K)	Thickness (m)
Glass windows	Single glass	5.7	0.006
External walls	Brick (finishing)	0.986	0.48
	Air cavity		
	Red brick	2.93	0.60
	Inside wood coating		
Roof	Clay tile (roofing) with slope	2.93	0.60
	Insulation		
	Concrete slab		
	Cement plaster (coating)		

TABLE 2
Assiut University Teaching Staff (AUTS) western house
mosque specification and indoor equipments.

Total area	Ground floor = 115m ² First floor = 79 m ²	No. of lights	36 fluorescent light (120cm) 70 fluorescent light (60cm)	Watt = 1440 Watt = 1440
Indoor height	Ground floor = 3.5m First floor = 6m	Wall fan	12 small one	Watt = 1440
Slope of outer ceiling	30° on horizontal	Air conditioner	9 split units	Watt = 31095
		Air heater	2 units	Watt = 7000

METHODOLOGY

To conduct this study, monitoring for energy analysis was conducted to determine the energy flow pattern over time and operational characteristics with monitoring of indoor thermal comfort. These data were used to validate the numerical simulation model and understand indoor energy characteristic and thermal comfort. Monitoring was conducted for two days during the winter season and one day in the beginning of the hot season for providing realistic data that represent the actual building energy performance during the prayer time.

Numbers of tripod with temperature/humidity data logger were used at a height of 0.6m above the floor according to ASHRAE 55/2004 to collect indoor temperature/relative humidity data while the prayers sit in the prayer hall doing light activity movement (movements of hands, feet, neck, reading the holy Qur'an, etc.). The metabolic rate was estimated to be 1.3 met as recommended by ISO 7730¹⁵ for the sedentary physical activity. The data were collected using the data survey and site visit.

Thermo Recorder data loggers (model TR72Ui) were used for measuring air temperature and humidity with measuring accuracy: $\pm 1\%RH$, $\pm 0.1^{\circ}C$.

For the simulations, a model of the mosque inside staff residential sector of Assiut University was built in the simulation software. Modeling and simulations were carried out using the dynamic thermal simulations tool, Design Builder (DB) in its fifth version (V.5.0.3.007)¹⁶ to evaluate the effect of the various parameters on monthly energy consumption (kWh) and indoor thermal comfort subject to alternative design and operation strategies¹⁷. Building envelope strategies are adapted to the local climate of Assiut and can be used for minimizing building energy generation.

SIMULATION

Energy modeling for the real mosque was conducted after energy auditing and indoor monitoring to study the effect of architecture different parameters on the mosque energy performance. Figure 2 shows the exterior view and the plan of the mosque built inside the design builder model. Energy simulation helps to investigate wide ranges and combination of different energy retrofitting strategies.

Information related to building geometrical, number of equipments include lighting unit, air heater, number of A/C units and its performance, envelope

thermal characteristics can be treated as stable parameters in the energy simulation model. Window types and areas, occupancy schedules, lighting power and schedules were needed for base case validation. It is important to simulate the performance of the building mosque according to shading strategies in order to minimize cooling load and overheating through building envelope.

The most common strategies used for building energy improvement are insulation improvements through the wall only or wall and roof insulation, solar shading (windows louvers), replacing lighting with LED lighting models. Also improvements for air infiltration strategies are used and their integration with wall and roof insulation. A value of 1.0 ACH during the occupied period and 0.5 ACH during the unoccupied period are considering the uncontrolled door operation during the occupancy. These strategies help to investigate the effect of different parameters on reduction of cooling demand and energy consumption in the current mosque with improvement of thermal comfort.

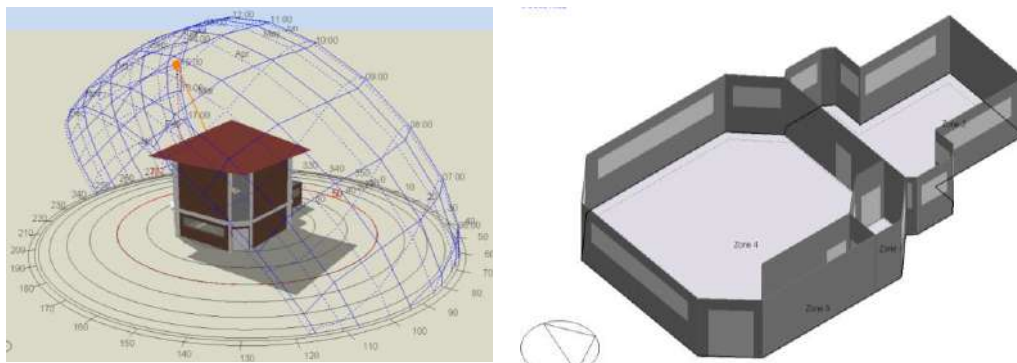


FIGURE 2

The exterior view and the plan of the mosque built inside design builder model.

RESULTS AND DISCUSSION

Energy Auditing and Indoor Temperature Monitoring

Monitoring for indoor temperature and energy auditing of the base case helps to understand different strategies for reducing energy inside the mosques. Figure 3 shows the energy consumption pattern for the mosque with relation to outdoor temperature during winter season and Figure 4 shows the energy consumption pattern during the beginning of a hot season and the usage of air condition between Maghrib and 'Isha. It is

clear that the fluctuation of energy pattern is due to the number of people inside the mosque and the use of equipments, heater, and air condition. The maximum energy consumption of using the different equipments and air condition during the early period of the summer season reached 5,100 W during the period between Maghrib and 'Isha.

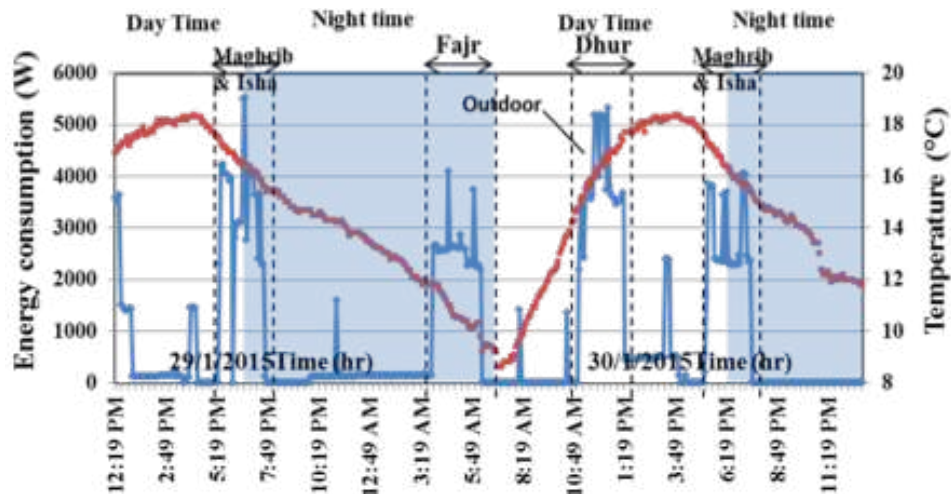


FIGURE 3

Energy consumption pattern for the mosque with relation to outdoor temperature during the winter season.

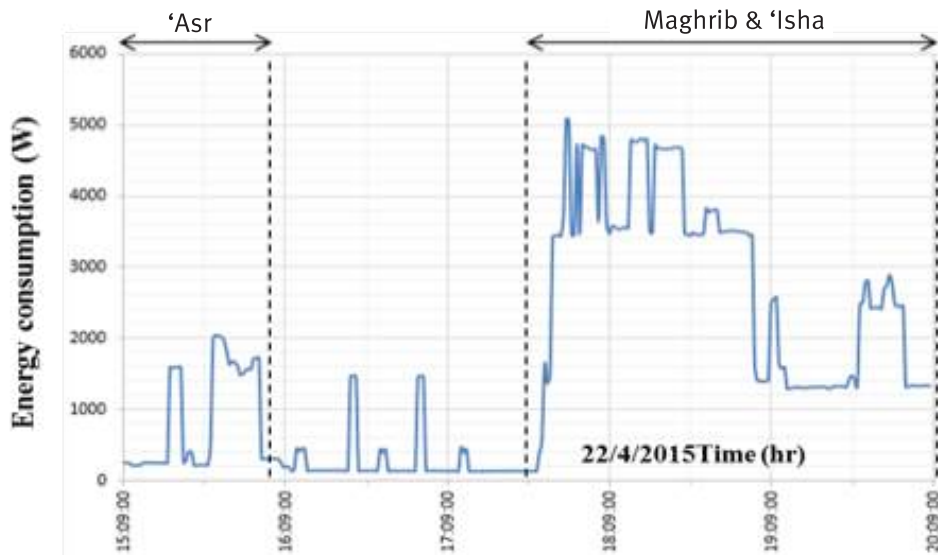


FIGURE 4

Energy consumption patterns for the mosque during the beginning of the hot period.

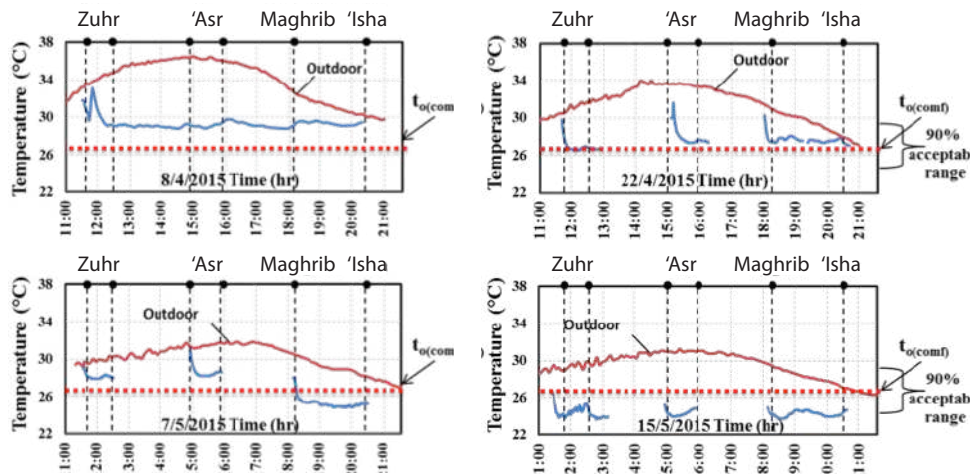


FIGURE 5

Temperature pattern of outdoor and indoor environment inside the mosque during the four days.

Numerical Calculation Result

Validation was done for the numerical simulation (design builder) with energy audit results. The detailed model for the numerical calculation was built; including boundary condition, geometry, material physical properties, and indoor lighting and equipments according to mosque monitoring and surveying. Results of the base case of the mosque were found in a good agreement with the corresponding energy consumption of the monitored values. The Root Mean Square Error reached 1.30 with R^2 equal 0.99. The amount of annual energy consumption of the base case is 16,982kWh.

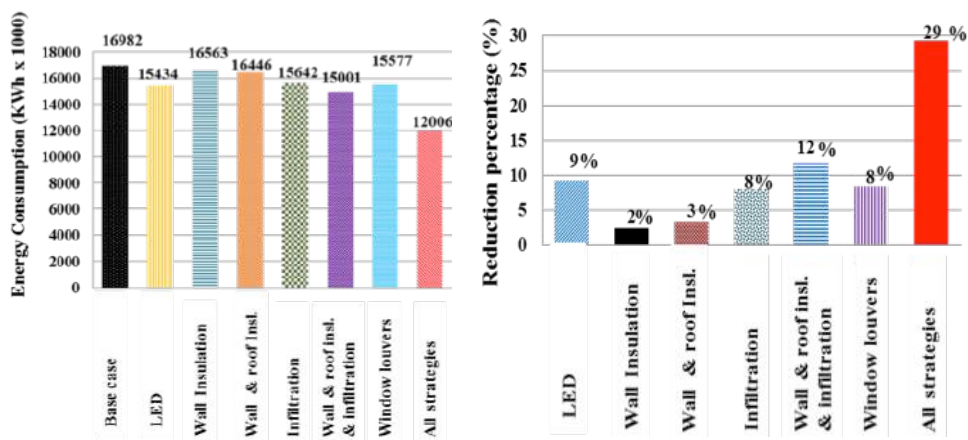


FIGURE 6

Annual electric consumption reduction for different strategies.

Assessment of annual energy conservation values and percentage according to all scenarios are examined as shown in Figure 6. It is clear that using LEDs efficient lighting unit's instead of incandescent lighting saves more energy as well as having longer life time.

It is concluded that replacing LED efficient lighting unit's results 9% of the annual electric consumption is saved with 1,548kWh and using wall and roof insulation with infiltration shows another 12% of the annual electric consumption is saved with 1,981kWh. Therefore, using wall and roof insulation with infiltration offer significant reductions of cooling load inside the mosque which is equivalent to previous research ^{13, 18}.

According to the wall and roof insulation strategies applied to outer building envelope insulation, the U-Value after applying the insulation strategies decreased to 0.263W/m²K from 0.986W/m²K for the external wall and decrease to 0.171W/m²K from 1.27W/m²K for insulation of the top roof. The difference of the U-Value between the base case and the applied strategy does not have large effect especially in the external walls mainly because the building's external walls are already have air cavity insulation that affect heat transfer from outdoor to indoor.

The strategies of applying wall and roof thermal insulation and using windows louvers with horizontal louvers with 0.5m and 0.4m for blade depth and vertical spacing respectively decrease annual energy consumption by 3% and 8% respectively. It is clear that the increase of energy consumption during the hot period from May until September is consumed by air condition and that is due to the hot climate and large number of people occupying the mosque in the same time especially in Ramadan month and hot months of July and August as shown in Figure 7.

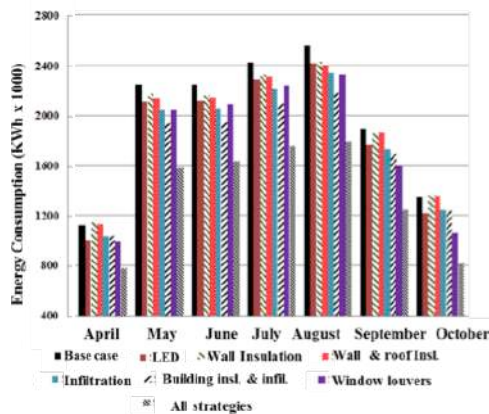


FIGURE 7

Monthly energy consumption reduction for the different strategies.

Figure 8 shows the temperature pattern inside the mosque based on the simulation result in hot days. It is clear that indoor temperature falls within the acceptable comfort range when using air condition during the prayer time. Based on the numerical simulation and the applying of the six strategies through building envelope design and construction, results of reducing heat gains through the building envelop with reduction of energy consumption by 29%. Improvement in mosque energy performance is achieved with an energy index of 61.8kWh/(m²·yr) compared to the original predicted value of base case of 87.5kWh/(m²·yr).

Therefore, these building design strategies are the strong approach for defence against the stress of outside climate in hot arid climate of Assiut which associated with thermal comfort conditions and air condition system efficiency.

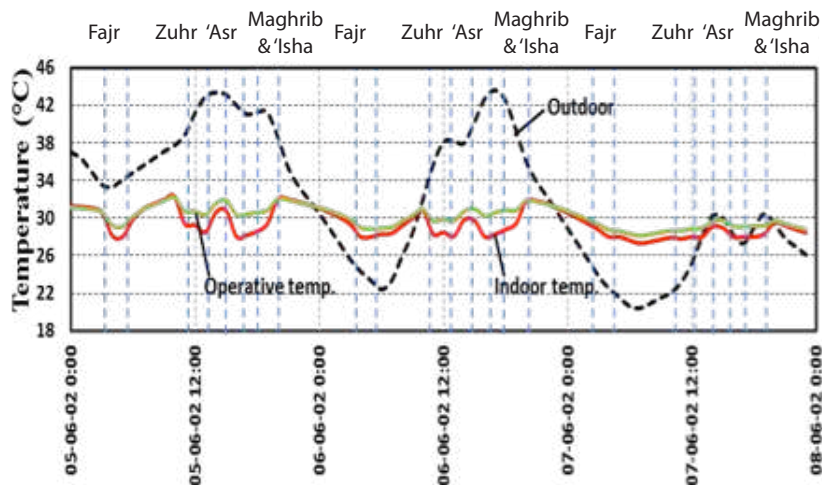


FIGURE 8

Temperature profile of indoor and outdoor environment inside the mosque during hot days based on simulation result.

CONCLUSION

This study is considered as an improvement approach for mosque energy efficiency design prototype built in Assiut University main campus that can be rebuilt for the university new campus in the New Assiut city. Energy audit for the mosque in the early period of the summer period result of high energy consumption especially between Maghrib and 'Isha due to the using of air condition and opening the mosque between the two prayers time with energy consumption of 5,100kWh. It is concluded that 29%

savings in annual energy consumption can be achieved by using thermal insulation for outer envelope of the mosque, replacing LED efficient lighting units and windows louvers with U-Values of $0.263\text{W/m}^2\text{K}$ and $0.171\text{W/m}^2\text{K}$ for walls and roof. According to the findings in this study, Assiut University Teaching Staff (AUTS) western house mosque was climatically designed with improvement of energy performance that can be applied in the construction phase. The improvement in mosque energy performance is achieved with an energy index of $61.8\text{kWh}/(\text{m}^2\cdot\text{yr})$ compared to the original predicted value of base case of $87.5\text{kWh}/(\text{m}^2\cdot\text{yr})$.

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EVALUATION STUDY ON THE INSTALLED PHOTOVOLTAIC PANELS AND THEIR EFFECT ON THE AESTHETIC PERCEPTION AND EVALUATION OF MOSQUE ARCHITECTURE IN AMMAN; LOOKING FOR INTEGRATED SOLUTIONS

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INTRODUCTION

IN the last two decades, the industry of photovoltaic (PV) cells prospered in Jordan in the shades of technological development, sustainability pleas, the economic benefits and relatively initial low-cost installation. Consequently, PV panels were largely spread and observed on buildings – residential, public, and religious buildings particularly mosques. Installing PV panels on buildings essentially followed the functional requirements that aimed at maximizing their performance with little or even no attention to their impact on the aesthetic appearance of the building. Therefore, buildings with installed PV panels were aesthetically compromised when the architectural form was heavily distracted by the large PV blue panels.

Studies on PV cells in correlation to architecture took different directions, such as their efficiency and performance, their impact on the architectural form, and vice versa. For example, B. Cody (Cody, 2010) suggested a strong impact of the photovoltaic systems on determining the architectural form of building. On a performance level, Salmeron et al. (Salmerón Lissén, Romero Rodríguez, Durán Parejo, & Sánchez de la Flor, 2018) evaluated the energy consumption, emissions, and economic analyses for photovoltaic system in office buildings. M. Ritzen (Ritzen, 2017) studied the environmental impact assessment of integrated photovoltaics in the office buildings. Another study conducted by Elsayed (Elsayed, Mohamed, 2016) explained the relationship between facade designs to develop an optimum methodology that explores the effect of building envelope geometries on the photovoltaic performance of curtain wall.

Achieving the integration between PV cells and architectural form was the subject of many studies as well. B. Emrah et al. (Biyik et al., 2017)

suggested three requirements to achieve the integration of PV cells and building: aesthetic requirements, dimensional requirements, and functional requirements. P. Lau (Lau, 2015) emphasized the importance of the aesthetic aspects in the integration of photovoltaic system with architectural design of building. For Lau, achieving the optimum integration between PV cells and architecture shall address the aesthetic, performance, and economic aspects. On the other hand, Farkas et al. (Farkas, Andresen, & Hestnes, 2009) referred to the basic problem in the development of photovoltaic products that is aesthetical, cultural, and social issues. Farkas explained the important to highlight these aspects beside other operational aspects such as economical, functional, and structural to achieve a successful building integration. Few studies focused on effect the photovoltaic cells on the aesthetic perception of the users as a main issue in design. For example; N. Pantoja et al. (Sánchez-Pantoja, Vidal, & Pastor, 2018) evaluated the aesthetic perception for two types of installations the photovoltaic cells in buildings.

Mosque Architecture and PV Systems

Mosque as a religious structure has its own unique value for Muslims worldwide in terms of its aesthetics and symbolic value. As a building type, the mosque has a long history and deep-rooted and well-established architectural traditions and iconic elements. Cultural principles are the basis of the formation of buildings and the main elements in the formation of spiritual concepts in the physical body of architectural monuments. Islamic architecture is a level of wisdom, where it responds to material and spiritual needs in the same way. From this point, the mosque as a most important building in Islamic architecture is very sensitive to any materialistic add to its form (Jalili, Abi, & Asl, 2016). In Jordan, mosque is one of the building types that go sustainable by having installed photovoltaic systems. The way these systems were installed did not take the particularity of the mosque and its significance into consideration. Large blue panels on metal frames were installed in response to operational and functional demands without any further considerations.

Few researches addressed the relationship between PV cells and mosque architecture; however, they did not address the aesthetic and symbolic value of the mosque. For example, A. Elshurafa et al. (Elshurafa, Alsubaie, Alabduljabbar, & Al-Hsaien, 2019) assessed the techno-economics of installing a photovoltaic system on a mosque's rooftop in Saudi Arabia. Rashid and Manan (Rashid, Alwi, & Manan, 2011) focused on the economic

aspects of the PV and the cost efficiency of installing PV system to the mosque in Malaysia. Therefore, there is a gap in knowledge regarding the impact of the installed photovoltaic systems on the aesthetic appreciation of the mosque in terms of formal and symbolic aspects as perceived by users. This topic did not receive sufficient attention in the research field. Therefore, and to cover this gap, the purpose of this study is to evaluate the effect of the installed photovoltaic panels on the aesthetic perception and evaluation of the architectural form of the mosque. The study compares three specific groups of respondents: architects, laymen, and cultural persons. The study also aims to suggest an integrated framework for integrating photovoltaic cells with different elements of the mosque architecture form. On the other hand, the integrated framework solutions were applied on the existed mosques to combine the sustainable aspects and architectural form and enhance the aesthetic aspects and symbolic religious value in mosques. The objectives of the research are:

1. evaluate and analyze the impact of adding photovoltaic panels on the aesthetic and symbolic evaluation of the mosque building type; and
2. suggest proposals to retrofit the existing situation by integration photovoltaics systems with architectural form of mosques.

METHODOLOGY

Subjects

One hundred (100) subjects participated in this study. The participants were divided into two categories: thirty-five (35) architects, and 65 non-architects which by its turn divided into thirty-five (35) layman persons, and thirty (30) cultured persons. In this context, a cultured person is the person that has a wide knowledge in the history of mosque, its symbolic aspects and the culture and values of community. All respondents were selected randomly for each category.

In this study, it is assumed that the aesthetic perception and evaluation of the architectural form of the mosque may differ among architects, layman and cultured participants. Ibrahim et al. (Ibrahim, Abu-Obeid, & Al-Simadi, 2002) stated that the aesthetic evaluation of architects differs from others. Because of their training and background in architecture, their comprehension of the built environment will be based on knowledge and education, thus they will be more objective in their responses than

the others. The depth of cultural aspects and background also suggested to have an impact on the aesthetic evaluation.

Stimulus Material

Three pairs of images that contain real mosque buildings in Amman. Many architects and architectural historians classified mosques into various categories based on their formal characteristics, for example central-dome, iwan, and courtyard types. Taken into consideration these classifications, field research and experts' opinions – the researchers decided to categorize mosques in Amman into two main categories:

1. traditional style: mosques with traditional elements – a dome, a minaret and mihrab (pulpit), most likely rectangular in shape with central-dome and a pin-like minaret; and
2. modern style: mosques with reinterpreted traditional elements of the mosque, more like an abstract architectural language and modern materials.

Mosques with a traditional style is the most common form in Amman. Therefore, three pairs of traditional mosques were selected as a stimulus material; three (3) mosques with photovoltaic cell panels on their roofs (Figures 2, 3, 6) and three (3) mosques that are almost identical to them, but without the installed (PV) panels (Figures 1, 4, 5). These mosques were presented to the participants in a colored-photos slide show.



FIGURE 1
Mosque without PV panels.



FIGURE 2
Mosque with PV panels.



FIGURE 3
Mosque without PV panels.



FIGURE 4
Mosque with PV panels.



FIGURE 5
Mosque with PV panels.



FIGURE 6
Mosque without PV panels.

Evaluation Tool

Seven-step semantic differential scale that contained thirty-two (32) semantics: perceptual, cognitive, and evaluative items. The semantic differential scale defined by Osgood (Osgood, Suci, & Tannenbaum, 1957) as "The successive allocation of a concept to a point in the multidimensional semantic space by selection from among a set of given scaled semantic

alternatives. So, difference means a function of multidimensional distance between the two points". This scale is set up using polar adjectives. On the other words, create opposite-meaning terms, and then measure the direction of these associations and its intensity on a seven-step scale. The study focused on the aesthetic experience which defined as "A general process associated with an individual's cognitive and affective response to an object belonging to a particular class of artifacts called art" (Mastandrea, 2011). On the other hand, for others, the aesthetic experience is the outcome of the matched action of different mental processes such as memory, attention, perception, imagination, emotion, and thought (Locher, Krupinski, Mello-Thoms, & Nodine, 2008).

Semantic differential scale evaluated three main aspects, i.e:

1. perception aspect: involves sensory inputs from brain and memory stored in the subconscious mind;
2. cognition aspects: refer of the process of realizing knowledge through thought, experience, and perception; and
3. evaluation aspect: involves priorities and values and that refer to good and bad, or beautiful and ugly.

The perceptual aspects were measured by nine (9) items: (Random – Ordered), (Without Rhythm – rhythm), (Inconsistent – Harmonious), (Incoherent – Coherent), (Dull – Bright), (Fuzzy – Clear), (Closed – Open), (Tight – Loose), and (Complex – Simple). The cognition aspect was measured by ten (10) items: (Familiar – Novel), (Traditional – Modern), (Unstable – Table), (Rigid – Flexible), (Dangerous – Safe), (Materialistic – Spiritual), (Insensitive – Sensitive), (Industrial – Natural), (Violent – Gentle), and (Dead – Alive). And the evaluation aspect was measured by thirteen (13) items: (Imperfect – Perfect), (Ineffective – Effective), (Incomplete – Integrated), (Weak – Powerful), (Dreadful – Delightful), (Uncomfortable – Comfortable), (Bad – Good), (Ugly – Beautiful), (Unsuitable – Suitable), (Sad – Happy), (Depressing – Cheerful), (Meaningless – Meaningful), and (Not Symbolic – Symbolic).

Experimental Setting

The experiment was conducted in a computer lab at the Department of Architecture – Jordan University of Science and Technology. The space within which the experiment took place was a rectangle room with data-show device, and the color for floor, ceiling and walls at classroom is white.

Experiment Procedure

The experiment was divided into two stages. In the first stage, the respondents were asked to answer general biographical questions. In the second stage, the mosques' photos were screened randomly as a colored slide show for the respondents. The respondents evaluated six (6) photos by completing the 7-step semantic differential scale for each photo. While the mosque photo was on the screen, the respondents were asked to evaluate the mosque in the photo on the provided questionnaire. The total time of the experiment was approximately (25) minutes.

ANALYSIS AND RESULTS

The Statistical Package for the Social Sciences (SPSS) was used to analyze the collected data. Mean, standard deviation, and T-test, were applied to examine the effect of installing photovoltaic cells on the aesthetic perception and to explain the relationship between the dependent and independent variables based on prediction for the value of dependent variable as a function for the independent one, and determining if there is any correlation between these variables. Analysis of Variance (ANOVA) and Scheffe test were applied to investigate the effect of photovoltaic cells on aesthetic perception of architects, laymen, and cultured persons.

The results revealed that the installed photovoltaic cells negatively impacted people's perception of the mosques and its religious appreciation. The mean of all the participants' responses for both groups showed higher positive evaluation of the mosques without PV cells than those with PV cells. The mean of aesthetic perception and evaluation of the mosques with PV cells are 2.31, while for the mosques without PV cells are 5.67 (Figure 7).

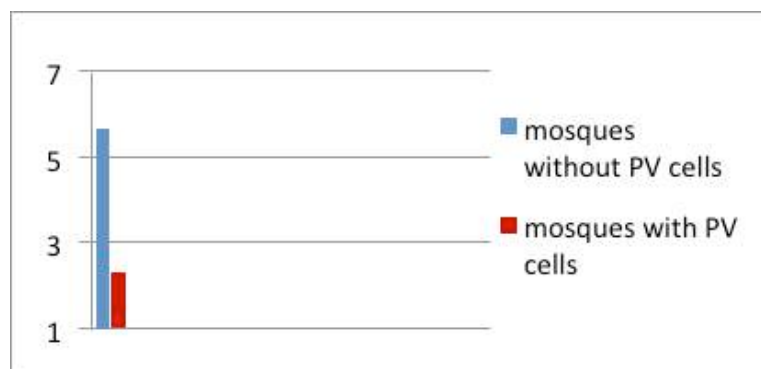


FIGURE 7

The impact of PV cells on the aesthetic perception and evaluation.

To examine if there are any significant differences among the three respondent groups – architects, laymen, and cultured – ANOVA test was applied. The results revealed significance differences between the architects, laymen, and cultured persons for Figure 4, Figure 5, and in all photos of mosques with installed PV cells (Tables 1 and 2).

TABLE 1
Mean and standard deviation for the three respondent groups across the six mosques' photos.

Items		N	Mean	Std. Deviation
Photo 1 (Figure 1)	Laymen persons	35	5.8641	1.07490
	Cultured persons	30	5.6037	.92935
	Architects	35	5.7500	.81301
	Total	100	5.7411	.93907
Photo 2 (Figure 2)	Laymen persons	35	2.4171	.76114
	Cultured persons	30	2.5227	.87777
	Architects	35	2.0639	.78238
	Total	100	2.3358	.81952
Photo 3 (Figure 3)	Laymen persons	35	5.8641	1.07490
	Cultured persons	30	5.6037	.92935
	Architects	35	5.7500	.81301
	Total	100	5.7411	.93907
Photo 4 (Figure 4)	Laymen persons	35	2.3370	.74417
	Cultured persons	30	2.8310	1.17884
	Architects	35	1.9020	.96127
	Total	100	2.3563	1.03190
Photo 5 (Figure 5)	Laymen persons	35	2.4620	.81441
	Cultured persons	30	2.5852	.99296
	Architects	35	1.6605	.61964
	Total	100	2.2393	.90874
Photo 6 (Figure 6)	Laymen persons	35	5.9443	.76523
	Cultured persons	30	5.3778	.90709
	Architects	35	5.4730	.82140
	Total	100	5.6035	.85720
Mosques with PV cells	Laymen persons	35	2.4053	.61165
	Cultured persons	30	2.6463	.84888
	Architects	35	1.8755	.67757
	Total	100	2.3105	.77709

Mosques without PV cells	Laymen persons	35	5.9042	.81264
	Cultured persons	30	5.4908	.84114
	Architects	35	5.6115	.75328
	Total	100	5.6723	.81040

TABLE 2

The significant results of ANOVA test for the three respondent groups.

		Sum of Squares	Mean Square	F	Sig.
Photo 4 (Figure 4)	Between groups	9.506	4.753	5.006	.010
	Within groups	60.771	.950		
	Total	70.277			
Photo 5 (Figure 5)	Between groups	11.143	5.571	8.223	.001
	Within groups	43.360	.678		
	Total	54.503			
Mosques with PV cells	Between groups	6.851	3.426	6.643	.002
	Within groups	33.005	.516		
	Total	39.856			
Mosques without PV cells	Between groups	2.043	1.022	1.583	.213
	Within groups	41.302	.645		
	Total	43.346			

The results of applying Scheffe test showed that there are differences among architects, laymen and cultured persons in their responses toward the different mosques (Table 3). In Figure 4, the results showed that the PV cells negatively affected the architect's aesthetic perception more than cultured people. For Figure 5, the results revealed that the architects showed greater negative response than layman response. These results are in agreement with the findings of Ibrahim et al. (Ibrahim et al., 2002) that architects develop different perception and evaluation responses of the architectural form than other groups.

TABLE 3

Scheffe test to compare between: architects, laymen, and cultured people.

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Photo 4 (Figure 4)	Laymen persons	Cultured persons	-.49401	.29060	.243
		Architects	.43497	.29060	.333
	Cultured persons	Laymen persons	.49401	.29060	.243
		Architects	.92898(*)	.29381	.010
	Architects	Laymen persons	-.43497	.29060	.333
		Cultured persons	-.92898(*)	.29381	.010
Photo 5 (Figure 5)	Laymen persons	Cultured persons	-.12327	.24546	.882
		Architects	.80145(*)	.24546	.007
	Cultured persons	Laymen persons	.12327	.24546	.882
		Architects	.92472(*)	.24818	.002
	Architects	Laymen persons	-.80145(*)	.24546	.007
		Cultured persons	-.92472(*)	.24818	.002
Mosques with PV cells	Laymen persons	Cultured persons	-.24096	.21415	.534
		Architects	.52987	.21415	.054
	Cultured persons	Laymen persons	.24096	.21415	.534
		Architects	.77083(*)	.21652	.003
	Architects	Laymen persons	-.52987	.21415	.054
		Cultured persons	-.77083(*)	.21652	.003

* (Note: The mean difference is significant at the .05 level.)

For a further investigation, the group of semantics were divided into two subgroups: formal semantics and cognitive and evaluative semantics (Table 4).

TABLE 4

List of formal semantics and cognitive and evaluative semantics.

Formal Semantics	Cognitive and Evaluative Semantics	
Ordered	Novel	Good
Rhythm	Modern	Comfortable
Harmonious	Safe	Beautiful
Coherent	Spiritual	Suitable
Bright	Sensitive	Happy
Clear	Natural	Cheerful
Open	Gentle	Meaningful
Loose	Alive	Symbolical
Simple	Perfect	
Stable	Effective	
Flexible	Integrated	
Powerful	Delightful	

The mean for each semantic was calculated for the two groups of mosques. The results showed that the mosques with installed PV panels were negatively evaluated on both semantic groups (Figures 8 and 9).

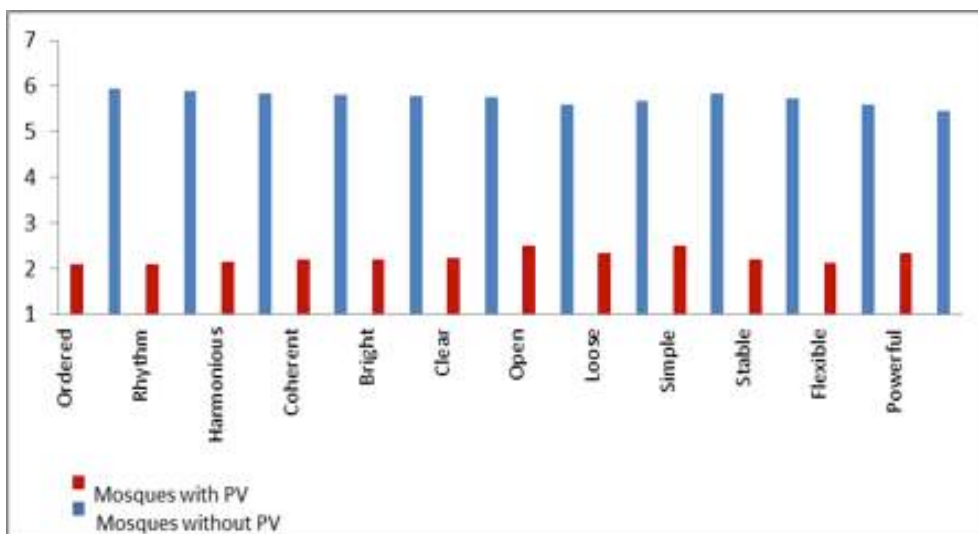


FIGURE 8

The effect of PV cells on the formal semantics of mosque architecture.

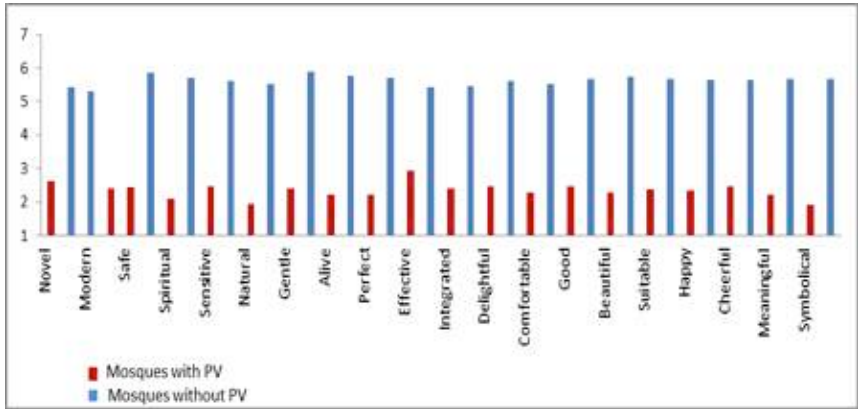


FIGURE 9

The effect of PV cells on the cognitive and evaluative semantics of mosque architecture.

By comparing the three respondent groups, the architects were the most negatively impacted by the installed PV panels among the three groups in both semantic groups (Figures 10 and 11).

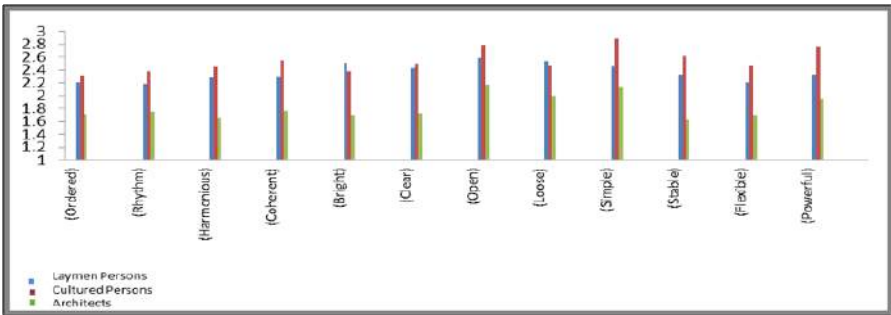


FIGURE 10

Comparing of the effect of PV cells on the formal semantics between: architects, laymen and cultured people.

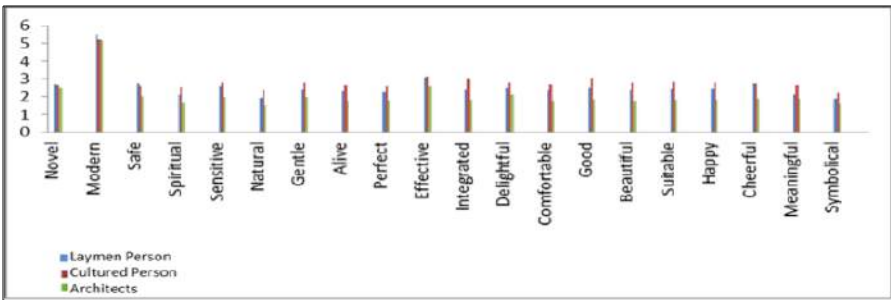


FIGURE 11

Comparing of the effect of PV cells on cognitive and evaluation semantics between: architects, laymen, and cultured people.

The results also showed that installing photovoltaic cells has become a phenomenon on the roofs of mosques, where nearly 80% of the participants agree on this. On the other hand, 70% of participants agree on the influence of photovoltaic cells on the form of the mosque and its architectural character, this result agrees with previous studies (Farkas et al., 2009).

Approximately 90% of the participants recommended the use of photovoltaic cells as a preliminary idea of the projects, which is agree with the importance of installing the photovoltaic cells at the design conceptual phase (Medio, 2013).

DISCUSSIONS

The results showed that PV cells negatively impact people's perception and evaluation of the mosque and its religious appreciation. The results also indicated the importance of integration between architectural form and photovoltaic (PV) systems. gap between renewable energy (photovoltaic system), and architectural form will be filled through finding integrated framework solutions that combine the sustainable aspects and architectural form. These solutions need to emphasize on preserving the architectural form and the aesthetics aspects and symbolic value of mosques.

In 1991, the first installation of Building-Integrated Photovoltaics (BIPV) was realized in Germany by combining the PV elements into a curtain wall facade. BIPV then became one of the fastest growing applications in photovoltaics system (Benemann, Chehab, & Schaar-Gabriel, 2001). BIPV can be used not only in new buildings, but also in existing buildings (European SUNRISE Project, n.d.). On the other hand, the scholars refer to the important role of the architects and their responsibility to reduce the energy use in renovation of existing and in design of new buildings (Farkas et al., 2009).

However, there are various factors that need to be considered when using BIPV systems, such as the photovoltaic module temperature, shading, installation angle and orientation (Peng, Huang, & Wu, 2011). According to Farkas et al., (2009), eight basic aspects have effect on successful BIPV systems; energy concept, financial budget, functional, constructional, structural, aesthetical, cultural and social.

1. Facade system: The BIPV system which is designed to give exterior skin to the building as part of its envelope.

2. Atrium system: The BIPV system consisting of glass element which is designed to provide different degrees of shading and to improve indoor thermal comfort.
3. Awning and Shading systems: The BIPV system consists of a range of PV materials which can be mounted onto a facade as awnings in aesthetic manner.
4. Roofing system: The BIPV system which is designed to displace traditional roofing materials.

According to Panopoulou (Panopoulou, 2008), each BIPV not only can be integrated into building, but also can be completely replace existing building elements (Figure 12). Panopoulou (2008) referred to the transparency and colors of photovoltaics as interesting architectural elements. Furthermore, he determined three basic ways to integrate photovoltaics in buildings:

1. roof – based systems (sloped roof and flat roof);
2. facade special applications; and
3. shading systems.

From architectural view, Kaan and Reijenga (Kaan & Reijenga, 2004) classified the types of PVs integration according to the increasing amount of architectural value into five types:

1. PV is applied invisibly;
2. PV is added to the design;
3. PV is added to the architectural image;
4. PV is determined the architectural image; and
5. PV is leaded to new architectural concept.

The Ways of Integrating Photovoltaics in Buildings

The photovoltaics can be integrated into different parts of the buildings; roofs, external walls, semi-transparent facades, skylights, and shading systems (European SUNRISE Project, n.d.). However, P. Eiffert and J. Kiss (Eiffert & Kiss, 2000) classified the main types of BIPV systems that are available commercially, into four categories:

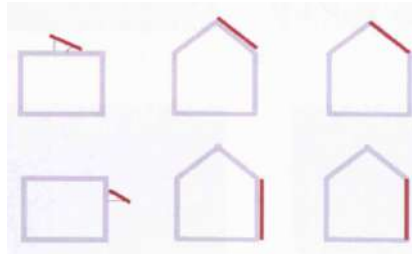


FIGURE 12

The ways of PVs integration in buildings.

According to Prasad and snow (2005), integrating photovoltaics in buildings can be divided into three basic places; roofs, elevations, and architectural details.

BIPV can be applied to mosque to enhance the negative impact of the PV panels on the architectural form. By taking all the above mentioned criteria and the ways BIPV can be applied, Figure 13 gives an example of BIPV on existed mosque by using graphic design software. As shown on the graphs, the PV panels became part of the mosque form without altering its integrity or any of its formal aspects.



FIGURE 13

An example of applying the methods of BIPV on existed mosque and the figure shows the mosque before and after the integration.

CONCLUSION AND RECOMMENDATION

This study aimed to evaluate the effect of the installed photovoltaic panels on the aesthetic perception and evaluation of the architectural form of the mosque. It also aimed to suggest an integrated framework for integrating photovoltaic cells with different elements of the mosque architecture form.

As indicated by the results, the superimposed methods of installing PV panels on mosques negatively impacted people's perception of the architectural form and its religious appreciation. Therefore, the methods of building-integrated photovoltaics (BIPV) can enhance the aesthetics aspects and symbolic religious value in mosques.

The growing concern about the role of renewable energy as a tool to achieve the sustainable development, and the effects of this energy on the architectural form open the door for further future research at this field due to its importance and the limited studies that deals with such topic in general and in mosques in Jordan specifically.

This study contributes to evaluate the aesthetic perception of the architectural form of the mosque. The study recommends using various ways of building-integrated photovoltaics (BIPV) to enhance the aesthetic perception and evaluation of the architectural form of the mosque.

Future research can examine the aesthetic perception and evaluation of the integrated solutions between photovoltaic cells and architectural form of mosques to find best ways of integration. For architects, the photovoltaic cells should be included to the architectural design from the beginning of the project as they effect on the form, layout and orientation of the building. On the other hand, photovoltaic cells can lead to new architectural concepts and images, future researches can select this indicator as a hot topic for further future research.

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REPLACING THE MOSQUE STEREOTYPE TO DISPLACE THE ISLAMOPHOBIA CONCEPT

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INTRODUCTION

THE relationship between Islamic and Western civilization witnessed a period of conflicts, and tension that has reached, in some historical periods, a military confrontation (Muhammad, 2012, pp. 40–43). In a new scene of tension of this relationship, Western societies recently have a wave of trend that has been classified as “Islamophobia”. By inductive the events after (11 September 2001) and accompanied by catastrophic events, the concept appeared. It expressed the negative feelings of Western society toward Muslims with unfair behavior, and created unreal images, and a distorted vision of the Western world about Islamic civilization and the continuation of the conflict.

The Western media keep imaging the Islamic country full with headers rocket minaret and domes, which contain activities feed Muslim youth with hatred toward the West, also imaging the mosque: as a mysterious, non-transparent, and solid building, which starting from radical ideas in return for ignorance of the truth of Islam (Ibrahim & Esposito, 2011, pp.vi). In contrast, Arab studies noted that the causes of the phenomenon are two reasons – first is related to the political situation and the reaction after the events of 11 September 2001, second to the interpretation of history (Ibid, pp. xxii).

The study is an attempt to identify dimensions of the problem, and, sought to answer the following specific research questions.

1. Is mosque stereotype associated with the concept of "Islamophobia"?
2. How can modern technology contributes to changing mosque stereotype as well as, to displace the concept of Islamophobia from Western societies?

Then the study assumed:

1. the stereotype of Islamophobia is the result of a combination of factors associated with the race memory and unconscious associations and the awareness and country, and these factors affect and influence each other, moreover, in the consolidation stereotype of the mosque;
2. adopting technological anchor in mosque architecture contributes effectively to displace of the Islamophobia concept in Western society and enhance Islamic vision as an open ideology believes in communication and dialogue and sends reassurance messages to the Western recipient, also, access to a communicative mosque architecture between the Islamic civilization and the Western receiver (individual or community).

In order to achieve the research aims, an inductive methodology was adopted by discussing the main concepts of independent and independent phenomena of research, preparing questionnaire across the web was directed to a sample of foreigners in Europe and America about the type of traditional and contemporary mosques, finally the samples were tested and determined the final conclusions and recommendations.

METHODOLOGY

The research adopted an inductive method (analytical and descriptive) such as the following stages.

1. The main research phenomena and the analysis of previous literature were defined in order to identify the main phenomena of research (Islamophobia, stereotype, mosque architecture and technology) as well as to derive measurement indicators and method.
2. Eight models of contemporary mosques were elected (model with historical orientation, hybrid model, non-traditional model, and informal model) and four classic agency models.

3. The questionnaire prepares and draws up to extract the roots of the stereotype and its theoretical and psychosocial features and included the following:
 - (a) The axis of public information and the axis of the roots of the stereotype and its features, theological and psychosocial and the axis of the academic features of the stereotype.
 - (b) The questions were presented to ten experts in psychology, environmental psychology, and architecture. Questions were drawn and redrafted in harmony with Western society.
 - (c) The questionnaire was prepared according to the Likert scale with seven degree (strongly agree, agree, agree to a certain extent, unsure, disagree to a certain extent, disagree, strongly disagree).
 - (d) Conducting a questionnaire survey across the web network for a random sample of Western society (1850 individuals from America, Holland, France, and Germany).
 - (e) The questionnaire was analyzed using the SPSS program, the Reliability Statistics test, and it was found to be 0.99. It is a high percentage. The multiple regression test (Regression) to verify the first hypothesis and the T-Test One – the second hypothesis and weights were proposed for the results according to a mechanism proposed by the researcher to determine the role of technology in the architecture of mosque to reduce the impact of the phobia of Islam in Western society.

LITERATURE REVIEW OF ISLAMOPHOBIA

1. The phenomenon of phobia the use of the scientific term (phobia) began at the beginning of the 19th century. Phobia or phobias term is due originally to "Psychiatry". It is a Greek word meaning "horror" deriving of the Greek word (Photos). The phenomenon includes fear and avoidance. It has grown since childhood and continues for years or decades, but the incidence rate is higher in midlife (20–45 years) and old age (65–90 years), moreover, a phenomenon that is widespread in the world by 3–15 (Eaton et al., 2018, pp. 678, 680). The term "Connect" with another word to indicate what is to be described from a separately satisfactory condition which causes by the environment and human instinct (Saleh, 2013, pp. 355-390), as well as there are many types of phobia such as animal phobia, natural environment phobia (dark places, highlands,, ... etc.), condition

phobia (driving the car, riding, transport, trains, flying, etc.), blood and needle phobia, and others (specific music, specific food, etc.); (Antony et al., 2006, pp. 4–5). It is one of the fear diseases which potential, chronic, unjustified, unnatural, and illogical of thing, place or behavior where the patient is infected panic attacks and severe panic, and he attempts to escape from position or face the thing or condition that he considers it a danger to his life (Saleh, 2013, pp. 355–390). Sometimes it may necessarily continue to be dealt with it but with discomfort, distress and weakness. About 12.5% of Americans suffer from phobias and are affected by sex (Antony and et al., 2006, pp. 4). Occasionally, phobia comes from something not scary in its origin, and not justified by reality, and unable one controls his fears or adjusts his emotions. Although he understood that it was illogical, his inability to practice his life and effects on his behavior (Abd al-Khaliq, 1989, pp. 645–647); Gerges, 1993, pp. 8; Al-Voile, 2006, pp. 4). Also phobia is an expression of the mental and cognitive disorder come from other reasons, perhaps events and experiences in early childhood. These unhappy experiences leak out to his unconscious then face his fear involuntary and difficult to control on it through bring the manifestations of turbulence which he experienced when exposed those experiences for the first time with more sharply (Saleh, 2013, pp. 355–390; Muhammad, 2012, pp. 40–43).

2. Islamophobia phenomenon has historical roots; it is a religious, cultural, and political phenomenon, as well as, it is an old term for a new meaning. It terms “phobias of Islam” or “Islamophobia”. Recently, terms talk about the West’s relations with Islam, and hostility, fear and phobia of all that is Islamic, or has a close or remote connection to Islam, until it became synonymous with Islam in the Western mind dictionary “terrorism”, or fear of all that is Islamic. The concept reappeared as a result of growing hatred of Islam after events (11th September 2001) the statistics documented by the research institutions to increase phobia in the West. Islamophobia concept is modern term which has been widely used at the end of the last century and the beginning of this century it expresses negative emotions toward Muslims and feelings translate into unfair behavior (Saleh, 2013, pp. 355–390); (Mohamed, 2012, pp. 40–43); (Ibrahim and Esposito, 2011, pp. xxxii). The causes of the phenomenon, according to Ibrahim and Esposito, are two reasons:

- (a) the first is related to the political situation and the reaction after the events of 11th September 2001; and
- (b) the second is the interpretation of history (Ibid, pp. xxii).

LITERATURE REVIEW OF STEREOTYPE AND THE MOSQUE'S ARCHITECTURE

In this paragraph, the concept of stereotypical language, terminology, psychology, and architecture has been highlighted and the definition of the stereotype of mosques has been defined as follows.

1. The stereotype linguistic (stereotyping) in English means formulating firm opinions about something. In the Al-Mawrid dictionary (2013) and the Oxford Dictionary (2014), stereotyping is defined as a model or template, and it is consistent with a pattern that lacks a distinctive individual character. It is a mental image shared by individuals, a group or a view that is so simplistic that it is distorted and represents an emotional attitude from a person, race, case or incident and it is something that repeats without change and represents a common idea and a constant image in mind (Ahmad, 2016, pp: 97).
2. The stereotype idiomatically the concept of stereotype is mixed with feelings of fear, phobia, and suspicion, and is distorted by the behavior of distortion, camouflage, and shading (Boulaouli, 2013, pp. 10). Walter Lippmann defined it as the anyone feeling has about an event he has not experienced, a feeling that stems from a mental perception of the event, and that the most important thing to do is not based on specific knowledge or directly, but on the image made or given to him as an exaggerated belief linked with functional category, which justify the behavior of removing that category; and defined by the German researcher, Gordon W. Allport, as similar to prejudices that may be positive or negative take toward a person or group, and difficult to correct which due to inertia and emotional shipments. The mental image is more general and comprehensive than the stereotype that comes at a later stage. A stereotype is a common fixed feature that applies to a group or a people characterized by simplification in their perception of the other, but the risk when a specific negative image is constantly repeated (constant and continuous). It is not composed automatically but is the result of many influences (Al-Hatari, 2012, pp. 11–13). As defined by Yamen Bodham as the final product for the psychological impressions that are formed in individuals and

groups toward a particular person or a particular people or race local or international organization or profession or anything else that can have an impact on human life. These impressions consist of direct and indirect experiences and are related to the emotions of individuals and their trends, regardless of the validity of the information contained in the summary of these experiences, it is for their owners a true reality in which they look at what they understand, understand and appreciate (Bodhan, 2006, pp. 3–4).

3. The stereotype psychologically can be determined according to the views of the Scottish philosopher and historian (David Hume, 1711–1776). They are the ideas of the emergence of impressions that represent the relationship of the cause of the disease and as a result of the views of orientalists have generated strong negative perceptions and beliefs in the mind of the Western man gave birth to this mental habit (stereotypes about Islam). It can also be interpreted psychologically according to the proposals of the Russian physiologist, Ivan Pavlov (1849–1936). As a reflexive act of condition, a kind of correlation between a conditioned stimulant and responsive, in other words, if a specific event has a specific response, it is a natural stimulant and that response is a natural response. The general orientation in the West is a natural stimulant for the Western man, resulting in negative or positive stereotypes as a natural response (Sadr, 2015, pp. 159–154). The stereotype can also be explained psychologically. According to Sigmund Freud (1856 to 1939), who explained the processes and functions of the psychological (producing the behavior) with its anatomical molecular theory (Analytic View) for levels of consciousness (Consciousness, Sub Consciousness, Preconscious, Unconscious), and personal (Superego, Ego, Libido) (W. Passer, 2014, pp. 525–526). It is through this theory that the stereotype can be interpreted as an unconscious image belonging to the repressed forces and the latent desires which are formed by inherited factors, Jung's comprehensive theory can trace stereotypical images to unconscious and collective psychological depressions (archetypes). Any residue lies in the memory of the group (race memory) and not the individual and these sediments accumulated as a result of the effects of society on the individual.
4. The stereotype is in architecture generally, defined as a static look of evaluation and circular, which refer to place, street, building, monument, etc., which appears in them likeness or stability within

certain considerations. Gordon Allport, see the stereotype is the result of linking three elements (impression, ideas, perception). It results in the construction of theories about different things, people and places, and building fixed hypotheses around these elements, start with the impression to form ideas then the perception of their coordination than the stereotype to install, as shown in Figure 1. The accuracy of architecture image was increased and cohesion, whenever the stereotype is stronger and fixed, also, stability of identity and meanings of elements and forms. Scott finds it that mental image is different from the stereotype. In it they cannot turn into a type because it can be added to and corrected information. Thus, the image being mental (variable) or stereotyped (static) both are affected by operations perception, give cumulative experiences and constitute perceptions and specific impressions in the minds of the recipients. In the mental images of the individual, there are fixed stereotypes, not changeable such as a specific place but it changes by processes of radical change such as demolition and replacement (Kawther, 2014, pp. 18–19).

5. Classical mosque stereotype: The mosque represents “the icon of Islam and its eternal symbol”. It has great significance in Muslims lives. It formed the space of worship, the center of social and cultural activities, and places of education. In addition, it represents the landmarks of the Islamic civilization, which attest to the depth of this civilization. The mosque occupies the highest place in Muslim society and occupies the engineering center of the city, in addition to its religious and historical symbolism. Where the first work of the Prophet Muhammad (PBUH) when he arrives in Medina, construction Prophet’s Mosque as a first step in the community of Medina. In general, the mosque stereotype was formed, as results to the repetition and stability of architectural elements of mosques. For example, repeat all or some elements of the mosque, such as from domes, minarets, mihrab, mimbar, courtyard, and the praying hall). The repetition and stability of these elements are formed stereotype about Islam (Ahmad, 2016, pp. 97). This stereotype content anything which related with Islam such as symbols, building, landmarks, individuals and groups; including the mosque elements and architecture; because it represents “the icon of Islam and its eternal symbol”.
6. Contemporary mosque stereotypes: The mosque’s stereotype was associated with technological development. The technology term is known as applied science or means and inventive tools, which

used for the people's livelihood and well-being of people, also it is a combination of accumulated knowledge, experience, and skills which managed by systematic systems that are practically embodied in machines and automatic and electronic equipment, they are used by individuals in their activities in order to facilitate tasks and meet their needs and social response, for their future economic aspirations within the constants of the cultural values of the society (Saida, 2006, pp. 10). In the past 50 years emerged technological trends in mosque architecture allow the communication and openness knowledge accessed on them. It represented in the appearance of patterns of mosque architecture away from traditional patterns, and rely on technology as a priority for design and the composition of forms and designs which changed the stereotype of mosque architecture depending on the dynamic Islamic thought, considerate zeitgeist, and technological progress. It appeared clearly in the contemporary productions of mosque architecture (Ben Qari, 2017, pp. 55). This change leads to change the stereotype of mosque architecture in another hand the technology has contributed the mosque as a modern urban building and deals with its techniques, as well as, to express of the city identity regardless of the mosque shape. Through contemporary works the mosque function was free of shape this will contribute to changing the traditional stereotype of the mind which may contribute to a conceptual shift in the mosque architecture.

LITERATURE REVIEW OF TRADITIONAL AND CONTEMPORARY MOSQUES TYPES

Ben Qari identified the trends of modern architecture mosque according to the formal and architectural components (Vernaculaire Style, Historical Style, Pan-Islamic Style, Modernist Style) (Ben Gari, 2017, pp. 47–50). Al-Obaidi identified the trends of contemporary mosque architecture with four basic models include a set of models affected by ideological factor, environmental factors (sustainable mosques), technological factor, and the aesthetic factor (Al-Obaidi, 2016, pp. 153–155). Al-Muqram classified contemporary mosque architecture trends to – informal mosques and non-existent, linked to the realization of the ideological factor, sustainable mosques, linked to the environmental factor, staged mosques, linked to the aesthetic factor, and hybrid mosques and non-traditional mosques, linked to technological factor (Al-Makram, 2017, pp. 11).

The most important classical stereotyping mosque elements, which confirmed by previous literature are Qiblah wall, mihrab, the mimbar, and chapel or prayer house and courtyard) and added to it later periods dome, and Minarets or monastery (Al-Obeidi, 2016, pp. 113; Hassan, 2002, pp. 49–79).

Previous literature has classified traditional mosques historically according to regions and the periods in which the type appeared within the Islamic ages into several varieties as follows:

1. based on formal levels (temporal and spatial) for example, regional models (Arabic, Safawi, Ottoman, Moghul);
2. based on structural formalities (multi-column, multi-column with emphasis on axis with the dome, multi-column ceilinged domes, the four-owen model, and the central dome model);
3. depending on importance of the prayer space form and construction as a basic component – prophetic model with corridor cutter, structural shoulders model, the four-owen model, the dome dominant model (Al-Makram, 2017, pp. 3; (Al-Khafaji, 2017, pp. 16; Kutbi, 2012, pp. 119–190; Saoud, 2002, pp. 4–9.

THE SCIENTIFIC APPROACHES TO THE TERM OF ISLAMOPHOBIA STEREOTYPE

There are scientific approaches that contribute to the stereotype formation.

1. Psychosocial approach: The stereotype links the classification that a person adopts in dealing with reality, where it is divided into social groups, whereas the stereotype emerges as a result of attitudes or behavior which striking, draws the view, and exciting strange, and excite attention. There are three implicit concepts (Bo Al-Awali, 2013, pp. 11):
 - (a) the stereotype that means the cognitive or impressionistic instance around a particular social group consisting of persons who share specific traits and emotions;
 - (b) prejudice indicates any positive or negative evaluation of a particular social group and the individuals who are involved; and
 - (c) racial discrimination refers to any positive or negative behavior directed at the social group and to the persons who make up them.

2. Approach interpretive: It is different from the media interpretations that usually focus on the negative dimension of the stereotype away from (the historical context, social, cultural, religious, etc.), and conforms to psychosocial vision that considers the stereotype can to be positive. Hans-Georg Gadamer believes that the prejudices and a prior images have a positive dimension, which plays an essential role in human communication and employs this dimension in dialogue with each other.
3. Academic approach: This approach is fair to the other, seeks to identify his identity, absorb his culture objectively, as well as, the abstraction of science. This scientific approach followed by the sum of orientalists in their abuse about Islamic civilization. On the other hand, the influence of the orientalist discourse on the formation of the Islam and Muslims stereotype has included studies and research conducted by Westerners to learn the East from all sides, orientalists and preachers played important political roles that led to the spread of European colonialism and its control over the eastern world in general and the Islamic world in particular. They followed several approaches to the study of Islamic civilization (Al-Haj, 2001, pp. 164–171).

The application of the orientalist approaches according to the psychosocial and interpretive approach to the Islamic civilization played a major role in promoting the concept of Islamophobia and drawing a negative stereotypical of the mosque because it is the symbol of Islam and Muslims, as well as it represents the formal embodiment of all the principles and Islam values. So we will discussed concept with the results of the research.

CASE STUDY

Eight symbols of contemporary mosques were elected (historical mosque, hybrid mosque, non-physical form mosque, and unfamiliar mosque), and four symbols of classical mosques (Arabic, Ottoman, Safawia, and Mongolian) as follows.

1. Historical mosque with transplanted mosque – inspired by ancient models and reproducing new technology through modern materials. These mosques have maintained the stereotype of the mosques, such as the following:

- (a) Al-Farouk Mosque and Center Omar bin Al-Khattab, Dubai 2011 – its design belongs to the Ottoman style (Blue Mosque, Istanbul) in the style of domes and lamps with high conical ends (63m) and is inspired by Islamic traditions in the mosque complexes including the chapel, the women's prayer hall, the library, the council and the lecture halls, and the office of the imam of the mosque. And a mihrab with three entrances and five domes for each entrance. The technology was employed on a formal level through the large structure of the roof of the mosque, where the diameter of the main dome was 12m, built of reinforced concrete, clad in the outside with concrete plates reinforced with fiberglass colored in light blue (Al-Obaidi, 2016, pp. 164).
 - (b) Sheikh Zayed Mosque in the UAE 2008 (Architect: Yusef Abdelki)– Technology has been used to transport a range of different Islamic architectural styles (Moroccan, Ottoman, and Indian). The mosque has a capacity of 960 worshippers; they distributed to the prayer halls (main hall, open hall, open hall for women) as well as other squares. The construction of the mosque used building materials imported from different countries including Italy, Germany, Morocco, India, Turkey, Iran, China, Greece as well as the UAE. Natural materials were chosen for construction and design, using marble, stone, gold, semiprecious stones, crystal, and ceramics. The mosque is distinguished by its dome, which reaches 82 domes inspired by Moroccan architecture, made of white marble. The outer diameter of the dome is 32.8 meters long and the qiblah wall contains the beautiful names of Allah on the wall in Kufic script with a fiber-optic background. The mosque surrounds four minarets in its four corners and the interior walls are decorated with gold, glass, and mosaics that are more concentrated on the western wall. The mosque is surrounded by artificial lakes with dark tiles (Al-Obaidi, 2016, pp. 166).
2. Modern mosques with hybridism – The Islamic centers in Europe and America formed a means to enhance the understanding of Islam as an open culture. The hybrid mosques mean a set of formal models that have committed themselves to some elements of the model and the application of special treatments such as borrowing the dome or minarets and formulating it to achieve functional communication with the ocean, showing flexibility in other parts resulting from adaptation. With the context of the site and in this type of mosque there has been a partial change in the traditional stereotype of the mosque for example:

- (a) Islamic Center in Germany Penzberg Islamic Forum (Architect: Alen Jasarevic) – Linking the mosque to the general context of public and open spaces within most of the treatments for the mosque and within the planning and formal levels, through the use of technology and through the rerepresentation of architecture of mosque within contemporary urban contexts, including the formal level and the promotion of peaceful coexistence between different religions adopted the concept of transparency in the formal formulation of the mosque. The mosque is characterized by its wide glass facade, which enhanced the visual communication between the interior space of the mosque and the external urban life. The mosque is open to everyone from different religions to attend lectures and to experience the special, the facades have turned into huge billboards about the religious function of the mosque by employing the Islamic structures within the surface treatments, which were reinforced by the Qur’anic writings. The walls of the entrance and through the writings on the one hand and the German translation, on the other hand, strengthened the cultural dialogue, while the employment of the minaret was an expression of the Islamic identity of the mosque through its influence on the formal Islamic heritage of Al-Malawiya and Ibn Tulun in Cairo. It emerged with its square, shaped plan, in the form of a group of three blocks moving toward the sky. It was executed with aluminium plates to permeate the Islamic writings (Al-Obaidi, 2016, pp. 170–169).
 - (b) The Islamic Center of Rebecca-Croatia 2013, Architect: Dušan Džamonj: symbolic mosque with context orientation, designed according to the architectural and cultural heritage of the Islamic region of the Mediterranean, within the formal level, the mosque is composed of a single sculptural form. Its main theme is the dome which expresses the strength and richness of the construction aspect within the style of the Ottoman mosques in the Mediterranean region (Al-Obaidi, 2016, pp. 168).
- 3 Non-traditional mosques with renewal tendency (Unfamiliar mosque)
 - The intervention of technology as a factor in the design process to achieve forms unfamiliar to the mosque and the establishment of a multi-function center and levels within the urban site as well as the basic function that requires the establishment of a chapel for examples:

- (a) Strasbourg Mosque in France (Zaha Hadid Architects, 2000)
 – The mosque is an abstract sculpture symbolizing itself. The goal of this model is to create a diverse space and create a new image that reflects the flexible Islamic identity. By employing new methods that promote the encoding of Islamic culture through technology related to “Qiblah facing the river, the story of light, Fractional folded crust, suspended mosque, spatial distribution and functional areas of the mosque and the use of traditional elements such as saucer, Qiblah wall, water, light, engineering, writing or line. The space organization of the mosque consists of two levels. Upper level – the space of the chapel, which represents the overall sacred level of the mosque and the courtyard is placed in front of him and through this link the mosque in the urban context and flows over the city. The courtyard represents the point of connection between the worldly events signed at the lower level and religious events at the upper level. Within the ground level, worldly events were signed, representing the main entrance to the building, a lecture hall, a dining area, an exhibition. The formal level of the Hanging Mosque highlights the effects of structural structure based on the use of fractional geometry in the construction of concrete contracts that represent the basic structure. This structure is interspersed with a secondary layer of concrete – containing glass (Al-Obeidi, 2016, pp. 174).
- (b) Shuaa Light Mosque in Dubai – The mosque includes a collection of formal treatments through the use of “new materials” technology as an influential factor in the formulation of the design idea. Design presented in the design competition of a mosque in Dubai by the international company (ZEST Architecture). In order to reduce the use of energy and employed technology to achieve the goal, the mosque is composed of two levels. The upper level is dedicated to the men’s chapel and part of it is dedicated to women. The separation between them is significant through the light from the ceiling. There is no separation between them. It is an unprecedented treatment in the design of mosques that require separation physically, the lower level is devoted to ablution areas, a library and a social center, all centered around a cool courtyard. The lighting of this part was achieved through the design of ceiling lights inspired by Islamic motifs. The shape of the mosque is a single crystalline elliptical shape that splits

into two halves through a strip of glass representing the beam of light, one of the halves rises to be the minaret, and the sun enters the space of the prayer, through this section to form the barrier between the sexes within the space of the chapel below. This insulation is achieved at night by employing artificial lighting, the overall flow of the mosque is achieved through the use of the structural system of the crust and was covered with a layer of white cement isolated, which provided the maximum reflection of sunlight during the day and the maximum cooling at night. The mass was signed towards Qiblah and ascending to the prayer space by a slope gradually rising parallel to the places of ablution toward the main staircase to reach its peak in the beam of light.

4. Non-physical form mosque – Non-compliance with a certain formality, the space of the mosque represents a flexible space known through the performance of the rituals of prayer and the space of the mosque is a fluid space that requires several treatments related to signing and continuity with the urban environment (functionally) or the space of the mosque represents the essence of religious space and promotes the spiritual aspect of Islam and relates to continuity with the urban environment. On the level of green areas, in this pattern has changed the stereotype in a comprehensive manner with the survival of some of the signs of form and the following examples:
 - (a) Cave Mosque: Focus on the essence of religious space as a basis for design and away from formal perception. This mosque is designed by architect Emre Arolat. Located on the outskirts of Istanbul and opened in 2013. The main objective is to strengthen the spiritual aspect of Islam. Hence, the adoption of the cave of Hira, where revelation was revealed by reporting the Prophet's prophecy to the Prophet (PBUH), was the basis for the design idea of the project. Where the simplicity and return to nature against the physical material of the mosque represented the design approach adopted, the mosque was signed below ground level to achieve the highest spiritual experience possible. The mosque lacked clear formal elements except for the lighthouse and a seating area adjacent to it, the simplicity and intermingling with nature is a prominent feature of this model (Al-Obeidi, 2016, pp. 159).
 - (b) The Vanishing Mosque: The fundamental point of design stems from the principle of infinity, which is affirmed by Islam in the

relationship between the worshipper and the creator, such a concept was the cornerstone of the proposed design of the mosque by UAE designer, Rami Farouk. The fading mosque represents the functional disappearance of the mosque with the city and by linking the effectiveness of prayer with the vital flow of the city, making it more symbolic, more revealing and more integrated into the cultural and spiritual work within the community. This relationship has been embodied within the levels of the mosque's architecture, which relate to components, directional, treatment of elements, general planning; with regard to formal treatments, except for the minaret, the mosque does not have any of the known components associated with the mosque as a structural style. The Islamic principles that have been taken into account in the design of the mosque have been embodied in both the schematic and the formal levels, which depend on the superficial treatments of the buildings surrounding the prayer yard, including directionality, infinity, light, the society, where inside the mosque represents outside. The community of the mosque expands to encompass the entire city when needed, reinforced by the sense of collective identity and deep roots that link spiritual life to urban life (Al-Obeidi, 2016, pp. 161).

5. Classical Mosques – It is a group of historical mosques that have adopted ancient traditional techniques and distinguished by its classical elements (dome, minaret, saucer, chapel, mihrab) and influenced by the arts of the countries ruled by the Islamic state in the period (7–13thAD), for example:
 - (a) The Andalusian-Moroccan style (Mosque of Cordoba): The square or rectangle of the chapel, the use of stone in the building, attention to the middle hall, only one or two domes above the middle gallery, the hollow mihrab or the horseshoe, the ceiling of the wooden gables, the square minarets, the massive gates and the thick walls, mosaic decorations and mosaics (Al-Khafaji, 2017, pp. 16).
 - (b) The Safawia style (Mosque in Isfahan): High-density ions, stone in construction, open saucer, large and rigid, high conical domes, Chinese ceramic decorations, huge walls, large gates, rectangular layout, the presence of four large octagonal capitals (Khufaji, 2017, p. 16).

- (c) Ottoman style with central dome (Sultanahmet Mosque or Blue Mosque): An open rectangular dish, similar to the Muhammed style, surrounded by four corridors covered with small domes, qiblah gallery is covered with a large medallion dome based on large spherical triangles and on four pillars and is supported by a group of semi-domes.
- (d) The Seljuk-style Mughal (Indian) with three domes (Friday Mosque in Delhi): Influenced by ancient Indian methods, stone construction, the existence of three domes and a front yard wide, the overall shape of the mosque rectangular and the ceilings with graceful columns rich in decoration and carrying domes.

RESULTS

The results of the questionnaire axes showed the following.

1. Results of the general questions axis – Associated with age, gender, education, country, spatial relationship with the mosque, societal influences and childhood memories, where the results showed that the ages (19–25) were the most interactive and by 17.89% of the rest of the ages. Higher degree holders were the most active and accounted for 34% of the participants. All respondents refrained from answering questions (Q4, Q5, Q8, Q9), which are related to nationalism and religion, their spatial relationship to the mosque and their observations of violent incidents, which is related to a general culture; therefore questions have been neglected as shown in Table 1.
2. Results of the axis of the stereotype roots and the interpretative and psychosocial features of the stereotype – it is an axis linked to the roots of the stereotype, unconscious associated, memory race, and the effects of society and politics, as shown in Table 2, as follows:
 - (a) The results show that (47%) of the society has increased their fear of the mosque after September 11 and (48%) because of the effects of society and general ideology and (52%) on the impact of education since childhood.
 - (b) (24%) percent of the compound is afraid of seeing the dome and (20%) of them are afraid of prayer space (27.5%) of them fear the effectiveness of prayer and (26.5%) of them fear religious speeches.

- (c) All respondents refrained from answering question Q10, which is linked to the influence of politicians and public policy in the country by establishing phobia and the results of the question were neglected.
- 3. The academic features of stereotypical (Question concerning the following mosques) – A focal point linked to the changing stereotype of the mosque (as a result of the use of modern technology by using materials and design methods), in the sense (fear and phobia or reassured and peace, matches the mosque with country's culture, mosque culture as a place for socializing and love between people and cultural enrichment or a radical way of thinking in Western country), as detailed in Tables 3, 4, 5, 6, 7, 8.

The results of the previous three axes were analyzed using the SPSS program and the following tests were carried out:

1. Through reliability statistics: It was found 0.99, which is high.
2. The first hypothesis test: Through the use of correlation and stepwise regression test, and analyze the relationship of independent factors with each other, as well as with the dependent factors on the other side. It was taken questionnaire responses from (strongly agree, agree, agree to a certain extent unsure). We exclusion of the remaining indicators, also selected fifty (50) random sample, and show the following results:
 - (a) Through the use of correlation test to factors which affect on the stereotype such as (sex, age, consciousness, country culture, community influences and memory race, family influences and childhood memories, mosque culture, and September 11 events). They affect each other with positive relations and significance level. The factors [awareness (Q3), the culture of the country (Q6), the events of September 11 (Q11), and community impact (Q12)] formed higher correlations and effects on other independent factors, as shown in Figure 2.
 - (b) Through use stepwise regression testing to analyze the relationship of independent and dependent factors, show that the mosque spatial relationship factors (Q7) and the country culture (Q6) are the highest influence on the identification of the mosque stereotype. Then consciousness (Q3), the September 11 events (Q11), and effects of childhood memories (Q13). Whereas fewer

effects of factors age (Q2), sex (Q1), and community impact (Q12) with other factors but all these relations have significance level.

3. The second hypothesis test: Through use the One-Sample test. It was taken respondents answer the questionnaire who feel (fear and phobia or reassured and peace, matches the mosque with country's culture, mosque culture as a place for socializing and love between people and cultural enrichment or a radical way of thinking in Western country) from (strongly agree, agree, agree to a certain extent unsure). For 50 random samples. The hypothesis has been tested in the level (90, 80, 85, 70, 60, and 65). The results are shown adoption of technology is contributes to Reduce the feeling of phobia by 15-30%, also the first and third model is considered the most efficient in achieving the hypothesis as Table 9.10 shows.

CONCLUSION AND FINDINGS

1. The events of September 11 are not the main influence and most powerful factor in enhancing the sense of Islamophobia, but the mosque spatial relationship factor and the country culture are the highest influence on the identification of the mosque stereotype. Then consciousness, the September 11 events, and effects of childhood memories. Whereas fewer effects of factors age, sex, and community impact with other factors but all these relations have significance level (Figure 15).
2. The most enhancing Islamophobia to the Western recipient are the elements of the dome and the prayer space and effectiveness of prayer and religious speeches.
3. The adoption of the technological base in the mosque architecture effectively contributes to reducing the phobia in the Western society by 15-30% and strengthens the vision of Islam as an open culture that is not closed and ideologically believes in communication and dialogue. The Historicism type No.1 and Unfamiliar Mosque type No.3 is the best of sending this message to the Western recipient.

RECOMMENDATIONS

1. Revisit the elements and mosques functions in Western society and revive the activities that were practiced in mosques (such as place of science seminars on religion, life and society, and a place of guidance

and education) and the return of the bright image that was enjoyed by the mosque previously, where the actual mosque existing in the Western countries is the main factor in the emergence of the concept of Islamophobia phenomenon and a stronger influence of the effects of society and memory of race and the consequences of the unconscious.

2. Adoption of modern technology in the construction of mosques in the West to deal with the cultures of these populations and is considered the Historicism type No.1 and Unfamiliar Mosque type No.3 is the best of sending this message to the Western recipient.

APPENDIX

Figures

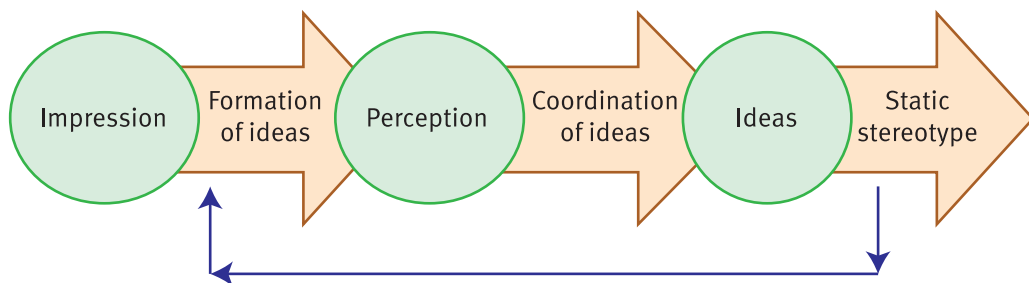


FIGURE 1

The stereotype as a result of the three elements, according to Gordon Allport.



FIGURE 2

Type 1 – Example No.1: Transplanted Mosque (Al-Farooq Umar Ibn Khattab Mosque).

Retrieved from <https://gulfupload.com/1z16mij0pmgv>



FIGURE 3

Type 1 – Example No. 2: Transplanted Mosque (Sheikh Zayed Mosque).

Retrieved from <https://gulfupload.com/27si8jj8o4wa>



FIGURE 4

Type 2 – Example no. 3: Hybrid Mosque (Penzberg Islamic Forum).

Retrieved from <https://gulfupload.com/117mi9h49a55>

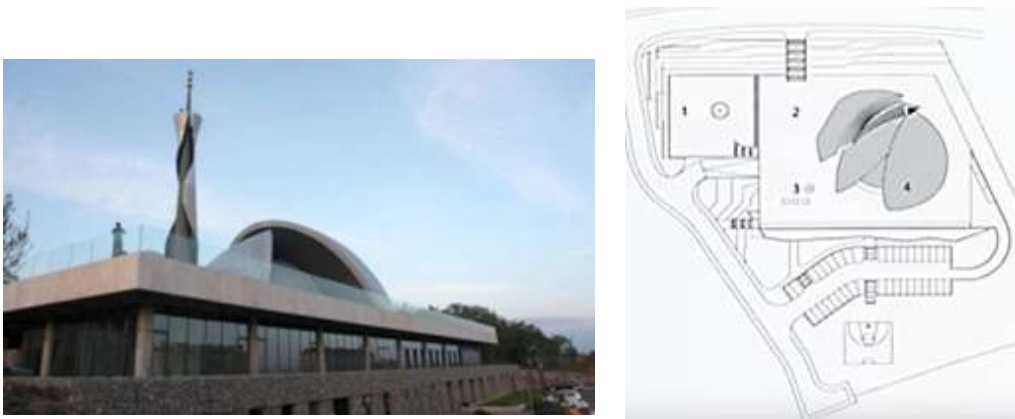
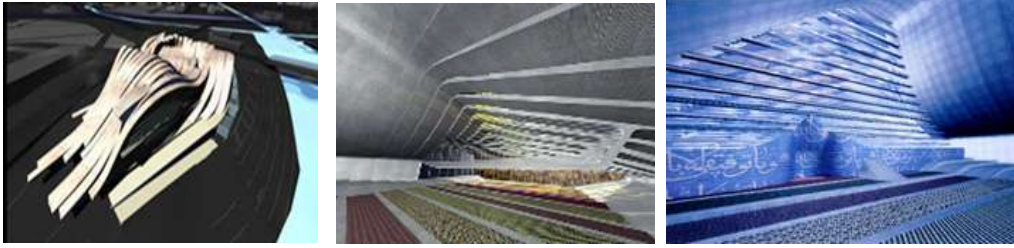


FIGURE 5

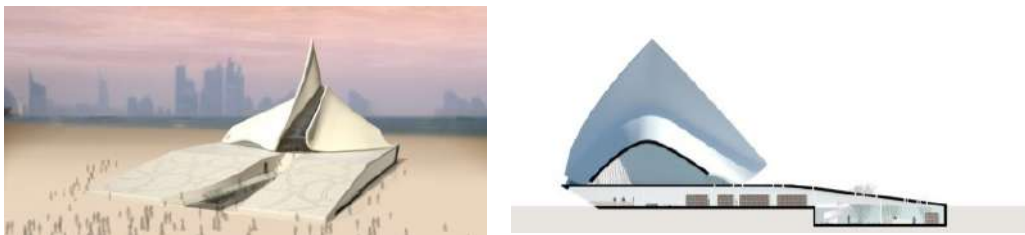
Type 2 – Example No. 4: Hybrid Mosque (Islamic Center In Rijeka-Croatia).

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**FIGURE 6**

Type 3 – Example No. 5: Unfamiliar Mosque (Strasbourg Mosque).

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**FIGURE 7**

Type 3 – Example No. 12: Unfamiliar Mosque (Shuaa Light Mosque in Dubai).

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**FIGURE 8**

Type 4 – Example no. 6: Non-physical form mosque (Cave Mosque).

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**FIGURE 9**

Type 4 – Example no. 7: Non-physical form mosque (the Vanishing Mosque).

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FIGURE 10

Type 5 – Example No. 8: Classical Mosque (Mosque of Cordoba, Spain 784 AH-1236 CE) (Hoteit, 2015, pp. 13551),

Retrieved from <https://gulfupload.com/zowugyuleu65>



FIGURE 11

Type 5 – Example No. 9: Classical Mosque (James Mosque of Isfahan/Iran Seljuk Mosques, style 8th century AD, with four-player hall architectural style and four gates face to face). (Abdollahnejad, 2015, pp. 55; Hoteit, 2015, pp. 13552; Saoud, 2002, pp. 7,

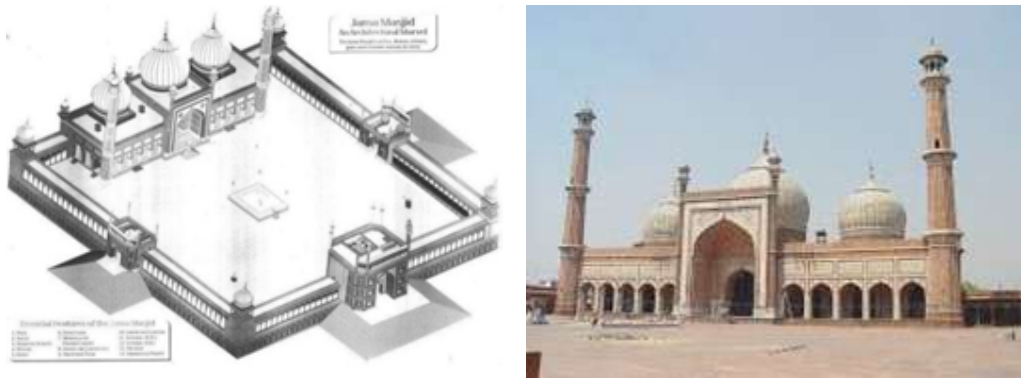
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FIGURE 12

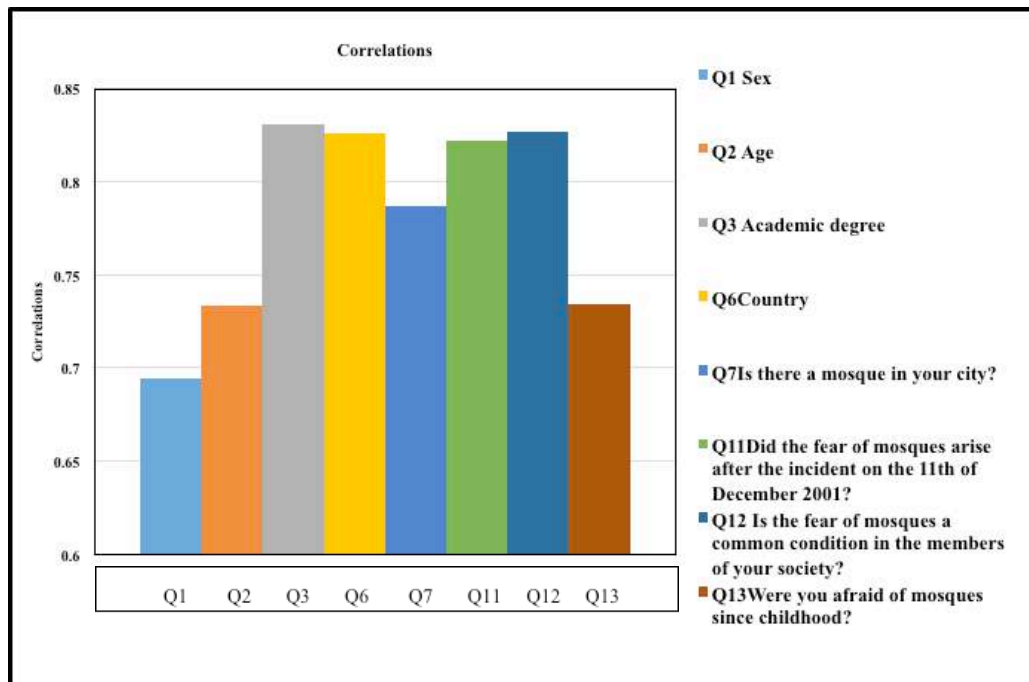
Type 5 – Example No. 10: Classical Mosque (Sultan Ahmet Mosque (Blue Mosque) Istanbul, Turkey (1616 AD). (Hoteit, 2015, pp. 13551; Saoud, 2002, pp. 7.

Retrieved from <https://gulfupload.com/pftjp2w0ulrf>

**FIGURE 13**

Type 5 – Example No. 11: Classical Mosque (Masjid Jamaa in Delhi 1656 CE).
Hoteit, 2015, pp. 13552,

Retrieved from <https://gulfupload.com/sxa2ihd5rl6h>



**Correlation is significant at the 0.01 level (2-tailed).

FIGURE 14

The analysis results of the relationship among independent variables with each other.

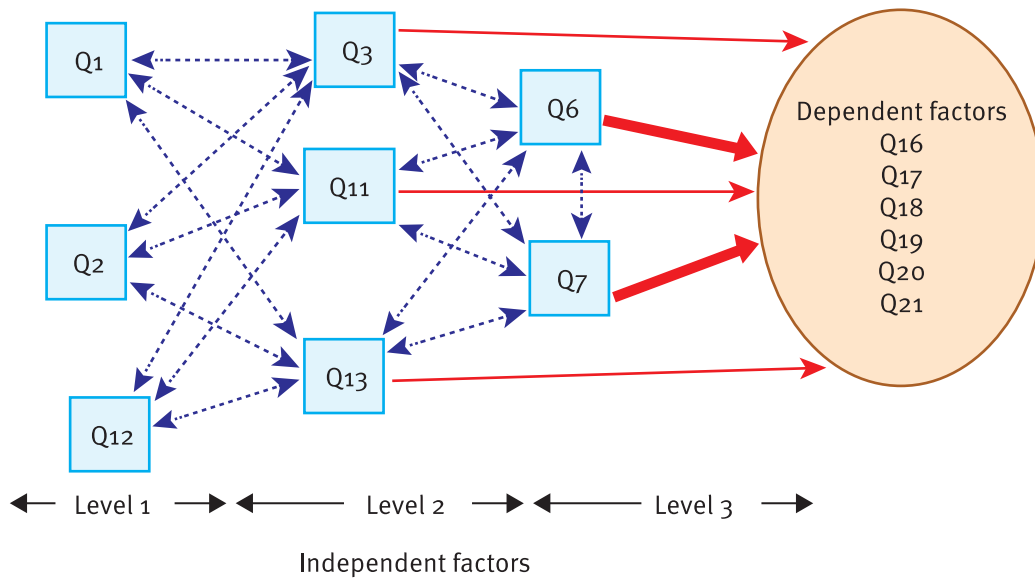


FIGURE 15

The relationship among independent and dependent variables and levels of influence for independent variables.

Tables

TABLE 1

Results of the questionnaire for the general axis.

Q6: Country%		Q3: Academic degree%		Q2: Age%		Q1: Sex%	
USA	24.94	Secondary	32.72	12–18	16.18	Male	50.68
France	23.94	College	33.17	19–25	17.89	Female	49.32
Germany	23.5	Post-graduate education	34.11	26–35	16.44		
Holland	27.27			36–45	16.39		
				46–65	15.28		
				More than 65	17.72		
Q9: Have you seen or heard of any frightening acts in your city's mosque?*		Q8: Have you visited a mosque before?*		Q7: Is there a mosque in your city?		%	
Q4: Nationality*		Q5: Religion*		Yes		32.72	
				No		33.78	
				There used to be		33.5	

* 4,5,8 & 9 Questions have been neglected.

TABLE 2 Results of a questionnaire dedicated to the stereotype roots which linked with unconscious consequences, memory race, and community influences.

No.	Questions	Yes %	No %
Q10	Do the fear from Islam "Islamophobia" as a result of politician's speeches in your country?	/	/
Q11	Did the fear of mosques arise after the incident on the 11th of September 2001?	47	53
Q12	Is the fear of mosques a common condition in the members of your society?	48	52
Q13	Were you afraid of mosques since childhood?	52	48
Q14	Do you feel frightened when looking at: The prayer niche The dome Minaret The main yard for the mosque The prayer space	19% 24% 19% 18% 20%	
Q15	Which activities at the mosque scare you the most: Prayer Sound of the adzan When people gather to pray Religious speeches	27.5 24 23 26.5	

*Q10 have been neglected

TABLE 3 The relationship among independent factors with each other and with the dependent factor (feel reassured when seeing the mosque) for each of the proposed patterns in the research sample.

Q.NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q16TYPEAV	Pearson Correlation	.445	.371	.517	.282	.275
	Sig. (1-tailed)	.001	.004	.000	.024	.027
Q16TYPE1	Pearson Correlation	.427	.372	.514	.290	.268
	Sig. (1-tailed)	.001	.004	.000	.021	.030
Q16TYPE2	Pearson Correlation	.428	.367	.531	.261	.298
	Sig. (1-tailed)	.001	.004	.000	.034	.018
Q16TYPE3	Pearson Correlation	.428	.367	.500	.270	.309
	Sig. (1-tailed)	.001	.004	.000	.029	.015
Q16TYPE4	Pearson Correlation	.433		.471		.309
	Sig. (1-tailed)	.001		.000		.015
Q16TYPE5	Pearson Correlation	.448	.368	.501		.315
	Sig. (1-tailed)	.001	.004	.000		.013
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 4 The relationship among independent factors with each other and with the dependent factor (feel afraid when seeing the mosque) for each of the proposed patterns in the research sample.

Q. NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q17TYPEAV	Pearson Correlation	.451	.378	.543	.245	.280
	Sig. (1-tailed)	.001	.003	.000	.043	.024
Q17TYPE1	Pearson Correlation	.376		.397		.258
	Sig. (1-tailed)	.004		.002		.035
Q17TYPE2	Pearson Correlation	.436	.371	.531	.261	.298
	Sig. (1-tailed)	.001	.004	.000	.034	.018
Q17TYPE3	Pearson Correlation	.443		.509	.316	.248
	Sig. (1-tailed)	.001		.000	.013	.041
Q17TYPE4	Pearson Correlation	.426	.381	.525	.280	.245
	Sig. (1-tailed)	.001	.003	.000	.024	.043
Q17TYPE5	Pearson Correlation	.435	.376	.521	.281	.259
	Sig. (1-tailed)	.001	.004	.000	.024	.035
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 5 The relationship among independent factors with each other and with the dependent factor (the mosque is the example of matches with the country's culture) for each of the proposed patterns in the research sample.

Q. NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q18TYPEAV	Pearson Correlation	.433	.347	.493	.292	.292
	Sig. (1-tailed)	.001	.007	.000	.020	.020
Q18TYPE1	Pearson Correlation	.423	.364	.514	.287	.271
	Sig. (1-tailed)	.001	.005	.000	.022	.028
Q18TYPE2	Pearson Correlation	.437	.360	.510	.307	.254
	Sig. (1-tailed)	.001	.005	.000	.015	.037
Q18TYPE3	Pearson Correlation	.426	.364	.509	.295	.303
	Sig. (1-tailed)	.001	.005	.000	.019	.016
Q18TYPE4	Pearson Correlation	.427	.361	.517	.298	
	Sig. (1-tailed)	.001	.005	.000	.018	
Q18TYPE5	Pearson Correlation	.430	.364	.505	.303	.295
	Sig. (1-tailed)	.001	.005	.000	.016	.019
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 6 The relationship among independent factors with each other and with the dependent factor (a mosque is a place for socializing and love between people) for each of the proposed patterns in the research sample.

Q. NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q19TYPEAV	Pearson Correlation	.433	.357	.496	.248	.316
	Sig. (1-tailed)	.001	.005	.000	.041	.013
Q19TYPE1	Pearson Correlation	.423	.379	.517	.297	.246
	Sig. (1-tailed)	.001	.003	.000	.018	.042
Q19TYPE2	Pearson Correlation	.428	.367	.500	.270	.309
	Sig. (1-tailed)	.001	.004	.000	.029	.015
Q19TYPE3	Pearson Correlation	.450	.379	.526	.239	.288
	Sig. (1-tailed)	.001	.003	.000	.047	.021
Q19TYPE4	Pearson Correlation	.436	.371	.531	.261	.298
	Sig. (1-tailed)	.001	.004	.000	.034	.018
Q19TYPE5	Pearson Correlation		.261	.328		.278
	Sig. (1-tailed)		.034	.010		.025
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 7 The relationship among independent factors with each other and with the dependent factor (feeling that the mosque is a cultural enriching) for each of the proposed patterns in the research sample.

Q. NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q20TYPEAV	Pearson Correlation	.446	.374	.532	.259	.281
	Sig. (1-tailed)	.001	.004	.000	.035	.024
Q20TYPE1	Pearson Correlation	.426	.381	.525	.280	.245
	Sig. (1-tailed)	.001	.003	.000	.024	.043
Q20TYPE2	Pearson Correlation	.434	.371	.513	.254	.307
	Sig. (1-tailed)	.001	.004	.000	.037	.015
Q20TYPE3	Pearson Correlation	.421	.373	.522	.305	
	Sig. (1-tailed)	.001	.004	.000	.016	
Q20TYPE4	Pearson Correlation	.431	.375	.524	.273	.266
	Sig. (1-tailed)	.001	.004	.000	.027	.031
Q20TYPE5	Pearson Correlation	.451	.378	.543	.245	.280
	Sig. (1-tailed)	.001	.003	.000	.043	.024
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 8 The relationship among independent factors with each other and with the dependent factor (a sense that the mosque is a source of radical ideas) for each of the proposed patterns in the research sample.

Q. NO.	Correlation	Q3	Q6	Q7	Q11	Q13
Q21TYPEAV	Pearson Correlation	.426	.352	.482	.263	.318
	Sig. (1-tailed)	.001	.005	.000	.032	.012
Q21TYPE1	Pearson Correlation	.426	.352	.482	.263	.318
	Sig. (1-tailed)	.001	.005	.000	.032	.012
Q21TYPE2	Pearson Correlation	.423	.379	.517	.297	.246
	Sig. (1-tailed)	.001	.003	.000	.018	.042
Q21TYPE3	Pearson Correlation	.434	.367	.515	.284	.292
	Sig. (1-tailed)	.001	.004	.000	.023	.020
Q21TYPE4	Pearson Correlation	.452	.340	.504	.318	.263
	Sig. (1-tailed)	.000	.005	.000	.012	.032
Q21TYPE5	Pearson Correlation	.449	.374	.528	.266	.273
	Sig. (1-tailed)	.001	.004	.000	.031	.027
Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).						

TABLE 9 Shows (T-Test one sample) test results for selected samples (65-90%).

Q. 16	90%	85%	80%	75%	70%	65%	Q.17	90%	85%	80%	75%	70%	65%
TYPE1	.000	.015	.765	.059	.000	.000	TYPE1	.000	.002	.216	.398	.005	.000
TYPE2	.000	.001	.093	.969	.108	.002	TYPE2	.000	.001	.186	.372	.003	.000
TYPE3	.000	.001	.088	.962	.106	.002	TYPE3	.000	.076	.654	.009	.000	.000
TYPE4	.000	.000	.009	.705	.058	.000	TYPE4	.000	.037	.967	.045	.000	.000
TYPE5	.000	.000	.012	.336	.515	.027	TYPE5	.000	.017	.767	.068	.000	.000
Q. 18	90%	85%	80%	75%	70%	65%	Q.19	90%	85%	80%	75%	70%	65%
TYPE1	.000	.001	.244	.226	.001	.000	TYPE1	.000	.055	.838	.021	.000	.000
TYPE2	.000	.046	.844	.018	.000	.000	TYPE2	.000	.001	.173	.352	.002	.000
TYPE3	.000	.002	.380	.137	.000	.000	TYPE3	.000	.001	.037	.448	.544	.052
TYPE4	.000	.318	.226	.001	.000	.000	TYPE4	.000	.001	.093	.969	.108	.002
TYPE5	.000	.004	.538	.081	.000	.000	TYPE5	.000	.000	.009	.705	.058	.000
Q. 20	90%	85%	80%	75%	70%	65%	Q.21	90%	85%	80%	75%	70%	65%
TYPE1	.000	.000	.117	.516	.005	.000	TYPE1	.000	.055	.838	.021	.000	.000
TYPE2	.001	.156	.494	.007	.000	.000	TYPE2	.000	.004	.183	.733	.047	.000
TYPE3	.000	.010	.593	.111	.000	.000	TYPE3	.000	.037	.850	.015	.000	.000
TYPE4	.000	.002	.216	.398	.005	.000	TYPE4	.000	.005	.428	.179	.001	.000
TYPE5	.000	.037	.967	.045	.000	.000	TYPE5	.000	.000	.106	.497	.004	.000
Sig. (2-tailed) ≥ 0.05 Achieve Hypothesis													

TABLE 10 Shows weights weighting which the researcher assumed for the model according to the level of verification of the hypothesis 85–70%.

Weighting*	85% 4 Excellent	80% 3 good	75% 2 medium	70% 1 Bad	Total number of weights = 60		
Weighting**	85% 1 Bad	80% 2 medium	75% 3 good	70% 4 Excellent			
Q. NO.	Q16 *	Q17 **	Q18 *	Q19 *	Q20 *	Q21 **	Σ#\60
TYPE1	5	9	5	7	3	5	34
TYPE2	6	5	3	5	6	3	28
TYPE3	6	6	5	3	9	5	34
TYPE4	6	2	7	6	5	2	28
TYPE5	3	5	5	6	6	6	31
Σ50	24	27	25	27	29	22	

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AN EMPIRICAL CLASSIFICATION OF COST OVERRUN IN INFRASTRUCTURE PROJECTS TO UNDERSTAND THE IMPACT OF SAUDI BUILDING CODE

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INTRODUCTION

COST overruns in infrastructure projects are common around the world. High profile examples include: the Wembley Stadium that experienced a 50% cost overrun; and the Scottish Parliament Building that was over three years late and experienced more than 900% cost overrun³. In Australia, the Western Australian Perth Arena had an original contract value of AUD 168 million, but a cost overrun of more than three times this amount³. According to Flyvbjerg^{2, 4} the average cost overrun for infrastructure large-scale projects could range from 20.4% to 44.7%; and 90% of projects have cost overruns worldwide, also cost overrun is found across 20 nations and five continents. Over the past 70 years, there have been no systematic improvements in cost overrun of infrastructure projects⁵.

Various causes of cost overruns have been identified. Studies have shown that technical factors lead to cost overruns, including lack of experience, project size, mistakes in design, overall price fluctuations, and inaccurate estimations⁶. Love et al.³ conducted a study on the causes of cost overruns via case studies on a hospital and a school. They found that technical factors (such as design errors) are the major causes leading to cost overruns.

On the other hand, according to Flyvbjerg et al.⁷ however, there are two basic reasons why projects experience cost overruns. Firstly, optimism bias encapsulates the systematic propensity of decision makers to be over-optimistic about outcomes of planned actions. Secondly, strategic misrepresentations are the misleading actions used in politicizations and economics, and by planners, to ensure projects proceed⁸. Traditional

estimation practices have been shown to be particularly vulnerable to these detrimental effects, resulting in poor estimation accuracy in previous studies⁹.

It is apparent that there are a large number of causes of overruns and many share similar patterns of impact on overrun costs. Therefore, it will be functionally useful and conceptually meaningful to develop a classification of causes based on their impact on the overruns of infrastructure projects to understand the impact of Saudi Building Code (SBC) compliance on buildings e.g. mosque. We identified the frequent causes through reviewing of empirical literature on the cost overrun of infrastructure projects. Based on the empirical study conducted in Saudi Arabia, a classification/taxonomy of causes has been developed to aid the assessment of cost overrun causes for large infrastructure projects by using cluster analysis. Below, background literature is reviewed and the research method is described. Then, based on the causes identified in the literature review, a classification of causes of cost overrun has been empirically developed. Finally, conclusions are drawn.

RELATED STUDY

Cost is one of the main considerations throughout a project's lifecycle and can be regarded as a significant parameter of a project and the driving force of project achievement. Despite its proven significance, it is not rare to observe a construction project failing to achieve its objectives within the specified, or even the approximate, estimated cost. Cost overruns vary significantly in scale from project to project. Yet, cost overrun is common to infrastructure projects¹⁰. Understanding the causes of cost overruns is critical to the success of infrastructure projects. Past studies have found significant, yet common cost overrun of infrastructure projects.

Pickrell¹¹ carried out a study for the US Department of Transportation covering US rail transit projects with a total value of US\$24.5 billion. The total capital cost overrun for eight of the projects was calculated to be 61% ranging from -10 to +106%. Another study by the Auditor General of Sweden¹², covering 15 road and rail projects, revealed that the average cost overrun of eight road projects was 86%. The range for road projects was from -2 to +182%, while the average cost overrun for the seven rail projects was 17%, ranging from -14 to +74%. Another study by Fouracre et al., carried out for the UK Transport and Road Research Laboratory (TRRL), covered 21 metro systems in developing countries. The outcomes of the study showed that six metro projects had cost overruns above 50%. Two of these projects

range up to 500%. Three had cost overruns in the range of up to 100%, and the remaining four ranged up to 50%.

Skamris and Flyvbjerg¹⁴ conducted a study in Denmark, in which they compared the accuracy of cost estimates on large-scale infrastructure projects. The study considered cost estimates of seven tunnels and bridges before the decision was made to build. The major conclusion from this study is that cost overrun of 50–100% is common for larger infrastructures, and that overruns above 100% are not unusual.

Around the globe, many other researchers have been attracted to cost overrun. Asian and African countries have attracted particular attention. In Southeast Asia, these researchers are: Kaming et al.¹⁵, in Indonesia; Ogunlana et al.¹⁶, in Thailand, Sambasivan; and in Malaysia, Soon¹⁷. Chan and Kumaraswamy¹⁸, Chan and Kumaraswamy¹⁹ and Lo et al.²⁰, studied cost overrun in Hong Kong, and Acharya et al.²¹, studied it from a Korean perspective. Chang²² conducted surveys in the US. In Middle Eastern countries where petroleum and natural gas exports have played an important role in the economy, researchers are: Faridi and El-Sayegh²³ in UAE, Koushki et al.²⁴, in Kuwait.

The studies on causes of overrun have identified a wide spectrum of causes. Frimpong et al.²⁵, identified 26 factors that cause cost overruns in the construction of ground water projects. They found that, according to the contractors and consultants, monthly payment difficulties were the most important cost-overrun factor. Owners, however, ranked poor contractor-management as the most important factor. Although there were some differences in viewpoints among the three groups surveyed, there was a high degree of agreement among them with respect to their ranking of the factors. The overall ranking results indicated that the three groups felt the major issues which can cause extreme groundwater project-cost overruns in developing countries are: monthly payment difficulties; poor contractor management; poor technical performances; material procurement; and escalation of material prices.

In Kuwait, Koushki et al.²⁴, did a study in which cost increases in the construction project was examined. The study found the three most important causes of cost overruns are contractor elide, material related problems and owners' financial constraints. Other studies have identified four of the most important factors that cause cost overruns as: design changes; inadequate planning; unpredictable weather conditions; and fluctuations in the cost of building materials^{26, 27}.

In Africa, Frimponget et al.²⁵, conducted studies in Ghana, as did Mansfield et al.²⁸, and Aibinu and Odeyinka²⁹ in Nigeria. In Vietnam, large-scale projects were studied by Long et al.³⁰, to identify project success factors, and by Long et al.³¹, to identify ordinary and general issues. Regarding these issues, the Vietnamese government declared the infrastructure project cost-overrun issues as the biggest “headache”³² in recent times, especially with government-related funded-projects³².

Skamris et al.³³, concluded that in most previous studies, technical factors such as changes in design and technological innovation could be explained as causes of cost overruns. However, there remains a considerable portion of divergence that cannot be clarified by technological causes alone. In fact, Wachs³⁴ pointed out that the probable cause of cost overruns in infrastructure projects is due to the inaccuracy of cost forecasts. Love et al.³, did a study of the cause cost overruns within two case studies (hospital and school) in Australia. He found that the technical factors (such as design error) are the major issue that lead to cost overruns.

Flyvbjerg et al.⁷, argues about the main causes of the cost overruns. They postulate that these causes affect projects through the life cycle, and are due to misinformation in policy and the management of the project. Why projects experience cost overruns is firstly due to optimism bias (appraisal optimism) that encapsulates the systematic propensity of decision makers to be overoptimistic about outcomes of planned actions. Secondly, they relate to the strategic misrepresentation (lying) that misleads actions used in politicizations and economics, and by planners to ensure the projects proceed. In addition, Flyvbjerg⁹ acknowledges other causes such as project size and location, however, he concludes that optimism bias and strategic misrepresentation are the main causes of cost overrun and thereby he did substantial research, which contributed to improving understanding of the reasons for the infrastructure cost overruns, by collaborating with the optimism bias and strategic misrepresentation.

Kahneman and Tversky⁵ developed the theories of reference class forecasting, Flyvbjerg and COWI³⁵ developed the method for its practical use in policy and planning. They argue that optimism bias and strategic misrepresentation can be measured by a forecasting method “reference class forecasting” (RCF) based on decisions made under uncertainty. By taking the outside view, the RCF approach mitigates optimism bias and strategic representation. Therefore, the RCF technique is by passes human bias by cutting directly to outcomes. It completely ignores the details of the project at hand (e.g. government regulations, the project size, the quality

of the contractor management team, plan changes, priority on construction deadlines, etc.) and it involves no attempt at forecasting the event that influences the project's future course.

As it is appeared in the literature of cost overrun causes there are two main schools of thought; technical school and deception (psychological and political-economic) school. Technical school focus (inside vies) on causes that lead to cost overruns based on how the work is done, these causes are, for example, a lack of experience, the size of the project, mistakes in design, overall price fluctuations, inaccurate estimations, government regulations, the project size, the quality of the contractor management team, plan changes, priority on construction deadlines, completeness and the project information timelines, the experience of the estimators, and bidding conditions; project characteristics, past data on similar types of projects, and the process of estimating.

Deception school developed, which they published various papers on cost overrun causes for infrastructure project and widely received and cited their outcome. The deception school (outside view) causes are optimism bias and strategic misrepresentation. It is clear that the different opinion about the critical factors of the cost overrun is controversial. In addition, the limitation of understanding cost overrun causes creates differences in mitigating the causes effectively. Therefore, it is important to develop a classification of cost overrun causes to reduce the complexity of causes, and to facilitate effective understanding in management of such causes.

RESEARCH DESIGN

Data Collection

The survey method for data collection was used through distributing questionnaires and conducting interviews to classify the causes. The survey was conducted in Saudi Arabia. The construction boom in infrastructure projects, which started in 2005, is expected to go through a period of accelerated growth over the next few years, with a value of projects estimated at US \$629 billion³⁶. On the other hand, there is a lack of research on cost overrun in infrastructure projects in Saudi Arabia in the literature. This study fills this research gap.

The questionnaire was directed towards three groups in both public and private organizations; owners, consultants and contractors, who are involved in infrastructure projects (project managers). There are three main

organizations that dealing with engineers, and contractors and consultants in Saudi Arabia. These organizations are; Saudi Council for Engineers (SCE), Ministry of Municipal and Rural Affairs (MoMRA) and Chamber of Commerce and Industry (CoCI). Their databases were used to distribute the questionnaire and also to gather some information (contact details) about the participants. The sample selected for each of the three groups is described below as: owners comprising the government agency (key decision-makers) responsible for the projects, consultants working in the infrastructure projects (project managers), contractors who are involved in the infrastructure projects (project managers). Because of the limitation number of project managers who involved of infrastructure projects in Saudi Arabia and registered at Saudi Council for Engineers (SCE), also have experience in infrastructure projects, the sample random number targeted in the study was 500 participants.

The selection of the personnel involved in the interviews was based on their knowledge and work experience in managing infrastructure projects. For example, the Regional Director of the Ministry of Higher Education or, and routinely deals with infrastructure projects and is currently managing the operational contracts of university projects within the region. The personnel involved in the interviews then verify the possibility of the cost overrun causes that identified from the literature review, as occurring in the projects.

Survey

Based on comprehensive review of the relevant literature, main cause of cost overrun in infrastructure projects and their relative reflect are measured. The questionnaire poses specific questions to the respondents' most recently completed infrastructure projects (e.g. education, health, transportation, water, and power) with a contract value over 80 million Saudi Riyals (US \$20 million), excluding operation and maintenance cost. The questionnaire consists of three sections: general information about the participant's experience; causes of cost overrun; and the frequency and severity of each of these causes, including the extent of cost overrun, respectively. The questionnaire was distributed online through survey-monkey website in two languages; Arabic and English.

The first section contains questions about participants and their organization, work experience, academic qualifications, the number of projects constructed within 20 years, location of these projects with type of the projects and the experience with cost overruns through that period.

In the second section, the participants were asked to scale the frequency of 41 cost overrun causes using Likert scale response Anchors: [Never (N) = 1, Occasionally (OC) = 2, Sometime (S) = 3, Often (O) = 4, Always (A) = 5]. Furthermore, they were asked to scale the severity of the same causes within the following scale: (No Significant (NS) = 1, some effect (SE) = 2, Moderate (M) = 3, Significant (S) = 4, Extremely Significant (ES) = 5]. They are also asked about their most recent involvement in a project regarding the overall major causes of cost overrun. The last section of the questionnaire elicits general comment in reference to the study.

In parallel, interviews were conducted with 15 key personnel from the industry in order to get their personal opinions and views about the possibility cost overruns causes in infrastructure projects. The questions were asked to the participants were the same questions in the questionnaire. The interviews were conducted with, three project directors, eight project managers and four project managers assistance.

DESCRIPTIVE STATISTICS

Questionnaires were distributed to 500, 391 potential responds were identified from the database. 160 (32%) returned completed questions. 23% of the responds are owners, 52% are contractors and 25% are consultants. According to Akintoye and Fitzgerald³⁷ the respond rate of this study is comparable to 42% of their survey study which is about cost estimating practices in the UK, while Vidogah and Ndekugri³⁸ states that 27% response rate to their survey, improving the management of claims on constriction; and based on Shash³⁹ 28.3% responded rate received, which his study is about factors considering in tendering decision by top UK contractors. Moser and Kalton⁴⁰ claimed that a survey could be considered biased if the response rate is less than 30%.

Regarding the type of infrastructure projects in which the respondents were involved, 35% were in education projects, 25% in health projects, 15.5% in mosques projects, 13% in water projects and 11.5% in power projects. The cost overrun in infrastructure projects for each type of project in Saudi Arabia is based on all projects that participants' organizations have been involved in the last 20 years: (4,146) health projects, (2,350) power projects, (2,410) water projects, (2,020) education projects, and (1,510) mosques projects. The average value of these projects is around US \$300bn and the max is around US \$621bn. This would be given a measure of the confidence that the data was representative most of infrastructure investment. This indicated that there is a growth in infrastructure budget in Saudi Arabia.

The average age of respondents is 40 years old and over. Most respondents have bachelor degree (58.8%) while the lowest respondents have diploma (6.9%). The respondents that have postgrad qualification come second with (34.4%). There are 36% of respondents have experience in infrastructure project over than 10 years.

The average cost overrun of power and health projects is 60%, mosques and water projects is 40% and education projects overall cost overrun is 30%. The responsibility of occurring the cost overrun in infrastructures are; 44% owners, 34% contractors, 20% consultants and 2% third party (e.g. other stockholders, changing of government regulation).

The top 10 causes were reported ranked by the computation of importance index are:

1. market conditions (materials and labors),
2. design changes,
3. practice of assigning contract to lowest bidding,
4. delays (in decision making and approval of drawings),
5. design error,
6. deficiencies in the infrastructure,
7. additional works and rework,
8. slow payment of completed works,
9. change in the scope of the project; and
10. changes in material specification and type.

TABLE 1
Ranking of cost overrun causes based on their importance in Saudi Arabia.

Causes of cost overrun	Coefficients	Overall	
		Ra	Il
Market conditions (materials and labor)	0.295	1	3.98
Design changes	0.257	2	3.85
Practice of assigning contract to lowest bidder	0.232	3	3.82
Delays (decision making, in approval of drawings, material delivery)	0.248	4	3.80
Design error	0.199	5	3.54
Deficiencies in the infrastructure	0.175	6	3.53
Additional work and rework	0.186	7	3.52
Slow payment of completed work	0.121	8	3.49

Change in the scope of the project	0.139	9	3.44
Changes in material specifications and type	0.138	10	3.42
Shortage of site workers	0.102	11	3.25
Incorrect planning and scheduling by contractors	0.086	12	3.24
Cash flow during construction	0.053	13	3.16
Inadequate specifications	0.055	14	3.14
Obstacles from government	0.051	15	3.07
Unrealistic contract duration and requirements imposed	0.053	16	3.05
Lack of experience of project (e.g., location, type)	0.051	17	3.02
Lack of constructability	0.048	18	2.96
Strategic misrepresentation	0.050	19	2.94
Project size	0.049	20	2.91
Inflation	0.042	21	2.88
Laws and regulatory frameworks	0.045	22	2.86
Failure to price in certain risks	0.043	23	2.79
Contractor's poor site management and supervision skills	0.040	24	2.78
Monthly payment difficulties from agencies (e.g., contractor, owner)	0.037	25	2.76
Late delivery of materials and equipment	0.036	26	2.67
Waste on site	0.034	27	2.66
Political complexities	0.029	28	2.65
Labor, insurance, work security or workers' health problems	0.021	29	2.64
Deficiencies in cost estimates prepared by public agencies	0.024	30	2.60
Poor financial control on site	0.030	31	2.55
Fraudulent practices	0.022	32	2.53
Equipment availability and failure	0.020	33	2.47
Optimism bias	0.019	34	2.43
Inadequate modern equipment (technology)	0.018	35	2.40
Site constraints	0.013	36	2.35
High interest rates charged by bankers on loans	0.015	37	2.27
Weather conditions	0.010	38	2.23
Fluctuations in monetary exchange rate	0.005	39	2.20
Social and culture impact (e.g., problems with neighbours)	0.009	40	2.10
Heritage material discovery	0.006	41	1.52

Note: II = Importance Index, Ra = Rank from 1 to 41; sample included 37 owners, 83 contractors and 39 consultants.

CLUSTER ANALYSIS

Cluster Analysis (CA) or clustering is a statistical method that consists in assigning a set of several objects into groups (called cluster) so that the objects in the same cluster are more similar to each other than to those in other clusters, because the number of groups is usually unknown before the analysis. Clustering involves several distinct steps. The most important steps are the definition of a suitable distance between objects to measure their closeness or similarity, and the choice of a clustering algorithm that will be applied on the data. In this way, it needs to answer the following questions: "How do we define closeness or similarity?", "How do we group cost overrun causes?", "How do we validate the groups given by the clustering algorithm?", and to finish, "How do we visualize and define these groups?" The clustering process consists four steps: preparing the data, determining the number of clusters, testing the cluster solution hierarchal cluster and validating. R project (version 3.0.2) for statistical computing and graphics is used for the analysis.

The raw data contains 160 observations and 41 variables (causes). These data are 1 to 5 (by ordinal scale), which will be used to measure the closeness in terms of impact on cost overrun. In addition, there are many clustering investigations that have starting point with the data, which is an $n \times n$ one-mode matrix that reflects a quantitative measure of closeness⁴¹. Therefore, a data matrix to measure the distance and similarity (proximity) between causes is needed.

Kendall's Tau correlation matrix is used as data collected in this study is ordinal, in R function (cor) was used as correlation plot as showed in Figure 1. The sign of the correlation coefficient defined on the range "-1 < r +1" measures the relationship. The value "1" reflects a stronger positive relationship and the value "-1" reflects a stronger negative relationship, which measures the correlation between two sets of ranking and the equation is written as:

$$T_{jk} = \frac{S_{jk}}{(0.5)(p)(p-1)} \quad (1)$$

Where; T_{jk} = Kendall's Tau correlation coefficient,
 S_{jk} = the accumulated value concordant pairs – discordant pairs),
 P = the number of rows in the data.

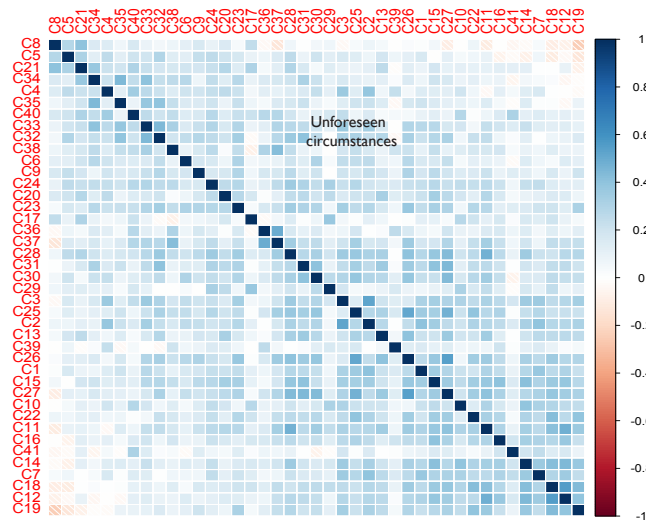


FIGURE 1
Correlation matrix.

After the data prepared and the method has been chosen, it requires standardize each variable to reduce bias. This is because to remove arbitrary affect on similarities among objects and to make attribute contribute more equally to the similarities among each variable. To standardize a variable, for each observation, the mean divided it by the standard deviation. In R, there is a function (scale) that will do standardize as explained in equation 2. This will make the sample has mean 0 and standard deviation 1. These methods were suggested by Art and Gnanadesikan⁴¹.

$$z = x - \mu/\sigma \quad (2)$$

Where, z = z score, x = measured value,
 μ = mean, and σ = standard deviation.

The determination of number of clustering is based on the data available. Comparing the within sum of squared error (SSE) for each cluster solution (number of clusters) is one of the most common methods of choosing the most appropriate cluster solution. The definition of within SSE is the sum of the squared distance between each object of a cluster and its cluster centroid. Therefore, SSE is the main measure of error. Generally, as the number of clusters increases, the within SSE should decrease because clusters are, by definition, more and more small. A plot of the within SSE against a series of sequential cluster levels can provide a useful graphical way to choose an appropriate cluster level. An appropriate cluster solution

could be defined as the solution when the reduction of within SSE slows dramatically. This produces an “elbow” in the plot of within SSE against cluster solutions. In the plot shown below (Figure 2), there is an “elbow” at the 4 cluster solution suggesting that solutions over 4 clusters do not have a substantial impact on the total SSE. Therefore, the “elbow” in the plot is extreme and using hierarchical clustering will test that.

$$SSE = \sum_{i=1}^n (y_i - \bar{y})^2 \quad (3)$$

Where; SSE = sum of square error, y_i = observations and \bar{y} = mean

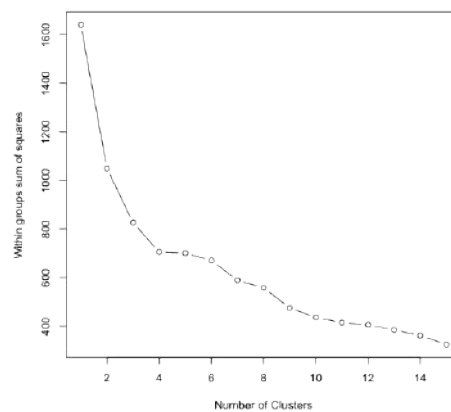


FIGURE 2

Elbow plot for the cluster determination.

The next step is testing the cluster solution using hierarchal cluster. The reason why the study selects hierarchal cluster is because it can test the cluster solution, which is different from K-means clustering that needs to specify the cluster solution before start the analysis. This means that hierarchal cluster does not require knowing or specifying the number of cluster, which will specify the number of clustering when it performed.

Hierarchical clustering procedures characterized by a tree-like structure built during the analysis. Most hierarchical techniques fall into a category called agglomerative clustering. In this category, clusters are consecutively formed from objects. Initially, this type of procedure starts with each object representing an individual cluster. These clusters are then sequentially merged according to their similarity⁴¹. First, the two most dis/similar clusters (i.e., dissimilarity are those with the smallest distance between them similarity are those with the biggest distance between them) are merged to form a new cluster at the bottom of the hierarchy. Examples of distance measure are Euclidean, Manhattan, or Correlation distance. In the next

step, another pair of clusters is merged and linked to a higher level of the hierarchy and so on until all the observations are in the same cluster. In this way, we need to choose a criterion to determine how elements are merged, that depends on the cluster structure. The main linkage criteria used are Single, Complete, Average and Ward's linkage. This allows a hierarchy of clusters to be established from the bottom up. I therefore concentrate on the agglomerative clustering procedures. However, before we discuss these, the study needs to define how similarities or dissimilarities are measured between pairs of objects.

Select a Measure of Dissimilarity or Distance; the most straightforward and generally accepted way of computing distances between objects in a multi-dimensional space is to compute Euclidean distances to generate a dissimilarity matrix, which depends on information value and the nature of the variables describing the objects to be clustered. Hence, in this analysis, the study chooses the Euclidean distance method⁴¹. The Euclidean distance is the square root of the sum of the squared differences in the variables' values.

$$D_{\text{Euclidean}}(A, B) = \sqrt{(X_a - X_b)^2 + (Y_a - Y_b)^2} \quad (4)$$

Select a Clustering Algorithm; after having chosen the distance or similarity measure, we have to decide which clustering algorithm will be applied⁵¹. Recommended to use "unweight pair-group method using arithmetic averages" (UPGMA) which is same as "average" agglomerative method for ordinal data. This method is very efficient and widely used⁴¹. The average or UPGMA method considers only distances between pairs of groups in different clusters. The distance of two clusters "x", "y" is defined as the average distance between any one element of "x" and any one element of "y". This method can be used with any kind of dis/similarity or distance measure between groups. This method is implemented in the function `hclust()`, included with the base distribution of R. Figure 3 shows the hierarchical cluster (tree) that generated from R with a four cleans rectangular. Each cluster contains the causes of cost overrun that related to each other in the same cluster.

$$D_{KL} = \frac{1}{n_K n_L} \sum_{i \in C_K} \sum_{j \in C_L} d(x_i, x_j) \quad (5)$$

Where; $d(x_i, x_j)$ is the distance between objects and; K and L are two sets of objects (clusters); n_K and n_L are the numbers of objects in clusters K and L respectively.

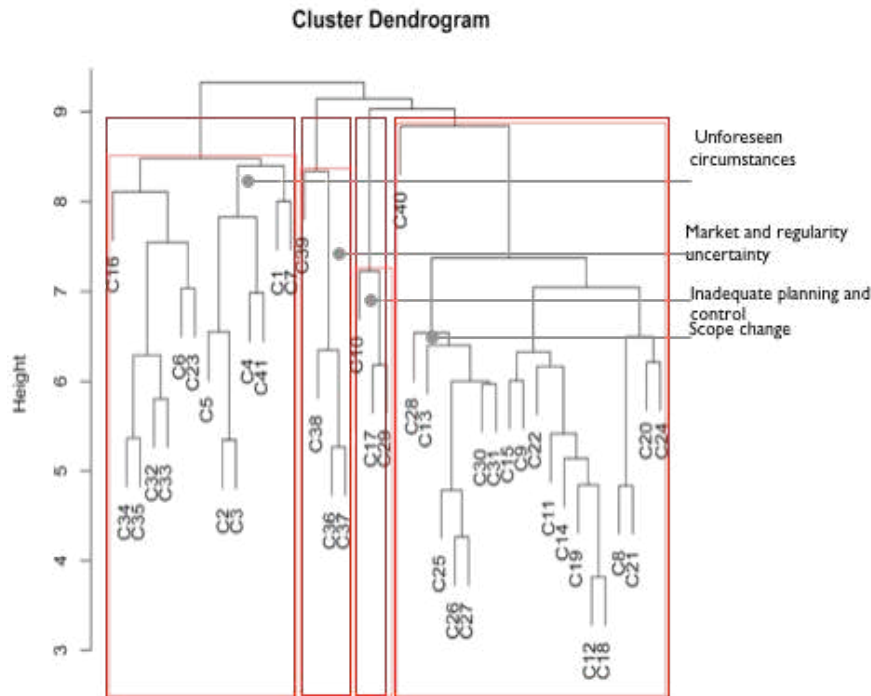


FIGURE 3
Hierarchical clustering (cut tree).

The next step is validation by using p-value. Cluster analysis is a technique to inspect the similarities/dissimilarities between objects. Hierarchical clustering generates a dendrogram, which contains clusters that show the similarities/dissimilarities based on a matrix computed by data. It provides detailed information on the relationships between objects. However, it is not clear how strong these clusters are supported by the data. The question is, "How accurate are these clusters?"

To answer the above question, the pvclust package (pvclust) is used (available in CRAN packages) for a statistical software R⁴³. This package is for assessing the uncertainty in hierarchical cluster analysis. For general statistical problems, pvclust can be used easily. Pvclust calculates probability values (p-values) for each cluster using bootstrap resampling techniques. Bootstrap resampling replicates data by resampling from the data itself. It is randomly chosen observations from the original data with replication^{44–45}. The procedure is repeated many times. There are two types of p-values, which are approximately unbiased (AU) p-value and bootstrap probability (BP) value. AU p-value is computed by multiscale bootstrap resampling, which is a better approximation to unbiased p-value than BP

value computed by normal bootstrap resampling. Therefore, the study measures the accuracy of these clusters as p-values, which ranges from 0 to 1. If the p-value of a cluster (or a hypothesis) is less than α , say smaller than 5%, the cluster is rejected at the α level of significance. That indicates how strong the cluster is supported by data^{46–47}.

In the analysis the number of bootstrap replicates is (nboot) = 10,000 are used to reduce the standard error (SE). Figure 4 shows the dendrogram that generated from the script 5.6, it can be seen in the figure that a four rectangulars have AU value of 0.99 or greater. Therefore, a cluster with AU p-value 0.95, the hypothesis is rejected with significance level 0.01 and 0.0, which indicates how strong the cluster is supported by data. Hence, it suggests having four clusters.

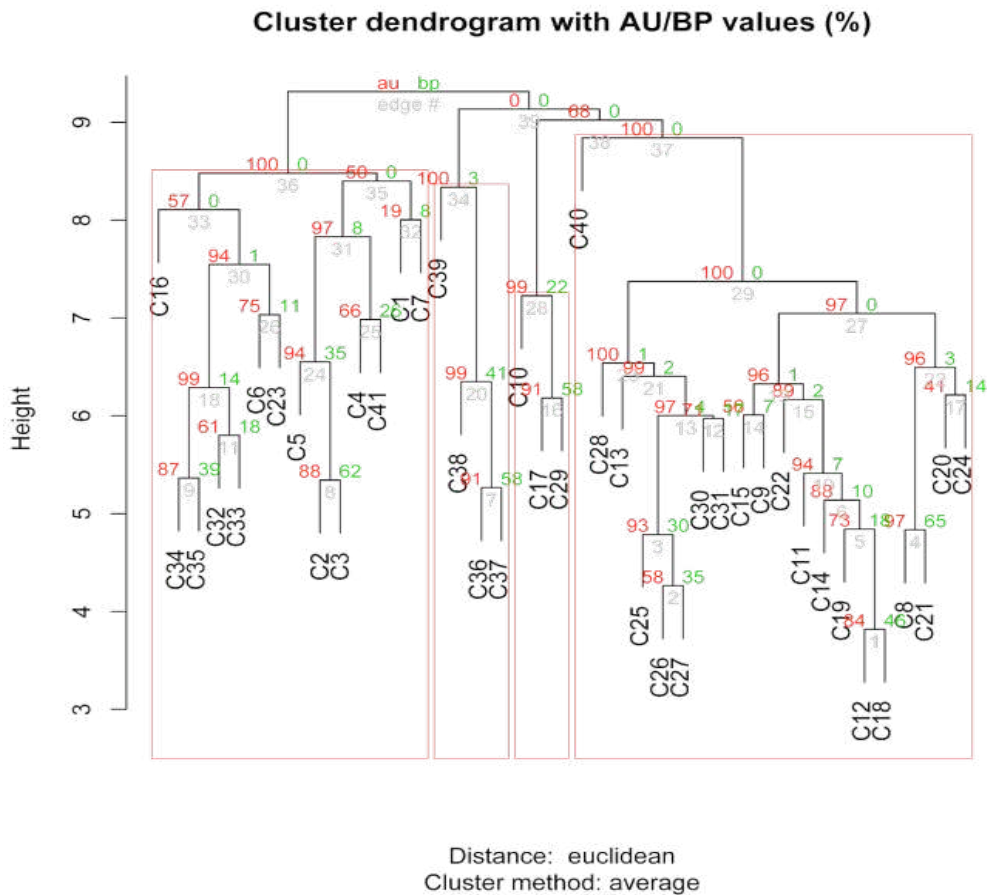


FIGURE 4

Hierarchical clustering, Values at branches are AU p-values (left), BP values (right), and cluster labels (bottom). Clusters with AU ≥ 95 are indicated by the rectangles.

TABLE 2
Four-cluster typology scheme for causes of cost overrun.

Typology clusters	Key	Causes of cost overrun	Relationship to cost overrun
Scope changes	C17	Design changes*	Unclear project scope forces project team to take short-cuts, crashing tasks, concurrent tasks/projects, which are known to cause delays and cost overrun (Shenhar and Dvir, 2007)
	C10	Additional work and rework*	
	C29	Change in the scope of the project*	
Market and regulatory uncertainty	C5	Market conditions (materials and labor)*	Increases the volatility of input costs and thus chances of overrun (Pindyck, 1993)
	C41	Practice of assigning the contract to the lowest bidder*	
	C4	Slow payment of completed works*	
	C3	Cash flow during construction	
	C33	Obstacles from government	
	C1	Inflation	
	C35	Laws and regulatory frameworks	
	C16	Failure to price in some risks	
	C2	Monthly payment difficulties from agencies (e.g. contractor, owner)	
	C34	Political complexities	
	C7	Deficiencies in cost estimates prepared by public agencies	
	C32	Fraudulent practices	
	C23	High interest rate charged by bankers on loans	
	C6	Fluctuation in money exchange rate	
Inadequate planning and control	C40	Delays (decision making, in approval of drawings, material delivery)*	Increases the complexity of coordination of parties and tasks, thus making it harder to meet present targets (Baccarini, 1996)
	C21	Design error*	
	C8	Deficiencies in the infrastructure*	
	C20	Changes in material specification and type*	
	C13	Shortage of site workers	
	C18	Incorrect planning and scheduling by contractors	
	C24	Inadequate specifications	

	C14	Unrealistic contract duration and requirements imposed	
	C11	Lack of experience of project manager (e.g. location, type)	
	C28	Lack of constructability	
	C15	Strategic misrepresentation	
	C22	Project size	
	C12	Contractor's poor site management and supervision skills	
	C19	Late delivery of materials and equipment	
	C25	Waste on site	
	C9	Labor, insurance, work security or workers' health problems	
	C27	Poor financial control on site	
	C26	Equipment availability and failure	
	C31	Optimism bias	
	C30	Inadequate modern equipment (technology)	
Unforeseen circumstances	C37	Site constraints	Increases the uncertainty of tasks and outcome, thus making planning and estimating difficult (Ofori, 1992)
	C36	Weather conditions	
	C38	Social and culture impact (e.g. problems with neighbors)	
	C39	Heritage material discovery	

Note: (*) ranked in the top 10 causes. Rank from 1 to 41, sample included 37 owners, 83 contractors and 39 consultants.

DISCUSSION OF RESULT

The determination of cluster number suggested a four clusters solution. The test of cluster level supported four clusters. Each group contains of objects, these objects have relationship between each other. These group are economic uncertainty, uniqueness, pace and complexity.

SCOPE CHANGE

The first cluster group represents the causes of cost overrun due to design changes, additional work and rework, and change in the scope of the project (the three causes based on ranking are C17, C10, and C29) (Figure 4 and Table 2). These causes rank in the top 10 according to importance. Based on three causes that are categorized in this group, the average

importance index (II) of this group is 3.57 and the coefficient average is 0.194 according to Table 1, where the scope change cluster had the greatest effect on cost overrun. The causes in this cluster are related to time, that is, the urgency of the project, namely, how much time there was to complete the job. Forcing the project team to take short-cuts or to work on tasks that clash with other tasks, and working on concurrent tasks and projects are known to cause delays and cost overrun.

In addition, currently in Saudi Arabia, the construction industry is growing rapidly and as a result, the scope and design stage of projects are often not considered carefully enough, which lead to numerous design issues throughout construction. Often the inspection and design approval is also considered poorly with government-funded projects. If the owners are unclear as to the project's scope, this can lead to unrealistic designs, which results in project delays and therefore cost overrun^{22, 20} stated that comprehensive planning and risk assessment are essential at the project outset. A very clearly defined scope leads to an accurate design, which leads to less cost and time¹⁸.

Market and Regulatory Uncertainty

The market and regularity uncertainty cluster group includes cost overrun causes such as inflation, monthly payment difficulties from agencies (e.g., contractors or owners), cash flow during construction, slow payment of completed work, market conditions (materials and labor), fluctuation in money exchange rate, deficiencies in cost estimates prepared by public agencies, failure to price in some risks, high interest rate charged by bankers on loans, fraudulent practices, government obstacles, political complexities, laws and regulatory framework, and the practice of assigning the contract to the lowest bidder (the 14 causes based on the ranking are C5, C41, C4, C3, C33, C1, C35, C16, C2, C34, C7, C32, C23, and C6) (Figure 4 and Table 2). Some of the causes in this cluster are clear (i.e., market conditions, slow payment of completed work, fraudulent practices, fluctuation in exchange rates, etc.). Others are indirect causes (i.e laws and regulatory frameworks, practice of assigning the contract to the lowest bidder, etc.).

Based on 14 causes categorized in this group, the average importance index (II) of this group is 2.98 and the coefficient average is 0.106, according to Table 1, in which market and regularity uncertainty ranked as the second highest influence on cost overrun. These causes relate to the owner, contractor, consultant and third party.

To reduce the outcomes of these causes, the owner, contractor, and consultant must clarify their liability to every party in the agreement. Some of the causes are ranked in the top 10 for their importance to project cost overruns, including market conditions (materials and labor), the slow payment of completed work, and the practice of assigning the contract to the lowest bidder. The causes of cost overrun included in this cluster relate to the chance or speculation that costs will change, whether directly or indirectly. Also, it refers to the possibility that a particular commodity is unstable.

Rapid developments in the construction industry, especially in large projects, mean that a large quantity of materials such as cement, steel and bricks is consumed and there is a dependency on a large workforce. This contributes to the shortage of materials and therefore increases prices. In addition, inflation and speculation on the impact of suppliers on prices of materials, which leads to fluctuations and escalation of prices in most cases, makes it hard to forecast. When there is a boom in projects year after year, there is a need for an increased number of construction workers. However, it is often the case that there is an insufficient supply of skilled workers³². The progress of projects impacts on the quality and productivity of workers, which leads to an increase in the cost of skilled workers. As a result, this leads to inaccurate estimates³¹ stated that the primary responsibility for the poor estimation of project cost lies with the contractor; however, the owner and the consultant also share this responsibility because they should carefully calculate the price of materials and labor before bidding.

Further, many large projects are delayed because the owner is late in paying for work and materials. In Saudi Arabia, the problem of payment delay is not due to insufficient funds but because the owner's payment procedure takes a long time to be approved. Owners should have a clear plan for payment for each project in accordance with the agreement. Also, the owner should carefully consider the existing practice of assigning the contract to the lowest bidder, as this could have a major impact on cost overrun. Consequently, market and regulatory uncertainty can be defined as input cost uncertainty. Input cost uncertainty occurs when the price of labor and materials required to complete a project fluctuate unpredictably, or when government regulations change unpredictably, which leads to increased construction costs^{48, 11}.

Inadequate Market and Regularity

All of the causes in this cluster relate to project planning and control, which comprise the most critical causes of cost overrun in large projects in Saudi

Arabia, as 20 causes are grouped in this cluster (the 20 causes based on the ranking are C40, C21, C8, C20, C13, C18, C24, C14, C11, C28, C15, C22, C12, C19, C25, C9, C27, C26, C31, and C30) and four causes are ranked in the top 10 causes: delays (decision making, approval of drawings, material delivery), design error, deficiencies in the infrastructure, and changes to material specification and type (Figure 4 and Table 2). Based on the 20 causes categorized in this group, the average importance index (II) of this group is 2.96 and the coefficient average is 0.07, according to Table 1, in which inadequate planning and control ranked as the third highest impact on cost overrun. The contractor's poor site management skills and lack of supervision is concerning and common issue in Saudi Arabia. Ensuring there is an adequate supply of trained and knowledgeable workers is extremely important for the success of large projects. The selection of contractors and consultants must be considered carefully³³. Coordination, communication and control of management are also extremely important for construction projects (C11, C12, C14, and C28). Establishing clear communication channels between parties through the utilization of advanced technology to effectively deal with any difficulties arising during implementation will reduce misunderstanding and increase the quality of work. These types of causes of cost overrun represent a dimension that is related to the project manager and project team or how the job is done. Competent project managers and competent project teams play a major role in successful project outcomes. Therefore, incompetent managers increase the complexity of coordinating parties and tasks, making it harder to meet targets. For example, if the project manager has very strong abilities (professional in communication, knowledgeable about many projects, ability to multi-task), it will be very hard for the project team to meet this standard because their experience may not be as diverse, thus this creates a gap where it is harder to meet targets^{31–32}.

Unforeseen Circumstances

The second cluster group represents cost overrun due to weather conditions, site constraints, problems with neighbors, social and cultural impacts and heritage material discovery (the four causes based on the ranking are C37, C36, C38, C39) (Figure 4 and Table 2). Based on four causes that were categorized in this group, the average importance index (II) of this group is 2.10 and the coefficient average is 0.00093 according to Table 1, in which the unforeseen circumstances were ranked as the fourth highest impact on cost overrun. These issues increase the pressure to find a solution to these problems associated with the project site that involve environmental,

social and cultural issues. For example, the increase in environmental requirements has a significant effect on construction operations, which leads to technical uncertainty. Technical uncertainty relates to the physical difficulty of completing a project. For example, when a project needs a special task to be undertaken in order to complete the job such as site constraints with unexpected geological conditions, a highly skilled expert is required. Engaging a specialist of this kind incurs a high cost that contributes to cost overrun if it has not been considered in the budget¹¹. In addition, “cultural cause” of cost overrun may include political deal making, and, sadly in many jurisdictions-corruptions.

COMPARING THE FINDING WITH OTHER STUDY

The aim of this section is to understand the typology by comparing the results of this research with two previous studies. Although the selected studies used similar techniques in their survey design (questionnaire), they classified the causes using different typology approach (Table 5–3). Therefore, a comparison is useful in order to understand the problems associated with infrastructure projects.

The inadequate planning and control cluster identified in this thesis overlaps significantly with Le-Hoai et al. (2008) in two categories, namely slowness and lack of constraints, and incompetence, and with Abdul Rahman et al. (2013) in five categories: contractor’s site management-related factors, information and communication, human resource-related factors, non-human-related factors, and project management and contract administration. In addition, in all three typology schemes, there is a category of scope changes identified in this thesis³² and expanding on⁴⁹ typology, this study groups a large number of causes into the market and regulatory dimension or cluster. Furthermore, this thesis identified a new cluster that had not been included previously as a category in similar studies: the unforeseen circumstances cluster. Based on the cluster analysis, this study has reduced the number of categories from seven in^{32, 49s} typologies to four, where each cluster consists of multiple causes (Table 2). As a result, the typology scheme for the causes of cost overrun assists to simplify the management of the large number of cost overrun causes by reducing the various causes to four dimensions in which this is in agreement with study conducted by⁵⁰. These results support proposition 1 that contends that cost overrun causes for infrastructure projects can be grouped into homogenous groups with much reduced dimensionality (Table 2).

According to the ranking of causes of cost overrun in Table 1, strategic misrepresentation and optimism bias ranked below the top 10 in Saudi Arabia and were placed in the inadequate planning and control cluster. This is because it was hard to identify whether these causes have a significant impact through an empirical survey. In addition, the geographical location and/or government system of Saudi Arabia is one reason that these causes do not have a significant effect on cost overrun. Based on the findings, the technical causes of cost overrun cannot be ignored in relation to cost estimation and should be included to reduce the risk of cost overrun.

IMPLICATIONS FOR PRACTICE

The study use inadequate planning and control, scope change, site condition and market and regularity uncertainty definitions to measure the cost overrun of assertions, components, and the rationale as a whole.

The findings on the causes of cost overrun in Saudi Arabia not only have provided an updated list of causes that are largely independent of geographical locations (similar impacts on cost overrun in other countries), it has also identified a number of risk factors that have a relatively large impact on the cost overrun of infrastructure projects in Saudi Arabia compared to other countries, such as poor coordination with government agencies and parallel contracts, inconsistent management strategy of parallel contracts by client, poor client staff communication and stakeholders' lack of participation during the conceptual phase. A key success factor to address this is to implement communication through information exchange. Effective communication should be accurate, procedural, understandable, timely and complete to facilitate information exchange. Generally, effective collaboration could improve this by enhancing the control capabilities of project parties and enabling them to control project activities and project team members, and help practitioners outline their learning needs.

Taken together, this causes of cost overrun model provides a structured view that enables an objective evaluation of planning decision methods. Therefore, the model in relation with SBC will reduce the complexity of understanding the causes that lead to understand large number of causes of overruns may share similar patterns of how it impact on overrun, and that help to facilitate effective management of such causes.

CONCLUSION

The purpose of this paper is to develop an empirical classification to aid the assessment of cost overrun causes for large infrastructure projects, to identify the major types and to measure the relationship between causes and overrun to understand the impact of Saudi Building Code (SBC). Since there are many studies identifying various causes, the study synthesized the empirical literature on infrastructure project cost overrun causes and analyzed the frequency of cost overrun causes. Based on developing an empirical classification via a survey that has been conducted in Saudi Arabia. The study have used the survey data for the analysis. The cluster analysis is composed of four phases: preparing the data, determine the number of clusters; test the cluster solution by suing hierarchal cluster and validation by using p-value. Data were first prepared by inspected the correlation to generate a data matrix. Then, determine the number of cluster based on SSE. Then, using hierarchal clustering to test the cluster solution. Finally a validation using P-value that developed and add-on R package by Shimodaira and Hasegawa⁴³.

The potential contribution of this study is identifying an empirically derived classification of cost overrun causes. The determination of cluster number suggested a four clusters solution. The test of cluster level supported the four clusters method hierarchal clustering. Each group contains of objects, these objects have relationship between each other. Hence, the cluster represents dimensions of cost overrun. Finally, the P-value shows the cluster is strong with four cluster solutions with 0.99 of greater, which that respects the value of 0.01 or low. These cluster groups are "inadequate planning and control", "scope change", "site condition" and "market and regularity uncertainty".

The typology scheme is beneficial as it focuses the attention of decision makers on the disclosure and management strategies in relation to the causes of cost overrun. The analysis has produced significant findings about the reasons that infrastructure projects have cost overruns and has provided the most important dimensions that represent cost overrun causes on which infrastructure agencies need to focus. The four dimensions are scope changes, market and regulatory uncertainty, inadequate planning and control and unforeseen circumstances.

The determination of the cluster number and the test of the cluster level supported the four-cluster method of hierarchal clustering, where each

cluster represents a dimension of cost overrun. The scope changes dimension represents an unclear project scope that leads to the urgency of the project, namely how much time there is to complete the job. The inadequate planning and control dimension refers to tasks, specialists, units and components, which can be operationalized as deferential, interdependence and integration in terms of organization and technology. The dimension of market and regulatory uncertainty represents factors impacting on the volatility of input costs for the project. The unforeseen circumstances dimension represents the uncertainty of a project's goal.

This finding helps to identify the main reason why there is cost overrun. Also, it helps to mitigate that problem in right way and can be included on a cost estimation method. Therefore, it can be used in the early stage of the project. In the future work will develop the groups and evaluate them based on the literature and use the four clusters for cost forecasting.

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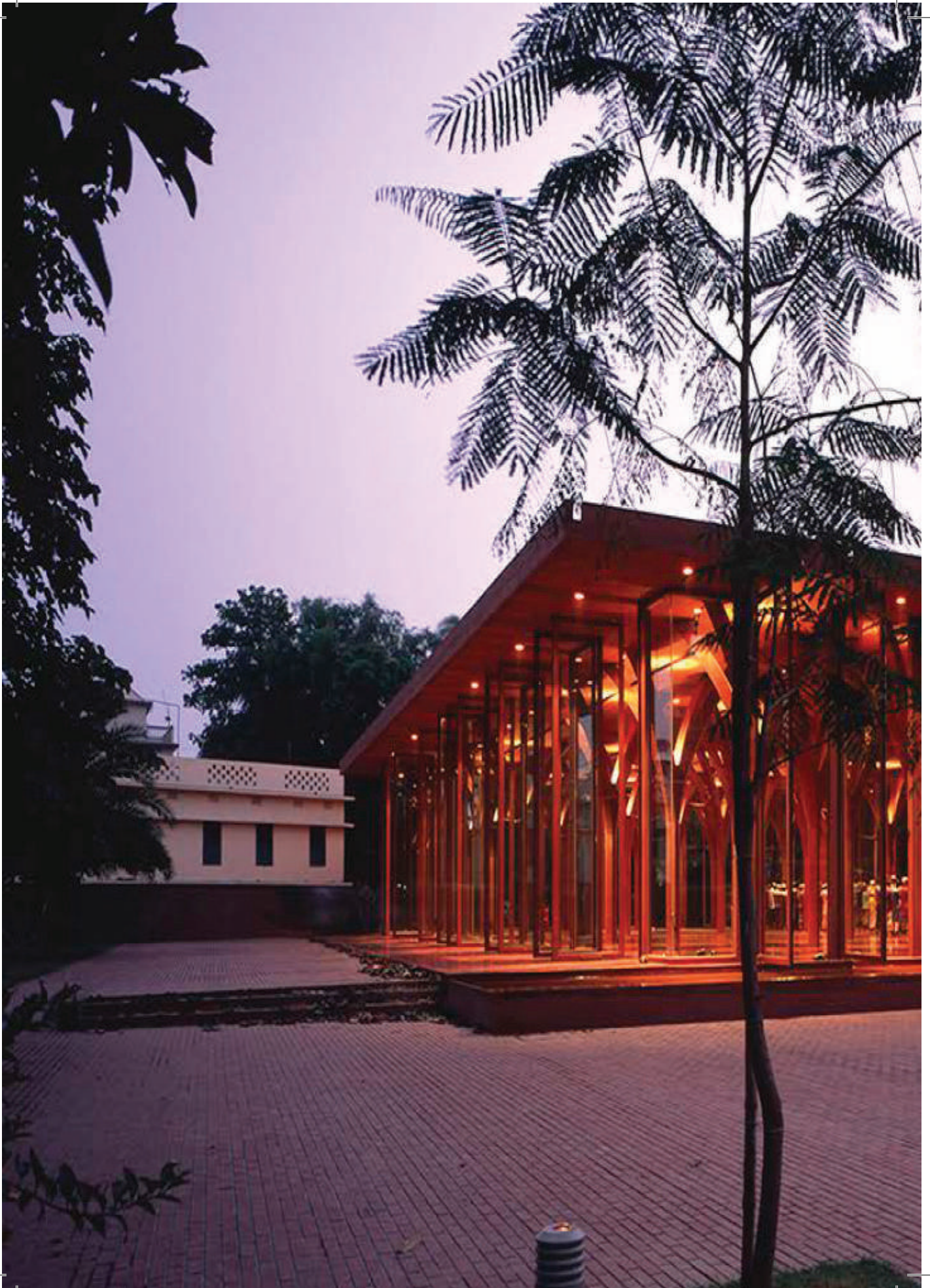
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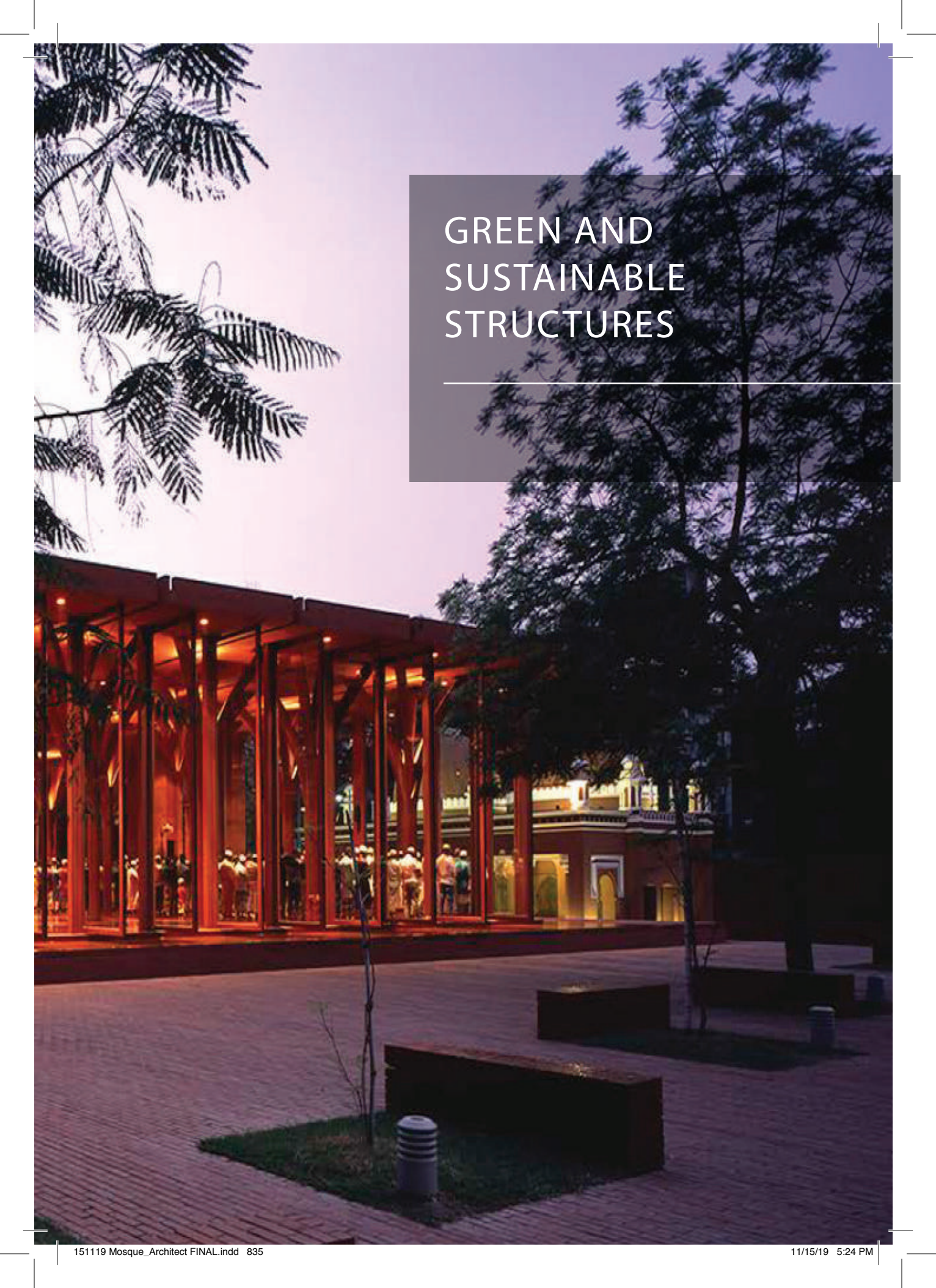
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GREEN AND SUSTAINABLE STRUCTURES

GREEN AND SUSTAINABLE
STRUCTURE OF THE MOSQUE
OF AL-IRSYAD SATYA INDONESIA

Dr. Ahmad Hairuddin Murtani
Saefudin Sardi

URBAN ECOLOGY MATRIX TOWARDS
SUSTAINABLE MOSQUE

Ar. Shabab Raihan Kabir

VERTICAL GARDEN WALL FOR
SUSTAINABLE MOSQUE BUILDING
IN HOT DRY CLIMATE

Aasem Alabdullatief
Siddig Omer
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Faisal Alosaimi

GREEN AND SUSTAINABLE STRUCTURE OF THE MOSQUE OF AL-IRSYAD SATYA INDONESIA

Dr. Ahmad Hairuddin Murtani, Ph.D
The Head of Al-Irsyad Satya Mosque

Saefudin Sardi
The staff of Al-Irsyad Satya Islamic School

INTRODUCTION

AL-IRSYAD Satya Mosque Kota Baru Parahyangan, West Java, Indonesia, was built on November 12, 2009 and completed on August 9, 2010, and its use was opened on August 27, 2010 to coincide with 17 Ramadan 1431H which coincided with using Nuzulul-Qur'an commemoration. The construction of the mosque was initiated by Parahyangan Satya Foundation with the support of PT. Belaputra Intiland of Lyman Group as the owner of Kota Baru Parahyangan where the mosque is located.

Al-Irsyad Satya Mosque stands on an area of 1ha with a mosque building area of 1,700m² and a yard area of 800m². It can accommodate around 1,500 worshippers. The architect of the mosque, according to Mardisiwi (2017), Ridwan Kamil said that the mosque's design was rich in religious philosophy. The idea of the mosque was inspired by the Ka'bah in the Masjid Al-Haram, Mecca, with simple cube shapes but with strong and deep impressions. Al-Irsyad Satya Mosque was built to accommodate the spiritual, educational, and social needs of the residents, especially the Muslims society of Kota Baru Parahyangan and its surrounding community. In the magazine of Techno Konstruksi, Brasali (1991) said that the construction of the mosque, it is expected that Kota Baru Parahnyangan can also grow, develop, and continue to strive to fulfill its function as an independent city with educational insights.

Kurniawan (2018) also added that at a glance, the shape of the Al-Irsyad Satya Mosque does not resemble a mosque building in general which "always" has a dome, the shape is a box or a cube with a grayish base color. But after entering the mosque, visitors will feel a coolness that is commonly found in mosques. Ornaments in the mosque are simple, but

can be said to be extraordinary, it is said so because the architecture is relatively simple. But precisely therein lies its uniqueness, simple but has extraordinary magical power.

The strength of the Al-Irsyad Satya Mosque emanates from the symbols depicted, from the courtyard of the mosque to the building; the landscape in the form of circular lines surrounding the mosque building, inspired by the concept of thawaf that surrounds the Ka'bah. The walls of the mosque building are written two declarations of faith or syahadatain in the form of giant three-dimensional calligraphy, which is neatly arranged from hollow bricks. Between the holes, the wind and sunlight blew. Although the mosque building only has an area of about 1,100m² with a capacity of around 1,500 worshippers, but it has 99 lights that read 99 holy names of Allah SWT or Asmaul Husna.



FIGURE 1

Al-Irsyad Satya Mosque, Kota Baru Parahyangan, West Bandung, Indonesia.

(Source: Emilio Photoimagination, 2010)

At night, if all the lights are on, the mosque will show its splendor. The uniqueness of other architectures also lies in the form of the mihrab, in contrast to the mosques in general which is tightly closed by the walls of the mosque building, at the Al-Irsyad Satya Mosque, the mihrab is left open, so that the nuances of the green mountains are clearly visible when someone sits inside. And other more uniqueness, the preacher's pulpit was designed on clear water decorated with colorful fish, just right on the water stands a large ball, which reads Allah SWT's calligraphy.

THE GREEN AND SUSTAINABLE STRUCTURE

Vale and Brenda (1991), as cited in Ibrahim, (1994, pp. 5) in *Principles of Green Architecture*, a “green” building places a high priority on health, environmental and resource conservation performance over its life-cycle. These new priorities expand and complement the classical building design concerns: economy, utility, durability, and delight. Green design emphasizes a number of new environmental, resource and occupant health concerns. The emphasis is on the integration of the design into a whole, for the purpose of minimizing their impacts on the occupants (Indoor Environmental Quality) and on the globe. This includes such issues as building site, materials selection, energy efficiency, water conservation, construction waste management, indoor air quality, and others. Many architects have already involved their designs into the process of considering the green architecture approaches.

Among those who identified principles of green architecture, Ibrahim (2008) elaborated the *Principles of Green Architecture* into guidelines for architectural practices, as followed:

1. conserving energy;
2. working with climate;
3. minimizing new resources;
4. respect for users;
5. respect for site; and
6. holism.

Principle 1: Conserving Energy

“A building should be constructed so as to minimize the need for fossil fuels to run it.”

Due to the growing of life standards in the recent decade and the provision of new materials and technologies, this principle of minimizing the use of energy seems to be ignored or lost. People used to live in communities to provide more shaded area and cooler air between buildings. On the contrary, people today are more adapted to the individualism way of life supported by a policy of cheap energy which encouraged people to use – for instance – automobiles. Such way of life affected the performance of the traditional community and – as a consequence – affected the ambition

for minimizing the use of energy. Recently, many architectural attempts are more adapted to conserving energy as a main goal in its performance rather than its dependence on the fossil fuels. Thus, those experiments should be widely recognized as creative experiments for achieving more green architecture.

Principle 2: Working with Climate

"Buildings should be designed to work with climate and natural energy sources."

The idea behind this principle is to reduce the dependence on fossil fuels for both warming and cooling a building. The conventional attempt to reduce such dependence on the fossil fuels in design building is by using insulation in the building structure. On the other hand, new approaches suggest that by making use of building form and the nature of building elements can provide comfort conditions inside the building. In the past, people used the natural resources such as wood to generate energy, thus the growing shortage of this resource made them switch to the use of solar energy to generate heat. Buildings were more orientated to the winter sun and therefore buildings were more sensitive for solar design. Another challenging matter was making buildings more adapted to warm climates. To provide comfort cooler atmosphere inside the building, the modern solution affords air conditioning systems which surely consume a lot of energy and increasingly contribute in the current pollution issues.

Principle 3: Minimizing New Resources

"A building should be designed so as to minimize the use of new resources and, at the end of its useful life, to form the resources for other architecture."

Obviously, the current built environment requires vast resources in order to meet the demands on new buildings due to the population and the economic growth in today's world. This world has not the sufficient resources that can meet the other generations' needs to build new environment by adapting demolition and rebuilding to meet those needs. Therefore, the need for reusing in a form of recycling materials and spaces is much more significant and on the other hand, rehabilitation and upgrading for minimal the environment impact is also important. Unfortunately, those who have an easy access to resources are unlikely

adapted to the approach of re-using existing structures which have been designed for one purpose and that can suit a different need than its designed purpose. But what if the existing building's components have been re-used in a different state but another problem emerges here which is the conservation of historical buildings. Many argue that it can still be useful if those buildings can be conserved in a changed state. Green approach suggests solutions that depend on resources and suggest that if the resources need to be modified/changed/replaced in a building is less in quantity than those used for demolition and rebuilding then the replacement is the solution and this solution also denies the historical importance of a building. However, the total benefits of reusing an existing building that has a historical importance can ignore the internal concerns and the renovation of existing building can also minimize resources instead of demolition and rebuilding.

Principle 4: Respect For Users

"A green architecture recognizes the importance of all the people involved with it."

Since different resources are included in the process of making a building, green architecture highlights the importance of human beings' involvement in the building process. The respect of users can be illustrated in two forms; for the professional builder, it is important to realize the effect of materials and processes that form the building on users, workers and on the construction site. Thus, such materials and processes should have less polluting and dangerous effect. Therefore, the use of insulating materials that contain Chlorofluorocarbons (CFCs) and methods of timber treatments that contains chemical components has poisoning effect on both workers and working-site environment and such processes should be eliminated from any green building practices. Another form of respecting users is recognizing the importance of human participation in the design and construction process. This value should be further developed in a way that could increase the level of satisfaction with the construction of a building. In parallel to that, people should freely engage into the process of design and creating a building.

Principle 5: Respect for Site

"A building will "touch-this-earth-lightly."

This phrase illustrates another green principle which highlights the awareness with the interaction between a building and its site. A building will touch this earth lightly means that in a case of removing a building from its site, that building could leave it in a condition as it was before placed there. And it also carries concerns of the materials with which a building was created from. Therefore, any building consumes heavily energy, creates pollution and eliminates users, does not touch this earth lightly. Temporary designs, structures for exhibitions, performances and other cultural events are considered good illustration of this principle because at the end of the event, these structures could leave the site without any alteration and it could easily be elsewhere.

Principle 6: Holism

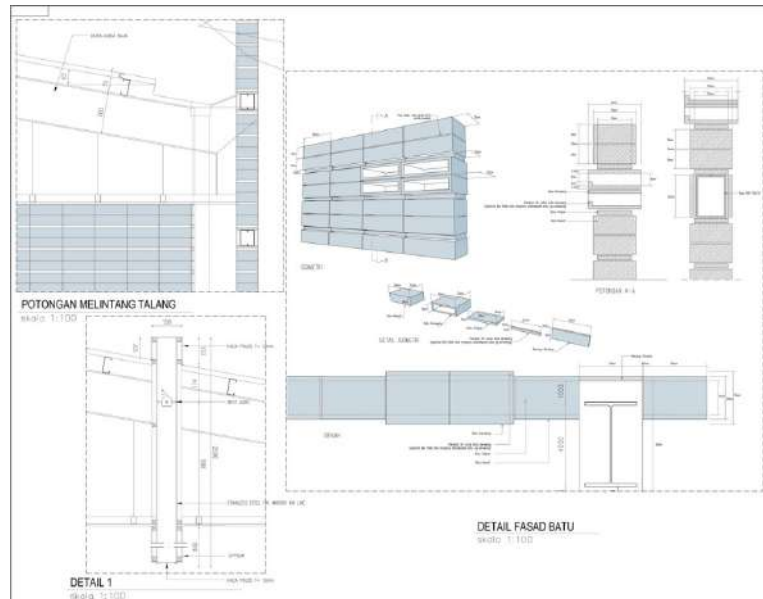
"All the green principles need to be embodied in a holistic approach to the built environment."

All green principles that have been previously demonstrated cannot be easily embodied in a single building, rather it can be involved into an interaction of systems – systems of playing, living, and working among buildings that represented into built forms. On the other hand, green architecture includes not only buildings and its designs but also sustainable form of urban environment.

GREEN AND SUSTAINABLE STRUCTURE OF THE MOSQUE OF AL-IRSYAD SATYA INDONESIA

The Facade to Create Tectonic Effect from Energy Reduce Raw Material

According to Sugiharto (2019), the architecture of the Al-Irsyad Satya Mosque is unique in that it uses stacked stones as the main facade to create tectonic effect, while embedding Islamic calligraphy on the facade as a graphic element and prayer reminder. The process of designing custom local material to fit into design concept was with effort in coordination and architectural detailing. The concrete blocks were fabricated less than 100 km away from the building site. Fewer resources in raw material, transportation, along with ISO certified factory immediately reduced energy with minimized waste. The natural texture of concrete blocks is also exposed to gain building character and give more comfort for the worshippers.

**FIGURE 2**

The uniqueness of the mosque by stacking stones as the main facade to create tectonic effect and embedding Islamic calligraphy.

(Source: The masterplan of Al-Irsyad Satya Mosque)

The Primary Shape of Square

According to ArchDaily (2010), the primary shape of the mosque takes the form of a square, which seems the most efficient since Muslims pray in straight rows facing a specific direction or the Qiblah. The structural columns are arranged in such way that the facade seems like it is not supported by any frame. This shape also alludes to Ka'bah, the most important structure in the Islamic world, to which all Muslims' prayers are directed.

The Natural Ventilation

The arrangement of concrete blocks also gives a solid and empty tectonic texture facade, of course there are positive and negative effects from the use of these blocks, but the most important of the use of these block is to provide natural ventilation in the building. The solid look of cubical form of the building actually has pores along the facade and gives it not only fresh air to the users but also to the building itself. The concept of natural ventilation is in line with the local tropical climate, without the usage of air-conditioning.



FIGURE 3

The Mosque of Al-Irsyad Satya, Kota Baru Parahyangan, Indonesia.

(Source: Emilio Photoimagination, 2010)

The Awards

The mosque which is located on Padalarang won the 5th place in the "Building of the Year 2010" by the National Frame Building Association. Al-Irsyad Satya Mosque was chosen in the religious architecture category. The design of the Al-Irsyad Satya Mosque is quite popular among other places of worship and was only defeated by the Tampa Covenant Church, Florida, United States, as reported by the popular architectural site, Archdaily.com. The following year, Al-Irsyad Satya Mosque also won a Green Leadership Award from BCI Asia.

The Natural Color

The simple but elegant and solemn and calm impression of this 1,871m² mosque emerged from its three-color elements, namely white, black, and gray. With this color, the Al-Irsyad Satya Mosque does indeed appear inconspicuous. This not only makes its existence almost integrated into the surrounding natural environment, but also makes it conducive to being a place of worship that – should be carried out in a solemn and calm manner.

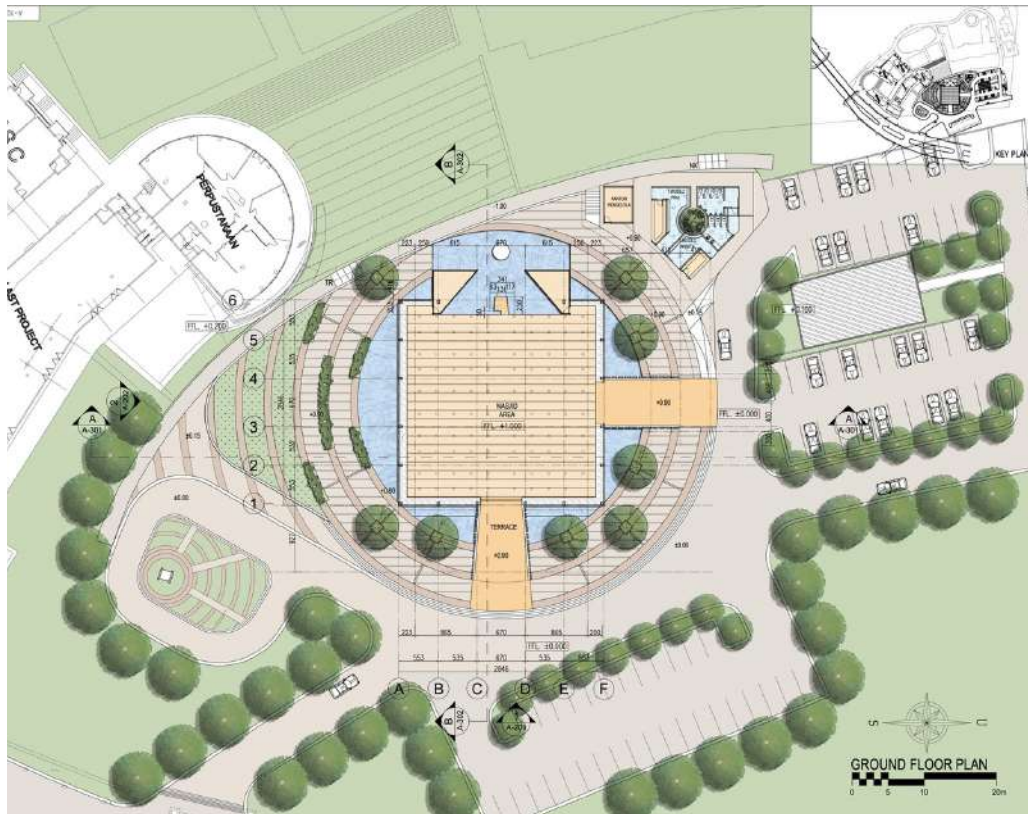


FIGURE 4

The circular lines are inspired by the concept of *thawaf*.

(Source: Emilio Photoimagination, 2010)

The Concept of Thawaf

According to Kurniawan (2018), the Al-Irsyad Mosque landscape is in the form of circular lines that surround the mosque building. The circular lines are inspired by the concept of *thawaf* (the journey of the pilgrims performing around the Ka'bah). Then the presence of *Ketapang Kencana* (*Terminalia mantaly*) trees in the surrounding area adds to the beauty and beauty of the mosque landscape created by the architect.



FIGURE 5

The hole in the wall of the mosque was formed in such a way as to form calligraphy of the Declarations of Faith.

(Source: Emilio Photoimagination, 2010)

The Calligraphy of the Mosque

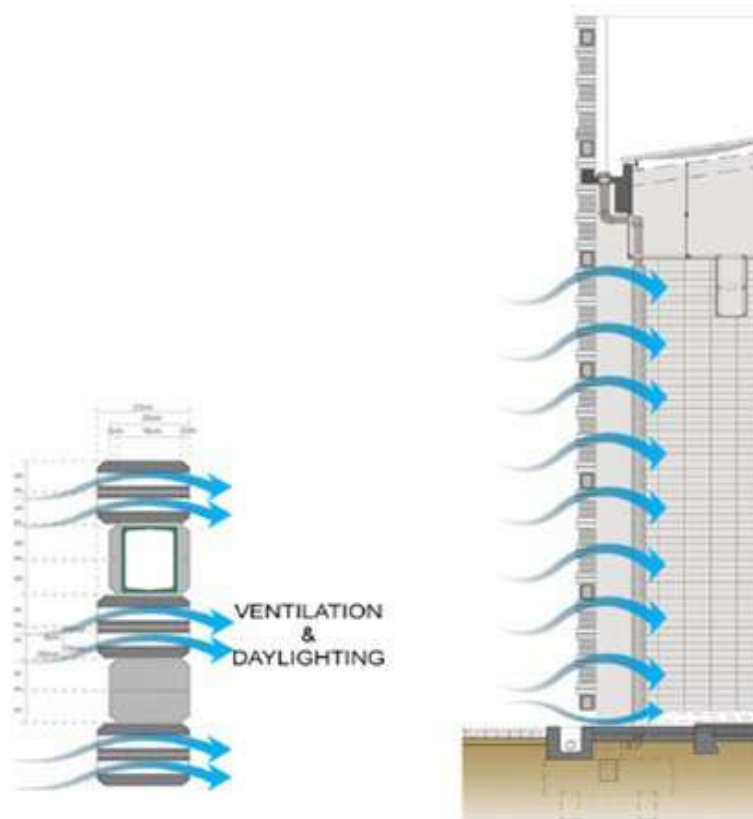
The face of the Al-Irsyad Mosque building is an arrangement of concrete blocks that form a two-sentence calligraphy of creed. The walls are neatly arranged but unique bricks, because the holes and gaps between the bricks look solid, so that when viewed from a distance, then on the wall surface is formed and reads two declarations of faith *Laa ilaaha illallah Muhammad Rasulullah* – there is no god but Allah, Muhammad is the Messenger of Allah.



FIGURE 6

The air circulation of the mosque is very good with the penetration of light presenting the calligraphy.

(Source: Emilio Photoimagination, 2010)

**FIGURE 7**

Penetrate into the room of this mosque.

(Source: Marketing Gallery of Kota Baru Parahyangan)

The Natural Light

If the day is bright, the natural light of the sun will penetrate into the room of this mosque. The light looks like a digital element that forms two sentences of creed. Then at dusk, a tinge of sunlight will rush into it, while at night, the electric light from inside the room will radiate out and form a two-sentence calligraphy of the creed that glows beautifully. Processed on the ceiling of the mosque also provides aesthetic enhancements to the mosque's room. Even though during the day the lights are not turned on, the shadows from the light coming from the direction of the mihrab on the lamp boxes give a more dramatic impression, and are able to achieve IEQ (Indoor Environment Quality) for user comfort and visual comfort, it makes the worshippers become more solemn in carrying out rituals of worship.

The Light of Asmaul Husna



FIGURE 8

The lamp of *Asmaul Husna*.

(Source: Emilio Photoimagination, 2010)



FIGURE 9

The cover lamp of *Asmaul Husna*.

(Source: Saefudin Sardi, 2019)

In the interior of the Al-Irsyad Satya Mosque, there are 99 lights, with each lamp bearing the Asmaul Husna calligraphy (99 beautiful names of Allah). Each writing on the lamp can be read clearly, starting from the right front to the last name in the left rear of the mosque. This is not merely beautifying the interior, but also – especially – reminding the worshippers to the attributes of Allah, the Creator.



FIGURE 10
Spacious inside.

(Source: Emilio Photoimagination, 2010)

The Capacity and Its Pillarless

In terms of capacity, the Al-Irsyad Satya Mosque can accommodate around 1,500 worshippers. The absence of supporting poles of roof supports makes the room really spacious. However, it does not mean there is no poles at all. Because, with the absence of a dome at the top, the ceiling part of the mosque is sufficiently supported by four sides of the wall which function as a pole as well as a support.

The Open-Air Mihrab

In the daylight there is no energy used for the lighting as natural daylight comes through the facade pores as well as from open mihrab and main entrance. The concept of open mihrab not only gives an exceptional view of surrounding landscape but also shows the greatness of nature which represents the existence of the Creator, Allah Subhanahu wa Taala.



FIGURE 11

The *mihrab* and its beautiful view.

(Source: Emilio Photoimagination, 2010)

Efforts to Green the Area around the Mosque

Since the establishment of the Al-Irsyad Satya Mosque, greening efforts have continued to be made to create environmental harmony, provide comfort for visitors, create cleaner air, and more than that to participate in the greening movement proclaimed by Kota Baru Parahyangan known as “go green – hayu hejo” as the regional language for the greening movement.

**FIGURE 12**

The green area around the mosque with plenty of plants.

(Source: Dudi Sugandi, 2019)

**FIGURE 13**

The Ketapang tree (*Terminalia mantaly*) and *Platycerium*.

(Source: Saefudin Sardi)

There are plenty of plants that have been planted around the mosque area, such as Damar trees (*Agathis dammara*), Pucuk merah (*Syzygium oleina*), Mango (*Mangifera indica*), Malay apple (*Syzygium malaccense* a.k.a. Mountain apple), Lavender (*Lavandula angustifolia*), Purple leaves (*Graptophyllum pictum*), Nail antlers (*Platynerium*), dwarf mondo grass (*Ophiopogon japonicus*), Miagos bush (*Osmoxylon lineare*), Callistemon (*Callistemon*), Australian pine (*Casuarina equisetifolia*), Bougainville (*Bougainvillea spectabilis*), and Ketapang tree (*Terminalia mantaly*).

The Building Legend of Al-Irsyad Satya Mosque

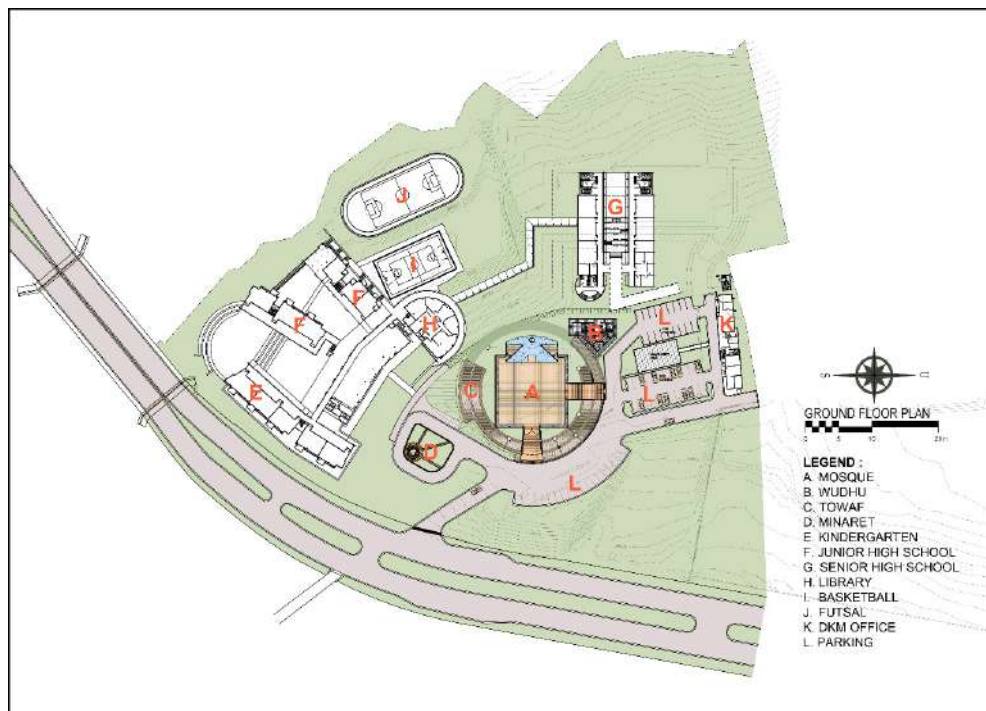


FIGURE 14

The legend of Al-Irsyad Satya Mosque's plan.

(Source: Marketing Gallery of Kota Baru Parahyangan, 2019)

CONCLUSION

Al-Irsyad Satya Mosque with all its uniqueness starting from the mosque room which does not have a window but provides air circulation which is maintained with the existence of irregular ventilation holes

but forms Arabic calligraphy with the words of shahada, designed for the architectural inspiration of the Ka'bah in Mecca. It looks simple but has a high aesthetic value, and most importantly as an application of green and sustainable architectural concepts. From the results of the analysis on the expression of the Al-Irsyad Mosque building it can be concluded that the building elements such as building sites, building arrangements, building facades, and building facade materials at Al-Irsyad Satya Mosque have sustainable design elements with passive engineering approaches such as insulate walls, local material and simple processing material.

Similarly, the expression of building space can be concluded that the elements forming the space from floor processing, wall processing, and ceiling processing at Al-Irsyad Satya Mosque there are elements of sustainable design with passive engineering approaches such as Shade & Filter, Cooling Effect and Indoor Environment Quality. Thus the expression of the Al-Irsyad Satya Mosque building has an influence on ecological, economic and social factors, with the application of energy-efficient building concepts applied to the use of local materials that are able to provide thermal comfort without using assistive technology such as air conditioning and lighting during the day. Because of its unique design, Al-Irsyad Satya Mosque is increasingly popular among the people so that the area is a major destination for event organizers to hold major events related to religion in particular as well as social activities in general.

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URBAN ECOLOGY MATRIX TOWARDS SUSTAINABLE MOSQUE

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INTRODUCTION

THE ECO-DESIGN is designing the built-environment such as mosque complex in a system considering the ecological footprint of the area. Openness has become an important issue in every city today for designing any kind of building, i.e. mosque or community structure. The purpose of this paper is to re examined qualitative parameters of dynamics of the urban mosque design, thereby enabling the designers to understand the contribution of unwrap and the public spaces in densely built environment. The study identified the causes of deteriorating urban environment in each city to that of the lack of public awareness towards their life style and pattern of living in urban community. An ecosystem is a discrete area in the biosphere, where living and non-living things intermingle within and between each other to fabricate a sustainable environment. The condition in which an animal or a human being lives along with other species of plants and animals in an area affects its life. In spite of this the urban open spaces are shrinking and are becoming less accessible at an alarming rate. The urbanization bonanza and market forces are blind folding us to the reality of the many ways in which the world around us is diminishing and emaciating. As cities are growing more rapidly, so the vast open and community spaces become ever more essential for the wellbeing of the urban dwellers. The image of a city is not derived from its concrete parts like building, roads etc. it is much deeper and more fluid, that is, its people, pattern of spaces and activities therein, the relationship between the living and non-living part of its environment, time, space, people and the religion and religious activity. This Study presents a searching appraisal of the spatial structure of the development of mosque design. It, therefore, looks into the spatial configuration of these developments in relation to its Social, Physical, and Biological contexts on mosque's rejuvenation.

AN OVERVIEW OF MOSQUE ARCHITECTURE IN BENGAL

Subsequently the establishment of Muslim canon in Bengal, Mosque architecture was adapted by the Muslims for the ritual needs of their belief. The Muslims needed a large space for congregational desire, particularly on Fridays, when all men were obligatory to carry out the prayer communally. There was no sanctum with a holy representation, and all worshipers had to stand in rows behind the imam who lead the prayer. During the Sultanate period the Friday (jami') mosque became very important as an official building because the khutbah gave official recognition to the sovereign, and also worked as a declaration of sovereignty.



FIGURE 1

Chronological of mosque position in Bangladesh.

Numerous mosques were built during the five and a half centuries of Muslim rule before the British colonial episode. Then it was a large multi-domed rectangular, hypostyle building of brick with stone veneer. Brick, easily manufactured from the profusely available clay of the delta, has been the traditional building material of Bengal from ancient times. Stone was not available locally, and during the early part of Muslim rule it was often quarried from pre-existing temples, as seen in Zafar Khan Ghazi's mosque. Stone columns divide the interior into two aisles, each with five square bays, covered by small domes.

The understanding, that the mihrab symbolized the place where the Prophet (PBUH) stood in the first mosque of Medina, also dictates a single mihrab.

This mihrab entrance organization and the rectangular shape remained popular in Bengal mosques throughout the Sultanate period. The building appears squat because the front row of arches springs directly from huge piers. The ornamentation is both in stone and terracotta, and some in a 15th century style suggestive of remodelling in later times.

The first Muslim sultan of Bengali origin favoured a style with indigenous roots. The tomb re established brick alone as the primary building material, and its form, a single-domed square building with curved cornice and roof, squat hemispherical drum less dome, engaged corner towers, and terracotta ornamentation, influenced all subsequent buildings, particularly mosques, the only building type that has survived in large numbers. A thin layer of lime wash, once probably painted, is sometimes still visible on the surface of the terracotta plaques. Sometimes a veranda would be added to the front, just as in a residential hut, with additional engaged towers in the exterior where the veranda joined the prayer chamber. Examples of small and large mosques with verandas are the Gopalganj Mosque in Dinajpur dated 865AH (1460), where the prayer chamber is only 4m²; and the Darasbari mosque in Gaur dated 884AH (1479) with a 30.32m × 11.81m rectangular prayer chamber, both in Bangladesh. The verandas used a variety of roofing devices: cross-vaults, as in the Gopalganj Mosque; or domes; or combinations, as in the Darasbari Mosque. It was built by Sultan Yusuf Shah in 884AH.

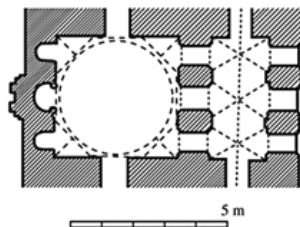


FIGURE 2
Gopalganj Mosque plan.

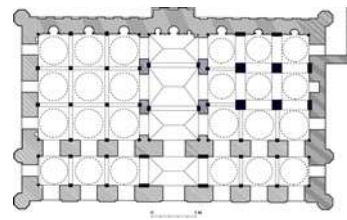


FIGURE 3
Darasbari Mosque plan.

In the 15th century architectural tradition of Bengal the most important example of this group is the Shatgumbad mosque in Bagerhat, the largest mosque in Bangladesh. The mosque has eleven bays and seven aisles, with the largest bay in the centre. This central bay is divided into seven independent, rectangular bays that are covered by the chau'-chalas; this being the earliest use of the form in Bengal. It connects the largest entrance in the east to the largest mihrab, and divides the mosque into northern and southern wings. Besides the tomb in Bagerhat the only other dated

monument in the Khan Jahan group is the Masjidbari Mosque of 876AH (1471–1472AD) in Mirzaganj, Patuakhali district. This mosque not only indicates the extent of influence of the Khan Jahan Style, but also helps us map the southern limits of Sultan Barbak Shah's kingdom to whose reign it is dated. It is also the only extant mosque with a large chau'-chala vault covering the entire veranda. The interior of the vault shows how meticulously the terracotta decoration was used to simulate the patterns of woven bamboo strips.



FIGURE 4
Shatgumbad Mosque, Bagerhat.

There are no pre-Islamic examples of nine-bayed buildings in Bengal, but such mosques are known, though not common, throughout the Islamic world; they are rare in other parts of India. In Bengal they were discontinued after the Sultanate period, but there are nine-bayed tombs in later Mughal times throughout the subcontinent.

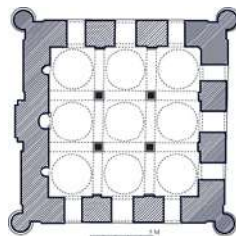


FIGURE 5
Masjidkur Mosque plan.

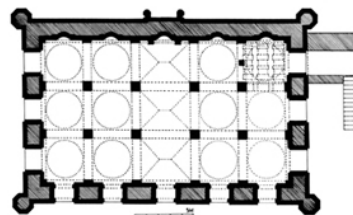


FIGURE 6
Chhoto Sona Mosque plan.

Sultanate architecture of the 16th century includes buildings of the Husain Shahi (1494–1538), Suri (1538–1563), and Karrani periods (1563–1575), before the takeover by the Mughals in 1576. The general serenity and prosperity brought as regards by the Husain Shahi rulers resulted in a large

number of buildings of a rather homogeneous style. Although the Bengal style broaden as far as Bihar and Assam at this time, there was nothing outstanding or innovative in design. Craftsmen seemed to reside in themselves with refining decoration and details. The Chhota Sona Mosque in Gaur dates by inscription to the reign of Sultan Alauddin Husain Shah (1494–1519), and was built by Wali Muhammad, a high official in the royal court. This rectangular mosque is entirely faced with stone in the exterior, while inside there is stone up to the springing of the arches.

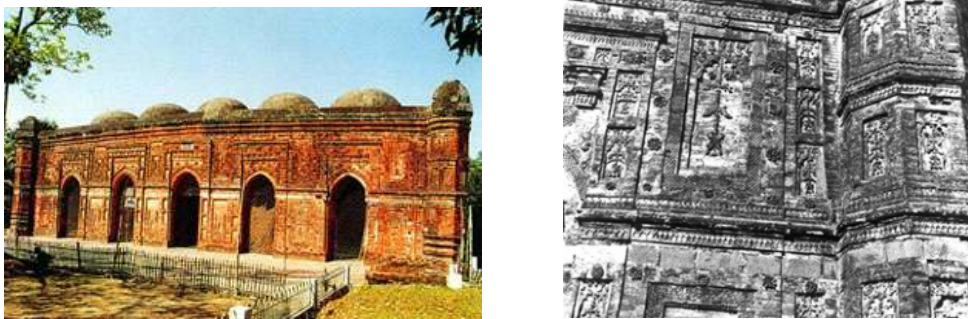


FIGURE 7

Bagha Mosque, Rajshahi and Terracotta Ornamentation, Bagha Mosque.

The Bagha mosque in Rajshahi was built by Sultan Nusrat Shah (1519–1532), son of Husain Shah in 930 AH (1523–1524). This rectangular mosque is within an enclosed courtyard, to be entered by a gate. Four pillars in the north-south direction divide the interior space into two aisles and five bays, each of the resulting ten bays being covered by a dome. The hanging ornament has lost its earlier vegetal quality and become highly ornamental, approximating jewelry design. The rectangular frames of the three large mihrabs in the interior have panels with niches holding flowering rose, fruiting pomegranate, and mango trees.

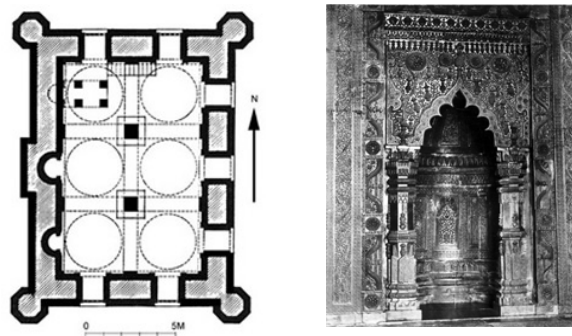


FIGURE 8

Kusumba Mosque plan and *central mihrab*, Rajshahi.

The Mosque at Kusumba, Rajshahi, dated by inscription to 966AH (1558–1559), is a rectangular six-domed mosque of two aisles and three bays whose exterior is entirely faced with stone. In contrast to the buildings of the Sultanate period, which have a marked regional character, Mughal buildings are constructed within the imperial tradition of Delhi and Agra, but are more subdued than contemporary architecture elsewhere in the subcontinent. As in Sultanate times, Mughal mosques consist of only a prayer hall, which is now single-aisle with three or five bays. The exterior surfaces are plastered and paneled, the cornices are straight, and the buildings look less ponderous than Sultanate ones because of the higher domes.



FIGURE 9

Lalbagh Fort Mosque and Satgumbad Mosque, Dhaka.

A refined Mughal provincial style was developed in the capital city of Dhaka in the 17th century. The Lalbagh Fort Mosque in Dhaka dated 1059AH (1649) and 1194AH (1780) conforms to the typical Mughal mosque plan. Located inside the fort, closest to the river, it was probably the earliest building on the site. Lateral arches in the interior divide the rectangular structure into three bays, the central one being the largest. The building is plastered, and the entire east facade is divided into small rectangular panels; the engaged tapering corner turrets have regularly spaced horizontal mouldings. The three doors in front are placed within recessed arches with half-domes ornamented with faceted stucco motifs. The Satgumbad Mosque in Dhaka, also of the second half of the 17th century, has a unique quality. Although the main prayer chamber has the regular three-bayed plan, enormous double-storied, domed corner pavilions replace the usual engaged turrets. The three domes of the prayer chamber together with the four corner ones add up to a total of seven, thus giving the mosque its name. While mosques in Dhaka reflect the imperial style of Delhi, the Sultanate style lived on in several mosques that were built away from the capital. The Atia Mosque in

Tangail district in Bangladesh was built in 1018AH (1609) by Sayyid Khan Panni. It is a single-domed, square mosque with a three-domed verandah in front, engaged octagonal corner towers and curved cornice.



FIGURE 10

Atia Mosque, Tangail, Kartalab Khan Mosque, Dhaka and Katra Mosque, Murshidabad.

These are Kartalab Khan's Mosque in Begumbazar, which he reportedly built during his residence in Dhaka between 1700–1703, and Khan Muhammad Mridha's Mosque in Lalbagh dated by inscription to 1116AH (1704–1705). Both are built on raised terraces with vaulted rooms in the plinth that were used for shops or for madrasa students. Both are single-aisle, and while Mridha's Mosque has three bays, Kartalab Khan's has five bays. An unusual feature of Kartalab Khan's Mosque is the room with a pitched do-chala roof with drooping eaves that is attached to the north side of the mosque. By 1717 Murshidabad became the last Mughal capital of Bengal. The earliest surviving and most significant of the monuments that were built to embellish this capital is the Jami Mosque, also known as the Katra mosque, built 1137AH (1724–1725). The names comes from the domed chambers that surround the mosque on all four sides, which are locally known to have served as a market but have been described also as a madrasa.

When the British relinquished their colonial monopoly on the subcontinent in 1947, they split it along religious lines: The predominantly Hindu western side of Bengal became a state in India, and the Muslim east became East Pakistan (separated by a thousand miles from West Pakistan). Over the next two decades, a resistance movement emerged in Bengali-speaking East Pakistan as the local population demanded greater representation and eventually freedom from the Urdu-speaking political elites in the West. In 1971, after a brief but brutal war, Bangladesh won its independence. In its early years of nationhood, the country had a distinct but austere tradition of mosque architecture to draw on. To set themselves within the framework of a more global Islam, engineers and architects relied on Turkic domes, peaked Mughal arches and massive Arab minarets the pan-Islamic shorthand for

sacred architecture to indicate the buildings' importance. These mosques had little to do with Bengal itself. (Source: Internet: "Reimagining What a Mosque Might Be", Michael Snyder.)

QUALITATIVE LEARNING AND THE ASSESSMENT CRITERIA FOR ECOSYSTEM OF URBAN SPACES

The ecological knowledge is a precious technical input to the built environment design method alike mosque and its parts. The mystical outlook that ecology represents, the main inspiration and purpose of architecture; it is seen as imparting an integrity and uniqueness to the profession of the designer of a mosque. There are specific skills in the design of different spaces, and the most successful schemes were often in the rare cases where the abilities of architect, urban designer and landscape architect were combined in one person. Ecology as a technical input into design is essentially a quite straight forward idea, especially when applied to urban situations. In environmental design, which by definition is design for everyday surroundings, they also constitute the qualitative aspects of the design, as distinct from quantitative functional or technical characteristics. Such qualitative functions have great influence on the degree to which the environment imparts a sense of well-being. The choice of qualitative characteristics when designing for an existing built environment, where there is something clearly to fit to, or to contrast with, is easier than thinking up completely new ideas for new developments.

Designs appear to have been generally as unlike nature as possible in form, artificial, a small part of the world symbolically under human control. Formal geometric or architectonic designs are clearly the product of human intellect. An ecosystem is any spatial part or organizational unit, which includes living organism and non-living substances, interacting to produce and exchange of materials between the living and non-living parts. Without the sun, nothing would happen on this earth. Its light, its warmth and its power enable plants, animals and human beings to blossom, grow and flourish. Without its light there would be no colours. It provides the energy that keeps everything alive – an unimaginable 4270 billion kilowatt hour every day. It would take 480 years for the world to use up the electricity produced by one day of solar energy. Or put in another way: the sun sends the world's energy requirements for a whole year to the earth every three minutes (Schaal, 1999).

The upper layer of soil, which provides plants with their site and their food. It consists of a mixture of mineral and organic components whose cavities

contain air and water in varying proportions. The mineral components are inorganic in origin and incombustible ones, i.e. the components originating in living matter, "the humus". But soil is by no means a dead mass, a mixture of the components that have just been listed, but consistently inhabited by the life and activities of various creatures that live in the soil and countless microorganisms (algae, plants, bacteria), whose activities create the conditions for plants growth. A single gram of fertile arable land can contain several hundred million of micro-organisms, but also up to five thousand million.

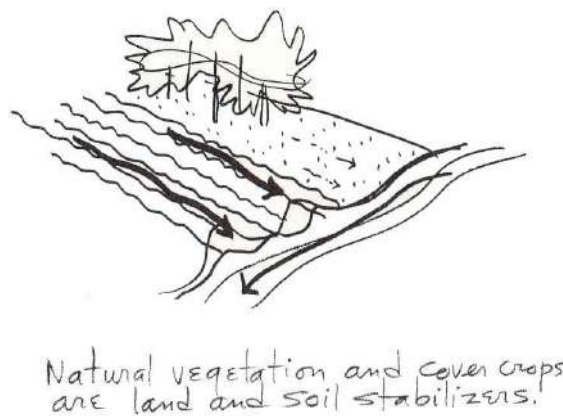


FIGURE 11
Soil stabilizers.

The tree is an organic-architectonic system consisting of a foundation. In the case of deciduous trees leaves are an additional summer feature, covering the bare winter structure. The language of tree shapes could be an art-historical draft. There are trees that strive steeply upwards and trailing trees. Leaf roofs, tree domes, forest cathedrals, groves. A tree has become involved with a spot on the earth; it has fixed itself there firmly. All the earth's oxygen was and will be produced by plants and trees. Plants consist of up to 95% water, and man and other animals of up to 60–70%. Water is inconstant metamorphosis and circulation. Over the sea it evaporates in the warmth of the sun, rises, is carried on to land by the wind and down on to the earth as rain or snow. Some evaporates again, the rest flows into the sea or inland lakes. Water is the basic prerequisite for any settlement. It is the principle element of natural life, as every living thing on the earth derives from it. Nature is what we have not made. It not only produces plants, soil, stone, water, air but also animals and man.

The basic concept of ecosystem is that everything is related to everything else; therefore it is believed that a comprehensive (multidisciplinary) approach of planning is needed for stable urban system (Ken Yeang, 2004; Mowla, 2003). The concept of ecosystem and biodiversity in the built environment design has been assessed and inferred that these can be successfully achieved at urban level by using place based environmental policy planning. Instead of confrontation we need cohabitation with nature for sustainable living. Open space are an important element of built environment which provide vibrancy and sustainability to a city. Ecological approach to design and manage these spaces is crucial to the sustainability of urban environment (Mowla, 2005).

The prime problem in our urban context is overheating, pollution, and water logging while governing ingredients in the natural environment are open spaces, woods and water bodies and the environmental variables are temperature, relative humidity, air velocity, precipitation, soil-moisture and biomes. Through analysis, thoughtful design and vigilant management of the development process and natural forces, even the largest structures can further the cause of a more harmonious assimilation of the built and natural environments. Eco-design approach does not reject high technology, but it is based on an ecological moral imperative "take least from and dump least into the environment". The environment desires to be in a state of equilibrium for sustainable living and the utility value of biodiversity which provides equilibrium can be divided into four categories: goods, services, information, and psycho-spiritual uses. First of all, biodiversity can be seen as a goods (or a resource) that can be consumed or useful by humans, and therefore should be protected. The second category is the wide variety of services offered to us by a healthy ecosystem. Green plants, for example, replenish the oxygen in the atmosphere and eliminate carbon dioxide. Fungal and microbial life-forms in the soil decompose dead organic material and play a vital role in recycling plant nutrients. Table 1 lists some of these services.

TABLE 1
Ecosystem services and functions.

Ecosystem Services	Function
Gas regulation	Regulation of atmospheric chemical composition
Climate regulation	Regulation of global temperature, precipitation, and other biologically mediated climatic processes at global or local levels

Disturbance regulation	Capacitance, damping and integrity of ecosystem response to environmental fluctuations
Water regulation	Regulation of hydrological flows
Water supply	Storage and retention of water
Erosion control and sediment retention	Retention of soil within an ecosystem
Soil formation	Soil formation processes
Nutrient cycling	Storage, internal cycling, processing, and acquisition of nutrients
Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess of xenic nutrients and compounds
Pollination	Movement of floral gametes
Biological control	Trophic-dynamic regulations of populations
Refugia	Habitat for resident and transient populations
Food production	That portion of gross primary production extractable as food
Raw materials	That portion of gross primary production extractable as raw materials
Genetic resources	Sources of unique biological materials and products
Recreation	Providing opportunities for recreational activities
Cultural	Providing opportunities for non-commercial uses

(Source: Mowla, Q.A., 2005b)

The concept of “keystone species” is species transform that could drastically alter the interactions among other species. Successive studies refined this concept to specify keystone predators, keystone food resources, and keystone habitat modifiers. The only way to realistically provide adequate habitat for these keystone species would be by creating regional and inter-regional systems of connected reserves.

Urbanization jeopardizes the flow of natural elements, reduces the number of keystone species, and contributes to the ecosystem deterioration and biodiversity loss. Urban designers should therefore encourage development configurations that minimize adverse edge effects. Natural corridors maintain

a uninterrupted flow of animals, plants, nutrients, water, and energy within the ecosystem. They also reduce the area effect, the edge effect and the distance effect. The designing of ecological corridors must be carefully done since species differ markedly in habitat needs and tolerances.

Backdrop and Rationale of the Study

Cities are not universal in character nor do they have universal requirements. Thus, the variation in shape, size, layout, treatment, and development of urban public spaces is an offshoot of physical, socio-cultural, political, and economic factors. Time and historical layering also play an important role on the unbolt space configuration of the city. Thus, different localities of a city have different set up of liberty situation. The theme is that the existing lattice of spaces must not be destroyed any more but revitalized. Staying within these basic parameters every city has to take effective strategy to develop its own urban space system. Prudent and creative utilization of every single bit of public spaces could bring life to the city, accelerate economic growth, and improve environmental, ecological, and social quality.

As cities grow ever more densely developed, so the remaining green spaces grow ever more important for the wellbeing of the cities' inhabitants. To create accessible green spaces now mean many structures are to be torn down in different localities. This proposition is neither practical nor feasible. Thus it can be argued, the design of existing green spaces should receive attention equal to that of the cities' buildings.

The next important factor to remember is that the man himself is an important part of community and if the community is not in the state of balance the man himself will suffer as much as any other community. The most important factor in the list is perhaps the responsibility that the architect/planner have for the long term development of built environment. This includes factors such as traffic planning for low emissions, urban typologies that promote compact solutions with high service levels while maintaining green and other spatial qualities, provision for mixed uses and integration of social classes and cultural groups. The available public spaces are required to be organized judiciously to maximize its response.

The eco-design ideas help to advance the concept of sustainable urban spaces and ways to organize them. In case of mosque building, different phases of transformation did not alter its basic character much, as being the urban Muslim socio-cultural and ritual centre. Though reduced in design stricture due to various hold back, the mosque area has continued

to attract more and more people to act upon ritual proceedings. What are the attributes that have remained intact in spite of massive interference is evaluated. The hypothesis, that besides other factors, there is a correlation between bio-mass and pattern of socio-ritual activities, is studied in this dissertation.

The study examines the current functions of built structure of a mosque, including the benefits and disadvantages of the present systems. Attempts have been made to assess the present use with a special focus of spatial consequences considering the time frame; it is too big a target. So, the scope for conducting the present study rests on the fact that to fill up the theoretical and empirical gap of knowledge in the following areas:

1. review the components of ecosystems and ecological imperatives, in the case of urban spaces; and
2. analysis and synthesis of the built structure of a mosque in terms of the eco-sustainable design checklist.



FIGURE 12

Present design of mosque and absence of eco rationality.

ENVIRONMENTALLY APPROPRIATE PROCESSES

Globalization has given us the freedom to adapt to newer possibilities. The information and technology available is overwhelming. While it offers so many options and solutions, we still find ourselves on the verge of a global environmental catastrophe. When it comes to the global options of materials and techniques of constructions we need to make our approach more scientific, respecting to the law of nature through its ecological context in this age of accelerated degradation.

TABLE 2
The attributes of eco-design and biodiversity.

	Components	Patterns	Processes
Landscape	Community types and significant characteristics (e.g., proportions, rarity, productivity, species diversity); hydrologic features; abiotic factors (e.g., climate, soils, geology, elevation, slope, aspect); land use types	Overall variety, connectivity, and fragmentation: patch sizes, shapes, and distributions; patch adjacencies and Correlations	Disturbances (e.g., fires, floods, storms, landslides) and their characteristics (frequency, intensity, size, seasons); long-term changes in vegetation and hydrologic features; nutrient flows; land use trends
Community	Species types that are ecologically valuable, endangered, rare, sensitive, exotic, or limited in distribution; key habitat resources (snags, woody debris, outcrops, perennial streams)	Vegetation structure (e.g., density, layers, canopy closure, stand gaps); distribution of species and habitat resources	Smaller-scale disturbances and their characteristics; vegetation changes following disturbances (succession); productivity, herbivores, predation, and parasitism; nutrient flows; human uses and impacts
Population	Absolute or relative size of populations	Number and distribution of populations; distance between populations; intent of individual ranges; migration patterns; population structures	Reproduction, mortality, and regeneration; movement abilities and characteristics; immigration, emigration, and interbreeding among populations
Genetic	Variety of gene forms (alleles); rare or destructive forms of genes	Diversity within individual populations; variations among populations	Rate of genetic change (due to chance, inbreeding or interbreeding)

(Source: Mowla, Q.A., 2005b)

Most materials have high energy consumption during their manufacture and extraction process (Embodied Energy). Implicit the measure of Embodied Energy of building materials are the associated environmental impacts. Large amount of ever increasing greenhouse gases are produced by these modern building materials which damage the urban air quality and are responsible for climate change. In a sustainable development perspective, we need to address the quality and sustainability of our use of natural resources and ecosystems, threats of global change, and the impact of production and use of energy, which is essential to our economies and to our way of life, and also centrally important in environmental problems.

In recent years, the construction industry worldwide has witnessed a trend towards environmentally responsive facilities, called eco properties. These structures carry the environmental theme throughout, from the positioning of building to maximize the natural assets benefits, to the careful selection of construction materials. A green property uses resources wisely, incorporating energy, water recycling, and waste reduction techniques into the daily operations. Emphasis is laid on energy efficiency, resource conservation, and environmental commitment.

TABLE 3

Below gives the embodied energy and emissions of some of the important building materials.

Name	Embodied energy	CO ₂ (g/kg)	CO	NO	SO ₂	CH ₂	NMVOC	Dust
Reinforced steel	16.3 MJ/kg	1,500	1.15	2.9	8.15	6.6	0.21	0.5
Primary aluminium	204 MJ/kg	11,687	26.683	24.769	15.139	19.907	2.538	1.754
Portland cement	4.3 MJ/kg	893	0.184	1.874	0.59	0.754	0.017	0.043
Inner paint	0.7 MJ/kg	91	0.046	0.14	0.035	0.1	0.013	0.02
Glass wall	16.5 MJ/kg	1,011	0.705	12.77	1.135	2.599	0.09	0.112
RCC	2.4 MJ/kg	258	0.153	0.534	0.157	0.0238	0.032	0.056
Mud Brick	2.4 MJ/kg							
Wood	12 MJ/kg	80						

(Source: Anurang Roy, ARCASIA Forum 12)

Every materials used in a typical modern building is the product of energy intensive processing – all consuming vast quantity of power in their manufacture (embodied energy). These materials have to be dug out from the ground, cut from the forest or fields, or created by human technology. All these processes use energy:

1. for extraction of material;
2. process and manufacture;
3. transportation cost;
4. energy for production of capital equipment;
5. disposal of waste; and
6. maintenance.

The manufacturing process also releases toxic affluent into water and hazardous chemicals into the atmosphere. The manufacture of Portland cement for example is responsible for on estimated 4% of the green-house gases.

It is interesting to note that the total energy consumed in building materials of a luxury hotel is about three times the energy consumed by a running hotel annually. Of course it is impossible to build with no environmental impact, but it's our responsibility to minimize the damage.

ECOLOGICAL FOOTPRINT AND THEORY OF PARTITIONED MATRIX

The ecological footprint is a resource management tool that measures how much land and water area a human population requires to produce the resources it consumes and to absorb its wastes, taking into account prevailing technology. Much of the body of analysis and synthesis within the realm of sustainable architecture has focused upon the physicality of the built environment, leaving the complex relationship between culture, climate and place largely undisturbed. For an architectural proposition to represent a truly sustainable design solution, reference to the cultural domain must be implicit.

In a world dominated by the culturally decontextualized homogeneity demanded by globalization, many contemporary architectural design propositions that purport to be sustainable, ignore the specificity of the cultural dimension. It is clear that globalization is not only an economic condition but holds (anti) cultural aspirations deep within. In that sense, International Modernism provides a paradigm for globalization.

Furthermore, International Modernism provides an iconography that represents globalization. The glass and steel tower – so beloved by modernism – has become the symbol of economic success, both at a corporate and nation-state scale. At its root, it is clear that International Modernism had very clear cultural aspirations. There is much to learn from Architecture before it became an expert's art. The untutored builders in space and time demonstrate an admirable talent for fitting their buildings into their natural surroundings.

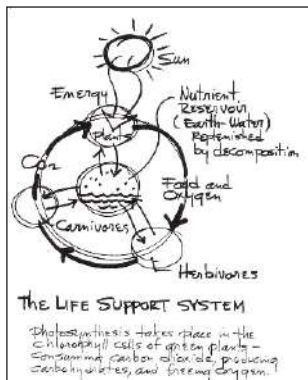


FIGURE 13

The life support system.

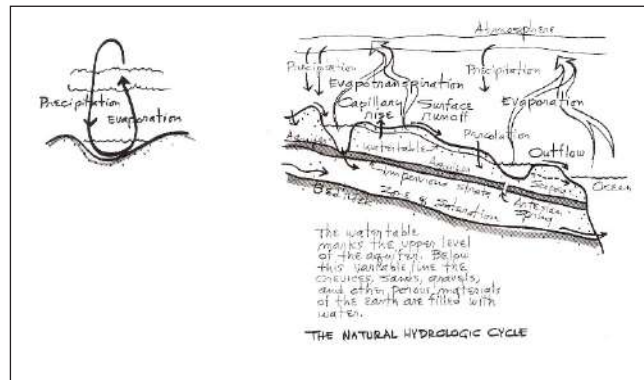


FIGURE 14

The natural hydrologic cycle.

Looking at the global economy today, one has to be increasingly aware of energy as a scarce resource; the need for architects to design for a sustainable future becomes a self-evident imperative. Here lies a likely trump card for affirming theoretical respectability: the design of energy-efficient enclosures has the potential to transform architectural design from being an uncertain, apparently whimsical craft, into a confident science. The theory for the design of the tall building might then be one that derives from energy conservation.

Eco towers are developing in cities around the world to deal with urban growth and migration from rural areas. They provide a way of coping with this, and avoiding development on nearby arable land. According to United Nations data, they reduce transportation costs, and thus reduce energy consumption. A "green" approach means that a balance must be achieved between organic and inorganic components to achieve a balanced eco-system. Traditional approaches by architects tend to try to "add on" environmental features and thus miss opportunities for "passive" approaches which minimize the impact on the environment.

Schemes should aim to create “cities in the sky”, in contrast to traditional high rise which merely stacks floors one on the other, creating compartmentalization. The challenge is to design in an organic and humane way with both horizontal and vertical integration.

We then compute the total per capita ecological footprint ('ef') by summing all the ecosystem areas appropriated by individual items in the annual shopping basket of consumption goods and services:

$$ef = \sum_{i=1}^{i=n} aa_i$$

Thus, the ecological footprint (EF_p) of a study population is the *per capita* footprint multiplied by population size (N): $EF_p = N(ef)$

FIGURE 15

Shows the formula of compute the total per capita ecological footprint.

(Kabir, 2009)

There are many definitions of green design. There are contradictions between existing technology and nature. The first starts with predetermined objectives whereas nature has a discernment of what is there rather than starting with fixed goals. Existing technology looks to process efficiency and mechanistic approaches while nature looks at systemic harmony and an organic, holistic approach. The aim is to try to bring this together. Architecture is like a prosthetic device – it is artificial, and man-made. The present built environment is mostly inorganic. What is needed is to start with the ecological system and using organic with inorganic components to achieve a balanced ecosystem. Ken Yeang started to look at different ways of achieving this. One way is horizontal greening either through putting all the greenery in one place similar to traditional city squares. The alternative is vertical greening allowing migration of species through it. He went on to explain some of the issues and techniques that have to be followed. For instance, planting has to follow the solar path and requires hardy species – as is being considered for the Elephant and Castle scheme. It is important to understand the system of energy and environment. There are four basic categories to be considered: passive mode which avoids any electro-mechanical devices; mixed mode using some electro-mechanical devices; full mode perhaps using environmental controls; and finally productive mode, which involves the building being used to generate its own energy through photo-voltaics and other systems. With ecological design the strategy has to optimize all the passive options, before progressing to the mixed and other

options. Most architects do it the other way round – they move straight to the “full” mode and see what systems they can add to it to achieve low energy – as a result they miss a lot of opportunities. In Elephant and Castle, the aim is to use composite strategies. There are low temperatures in winter so the proposed approach is to use solar gain and other passive features.

Most ecological designers define eco design as designing with minimal impact on the environment but it is a battle that you can never win. But there are ways to include biodiversity. One approach is the “landscaped bridge” which immediately improves the environment, encouraging species to move in from nearby green areas. It involves working in a different way – it means putting the buildings in a park rather than building first and creating the park after. It is important to understand that ecological design requires an understanding of a site’s carrying capacity. It involves “sieve” mapping devices to achieve minimum impact on the existing natural environment. It requires analyzing the current species and vegetation and deciding what to bring in. Thus, ecological design involves the use of partition matrix approaches to indicate how one factor impacts on another and the effect of architecture on the environment. It shows that you cannot change one thing without changing the others. There is still a need to develop ecological design criteria and global monitoring. Basically ecological design is in its infancy. Ecological designers are still experimenting with a range of systems and there is a long way to go. (Source: Internet: http://webpages.ull.es/users/mach/PDFS/VOL4_2/VOL_4_2_b.pdf.)

Ecological footprint is a tool to measure our ecological performance. Ecology as a technical input into design is essentially a quite straightforward idea, especially when applied to urban situations in case of mosque design. Eco space are an important element of built environment of a mosque which provide vibrancy and sustainability to a macro space of the community. The unplanned encroachments and promulgation of built forms contribute to deforestation, water logging, flooding, overheating, pollution of water, soil, and air etc. The prime problem in our urban context is overheating, pollution and water logging while governing ingredients in the natural environment are open spaces, woods and water bodies and the environmental variables are temperature, relative humidity, air velocity, precipitation, soil-moisture, and biomes. We depend on these ecological assets to survive. Their depletion systematically undermines the wellbeing of people. Livelihoods disappear, resource conflicts

emerge, land becomes barren, and resources become increasingly costly or unavailable.

Architects seem to think that the important thing is that mosque buildings look ecological. We must consider a large number of environmental factors that concern the architect. When we talk about the environment friendly architecture the following factors should be included (Vestbro, 2002):

1. design for low health risks;
2. design for low energy use;
3. design that do not deplete the bedrocks;
4. designs using local materials (that do not generate long transport);
5. designs that are well adapted to climate;
6. designs adapted to changes (to avoid destruction and new building when uses change);
7. planning for the long term development of the built environment towards sustainability;
8. design that facilitates neighbourly co-operation around environmental tasks; and
9. design that look environment friendly (to stimulate ecological thinking).

The first four factors do not require any further explanation. The problem is mainly to find out exactly which designs that provides for good health, little use of energy etc. In order to depletion of bedrock, all kinds' metals should be avoided, but if constructions are such that metal components can be recycled, then of course this renewable material can be used. In addition, building materials that use a lot of energy for its productions, such as cement, should be avoided, unless construction elements can easily be dismantled and reused. For this purpose, new construction techniques are required, e.g. disconnectable joints between construction elements.

DISCUSSIONS AND RECOMMENDATIONS

Summary of Findings

Dhaka, the capital city of Bangladesh was once blessed with lush green open spaces with age-old trees and many natural water bodies, some of which still exist. Now few spaces still stand with the several species of plants/trees. Biomass is under threat in this locality because the current rate of extinction of different species due to the spreading growth of built

surfaces and genetic resources are 100 times faster than what it would have been through the natural process. Therefore, there is a big need for conservation. Here we have identified during our study that the causes of deteriorating mosque space environment is the lack of public awareness towards the natural elements of the environment and the presence of voracious mentality of the society. Vegetation plays a substantial role in sustainability of mosque space and is of great value in greening areas and contributing to regional design. Any structure of mosque needs the ecological landscaping, which has created wild landscape of indigenous species. This paper attempts to define a guideline for a fruitful study on ecosystem to make our mosque green. Mosque uses energy wasting materials such as reinforced concrete, which is most unsuitable to the hot and humid climate of this locality. Not only that in future huge gathering of people in the plaza/court yard will create hammering pressure on its traffic system and also the essence of space would be destroyed.

Vegetation plays a significant part in microclimate design but is also of great value in greening mosques. Ecological landscaping has created wild landscapes of indigenous species. Local environmental design has been the start of community business initiatives that have helped towards regeneration. We find potential of vegetation in reducing the quantities of harmful gases in the air along with dirt and dust.

According to the sustainability paradigm it is, however, essential to respect traditions. One reason is that existing building stock needs to be preserved and reused in order not to waste resources. Another reason is that local climatic conditions must be taken into consideration to save energy and give buildings an ecological expression. Traditional mosque building techniques have often proved more sustainable than modern constructions. To achieve sustainability it is important to implement agreements on the reduction of non-renewable resources such as steel, aluminium, and other metals. To save energy it is also necessary to reduce the use of cement and burnt brick. It is likely that earth will be a most appropriate construction material if sustainability becomes the leading paradigm in architecture. In less developed countries adobe and rammed earth are already the most dominating building materials. Architecture is designed for the inhabitant who must live in and use his building of worship. Building with ventilation, sanitation, and other installations make its look organic. They do not only appeal to the eye,

but may also produce smell and stimulate touching. It is an ideal environment for children.

City is the centre of ecological destruction; it can be the centre of ecological reconstruction. It is a task worthy of our best efforts and it will provide us with a lifetime's work. Using an urban "ecology checklist" one can begin to identify those impacts of the conventional built environment which separate it from the natural environment, or wilderness. With this measuring stick one may proceed to assess the ecological impact of urbanism.

Recommendation

The ecological approach to our business and design is ultimately about environmental integration. An urban area has no unifying notion underlying the layout but its various parts tell their individual tale of many generations of the local inhabitants and their continuous effort to adapt their environment to their changing needs, with aid of improving technique and under the pressure of economic necessity and shifting cultural values.

In this paper we have trace out the decision making process involved in the growth and formation of openness has become an important issue in the world today. A change of land use in areas not optimally used is positive when enough space is left. The growing number of low and high-rise buildings contributes further to a feeling of being shifted in narrow canyons. There are also social problems that are increase in criminal behaviour is detrimental to public safety.

There was no control over encroachment at any urban area. In Bangladesh, we have no bylaws and rules to handle public spaces like communal gathering as a result every day we lose the beauty and create crisis in the built environment. However, how can we improve the biomass of this area? The following options perhaps may be considered:

1. remove blight and obsolescence;
2. reshape the disfigure earth;
3. restore the topsoil section;
4. re-establish the natural covers;

5. reclaim extraction pits, fills, and spoil pipes;
6. reassemble the unused parcels;
7. rezone the slopes;
8. maintain the quality of the land;
9. prevent landscape defacement;
10. maintain an orderly project site;
11. take steps to preclude erosion;
12. protect water resources;
13. preserve the fish and wildlife habitat; and
14. restore disturbed areas, etc.

It is observed that the eco-design approach revolves around plantation or natural inter-relationship of elements constituting our living environment. In 1984 forest cover in Bangladesh is about 9%. A minimum of 25% forest cover is suggested for a healthy ecosystem as about 150m² leaf surface is needed to meet the yearly oxygen requirement of each person and to absorb the carbon-di-oxide (CO₂) from the air produced by him. Planting programmes may help reduce urban temperatures and make cities greener, cleaner and ecologically more sustainable. Within ten to fifteen years the time a tree takes to grow to a useful size - trees placed in strategic locations can reduce heating and cooling costs by an average of 10-20% besides absorbing pollutants. Streets lined with trees may reduce the street surface temperature by 11°C (Mowla, 1984 and 86). A mature tree may transpire as much as 455 litres of water per day which provides the cooling effect of five 10,000BTU (10600kj) air-conditioners working 20hrs/day (Rubenstein, 1992). Or properly watered trees with a moderate crown of about 10 meter can evapotranspire up to 180 litres of water in a day, which is like removing all the heat produced in four hours by a standard electric space heater. Trees shading the south and west sides of building or roads or spaces blocks the summer sun thereby reducing the cooling energy by as much as 30% while allowing sun during winter when altitude of sun is low thereby reducing heating cost (Mowla, 1984 and 1986). It has also been estimated that about 30-meter depth of trees reduces sound between the source and the observer by about 21dB (Rubenstein, 1992). Trees grouped together create a refreshing park or oasis in a city and also cools, nearby neighbourhoods. These facts points towards the importance of vegetation in urban environmental sustainability.

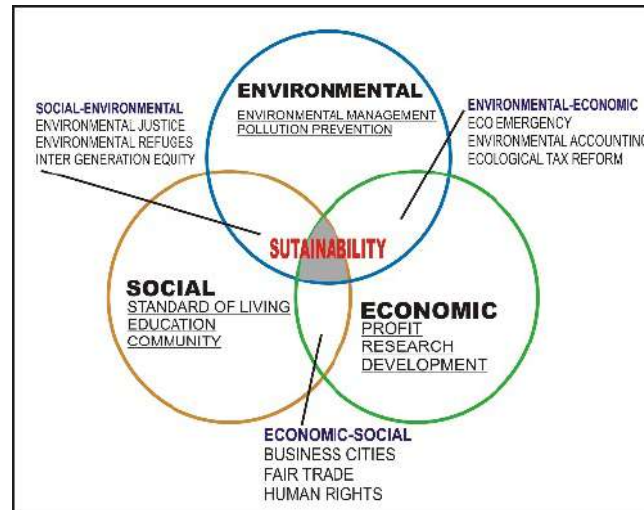


FIGURE 16
Concept of sustainability.

For every city, dust and smoke in the air is a big problem. There are certain hardy local plants which can withstand pollutants such as sulphur dioxide from auto-emissions, and deposition of physical pollutants such as dust and other particulate matter. As the cooling effect of green parks in its surrounding areas (cooling effect range of a green park is about 150m–200m from the park edge depending on surrounding urban morphology) is not dependent on its size but rather on its location and biomes (Mowla, 1984), even and judicious distribution of green urban corridors, green urban pockets, vegetated roofs or water bodies has a greater potentials to compensate the dwindling natural greens and combat urban-heat-island effect, alleviate storm water pressure on the sewerage system, reduce energy consumption, and purify the air besides supplying green habitat and nesting areas for displaced birds, butterflies and other wild life. Here an Urban Designer may have to use his judgement between habitat fragmentation and bioclimatic comfort levels.

Thick vegetation may reduce the habitat fragmentation effect which may be grown especially with the pollution resistant or hardy species to reduce atmospheric and noise pollution. Trees are good air filters other local varieties of fruit bearing trees may also be planted in the peripheral locations and along the residential plots but away from the water body. There are numerous local species of plants that may be used to achieve different design effects.



FIGURE 17

Present movement in mosque design with green roofs and lot of green and open surfaces.

Green roofs (VgR) also offer many ecological, economic, aesthetic, and psychological benefits, especially in high density urban areas where ground level recreation and green space is scarce. Extensive green roofs are built when the primary desire is for an ecological roof with limited human access. Intensive green roofs look like traditional roof gardens because a much wider variety of plant material is encouraged in this approach. VgR can help reduce global warming, lower the urban heat island effect, improve air quality, reduce ambient air temperatures, filter air, bind dust particles, and reduce glare. VgR can also alleviate storm water system, reduce combined sewer overflows rates by retaining 50–95% of rainwater on site, cool down and reduce runoff flow, and absorb and filter heavy metals and pollutants (Ken Yeang, 2004). The cooling effect of rooftop plants was confirmed by different studies and the maximum temperature difference of 4.2°C was detected (Mowla, 1984). Reduced energy consumption can cut cooling cost up to 50% and heating by 25% (Mowla, 1984). Added layers protect structural elements from UV rays, wind and temperature extremes while providing acoustical insulation and noise reduction up to 50dB. A more realistic approach is to create an ecological network from four basic components: ecological nodes, restoration areas, buffers, and ecological corridors.

Preserving the remaining green areas will often not be enough to ensure the health of the ecosystem. This is why ecological nodes need to be supplemented with restoration areas that have a high ecological potential (but not necessarily a high ecological value at the present moment). The role of restoration areas will be to supplement and strengthen the ecological nodes already in place. Many years will be required, however, before restoration areas come back to their natural state.

Ecological nodes as well as restoration areas should be surrounded by buffers. Alien species can thrive in and around ecological nodes, but also disturb the Ecological flows of the ecosystem. Buffers can protect rich ecological areas by protecting them from direct contact with intensive land uses. In addition, buffers can serve as marginal habitats for vulnerable species.

Ecological corridors, placed strategically, would link ecological nodes together and maintain the ecological flows within the system without necessarily preserving the entire ecosystem – an unrealistic option, especially in peri-urban localities experiencing development pressure. These ecological corridors could, like buffer zones, serve as moderate to high quality habitat for some species. More importantly, they can promote species dispersal between patches to prevent the genetic isolation of small breeding populations or offer travel corridors for migratory species. The appropriate width of ecological corridors depends on the goals and resources of individual municipalities. Taken together, these different elements can realistically ensure biodiversity preservation without merely preserving land and permitting economic growth.

CONCLUSIONS

The eco-design is designing the built environment as a system within the natural environment. The need for change is primarily a result of the continuous process of intensification of land use. Openness has become an important issue in urban area today. The purpose of this paper is to present techniques that enable the designer to understand the settlement pattern of the built environment and the accommodation of our mosques collectively and the mosque itself is the room of all mighty Allah SWT. Here we have identified that the causes of deteriorating urban environment is the lack of public awareness towards their life style and pattern of living. Still every day the urban community spaces are shrinking and are becoming less accessible at an upsetting rate. This is a frightening situation in cities especially of rapidly urbanizing countries. It is believed that Bangladesh being in the tropical area is better placed to strike the resources in their built environment design. This is, as we experience today, more true of Dhaka, the capital of Bangladesh, hundreds mosques of different sizes were either partly or fully lost to evade building structures. Like any other sustainable city, Dhaka needs a huge stock of eco-designed mosques for urban services or utilities needed for different Islamic activities. It is known that for a healthy city we need a right balance and proportion of

built up spaces. The design of those congressional spaces for the most part, urban mosques-should receive concentration equal to that of the buildings.

Sustainable development means changes in economic structures, organization and activity of an economic ecological system that are directed towards maximum welfare and which can be sustained by available resources. Achieving the goals of sustainable development involves changes in attitude towards life and patterns of consumption, identifying environmental problems from people's perspective, and regeneration of traditional or folk wisdom to protect environment. Failure to protect and manage the environment as well as to sustain development are likely to hit survival of many developing countries in the coming years. Our myriad of construction, manufacturing and other activities are, in effect, making the biosphere more and more inorganic, artificial and increasingly bio-locally simplified. To continue without the balancing the biotic content means simply adding to the biosphere's artificiality, thereby making it increasingly more and more inorganic. Exacerbating this are other environmentally destructive acts such as deforestation and pollution. This results in the biological simplification of the biosphere and reduction of its complexity and diversity. We must first reverse this trend and start by balancing our built environment with greater levels of biomass, ameliorating biodiversity and ecological connectivity in the built forms and complementing their inorganic content with appropriate biomass. We should improve the ecological linkages between our designs and our business processes with the surrounding landscape, both horizontally and vertically. Achieving these linkages ensures a wider level of species connectivity, interaction, mobility, and sharing of resources across boundaries. Such real improvements in connectivity enhance biodiversity and further increase habitat resilience and species survival.

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VERTICAL GARDEN WALL FOR SUSTAINABLE MOSQUE BUILDING IN HOT DRY CLIMATE

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INTRODUCTION

Countries in hot arid climate are suffering from high electrical consumptions that are consumed by buildings. These consumptions are mainly for the cooling purposes. The hot arid climate in Saudi Arabia has been selected for this study represented by the climate of Riyadh, the capital of Saudi Arabia. The Saudi building code has divided the country land into three climate zones. The largest and most occupied one is the hot arid zone (SBC. gov.sa, 2018). In consequence, 65% of the energy consumption in Saudi Arabia is used for providing comfortably thermal indoor environment in buildings due to the harsh weather (Alajlan et al., 1998).

As a result of booming in populations and development projects, the electricity consumption in the country has doubled in the last decade (US Energy Information Administration, 2018). In addition, relying on fossil fuel for electricity, the case of Saudi Arabia, cause a tremendous CO₂ emission that harms the planet. Figure 1 shows the CO₂ emission of Saudi Arabia for the last decades as stated on the World Bank data (The World Bank, 2019). From that, there is an essential need for any assist on reducing the

non-sustainable energy consumptions by any means. Furthermore, the number of mosque buildings is in ongoing increase as the total number of them in the whole country is exceeding 100 thousands and the majority of them falls in the hot arid zones (MOIA, 2013).

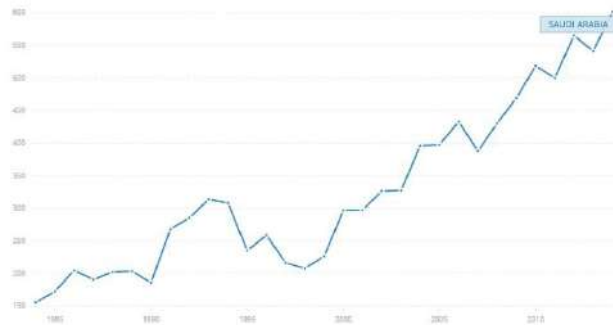


FIGURE 1

The CO₂ emission (ton) of Saudi Arabia.

(The World Bank, 2019)

In particular, vertical garden is a description of the system that consists of installation number of animate plants with irrigation system (Vaezizadeh et al., 2016). This system, the vertical garden, is one of the sustainable technologies that is very trending in the green buildings industries. The green layer on building's envelop, either roof or wall, has a positive impact on the thermal performance (Alabdullatief et al., 2016). The concept of vertical garden is applicable on inner or outer surfaces of any construction wall. Figure 2 shows an example of indoor vertical garden (green wall).

This paper examines the inner vertical garden in mosque building as it has more advantages than the outer on the indoor mosque atmosphere. The inner vertical garden is projected to have an impact on many forms as: thermally, ecologically, aesthetically, and psychology form. The thermal impact is achievable by improving the thermal comfort for users and reducing the cooling loads. The aesthetical impact comes in visual benefits, smell benefits, and enhancing the livable indoor space. The psychology benefits, are approachable in the serene and tranquil mood that comes from being surrounded by plants. The Holy Quran mentioned this point as a reward for Muslims in paradise (Aljannah) where there are trees and a green atmosphere. Moreover, it is possible to use some plants that already been mentioned in the Holy Quran such as the Basil (Arrihan) see Figure 2.

**FIGURE 2**

The indoor vertical garden and the basil plant.

(Elonahome, 2019)

This paper aims to investigate the thermal impact of the vertical garden, also known as a green wall, on the indoor environment of a mosque building in a hot arid climate. Likewise, there are other researches have been based on the thermal impact of green wall system on buildings but not mosque building. Their results are positive on the thermal aspects as found on (Mazzali et al., 2010 and Olivieri et al., 2013). The outcome of this system is expected to reduce space cooling's energy consumption and then assist designers and architects to make further sustainable decisions in mosque building projects. The method of this research focuses on green wall as a mean of reducing building cooling loads through computer simulation using mosque building in the climate of Riyadh City as a case study of hot arid climate.

THE CASE STUDY

Riyadh is the capital and largest city in Saudi Arabia. It is one of the most populated cities in the Arab world, with a population of 6.9 million people as of 2018 (RDA, 2018). It is one of the largest Arab cities in area, at a size of 1,913 square kilometers at about 600m above sea level. This city has no humid seasons, which makes it a typical hot dry site. Figure 3 presents the characters of Riyadh climatic conditions.

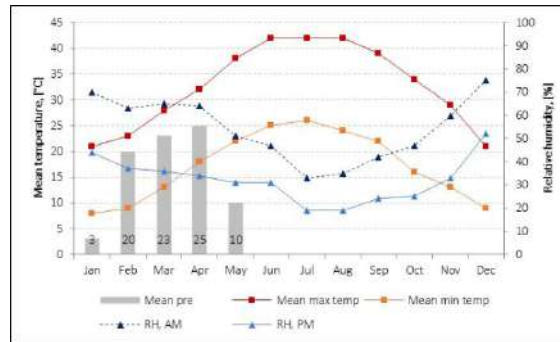


FIGURE 3

The climatic condition of Riyadh City.

(Al-Khatiri et al., 2019)

The selected building case is Alhikmah Mosque and it was selected due to number of reasons as:

1. obtained data from real consumptions in order to calibrate the simulated model;
2. suitability of applying the suggested system on the already built construction; and
3. the building specifications like: location, size, building materials, and ceiling height.

The building was built about eight years ago and the prayer hall (the investigated zone) took a rectangle shape with dimensions of 20×60m which covers a total floor area 1200m². The rectangle shape is facing the qiblah direction (west) so the building is stretched on the north-south axis. Figure 4 shows a picture of the building, the 3D models, and an interior picture.

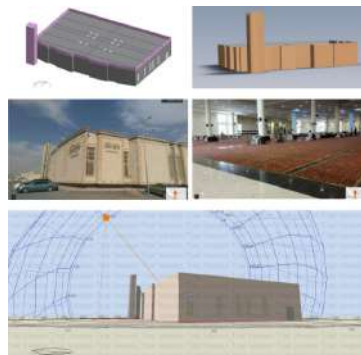


FIGURE 4

The 3D models and the building's pictures.

THE MODEL'S SITTINGS

The building configuration setting for Riyadh City was developed in the DesignBuilder software and has been used in conjunction with data from Climate Consultant v4, a software that analysis the weather data for a given site based on the climate. The model has been drawn in DesignBuilder v4.5 and then simulated the energy performance using Energy Plus v8.3 computer simulation. Later on, the results were analyzed and compared. The weather file was taken from the King Abdulaziz City for Science and Technology in Riyadh. It is expected to be the most accurate file data that is available for Energy Plus users who are investigating the Saudi region.

The model setting for the building template and specifications was selected based on ASHRAE Standard 90.1 and 62.1 (Stanke, 2006) where the selected building type was Public Assembly Spaces – place of religious worship. Clothing set for winter was at 1.25 clo and for summer was 0.75 clo according to a study carried out by Al-Ajmi (Al-Aajmi, 2010) which took into account the Arabic style of clothing. Regarding the occupancy density, from observation it varies from day to day and from prayer time to another in most mosque buildings. In this model it was set on to be 45% as derived from the estimation by the Imam (who leads prayer officially) for the five daily prayer times.

METHODOLOGY

The method that has been followed in this paper is very straightforward. The mosque building model was created and assigned with the proper characteristics and specifications including weather date and develop materials. Then the model, using DesignBuilder software, was validated by comparing the cooling load per floor area w/m^2 of the actual consumption with the simulated model. To measure the impact of the vertical garden system in the selected hot dry climate, a worst case scenario has been selected. This was done by simulating the case on the hottest day of the year, which was the 20th of July. The data obtained during the five daily prayers based on the local timing. The set-point for cooling the mosque was set on 22°C . Later, the system of the green wall (the vertical garden) was applied and then the cooling loads per floor area were compared again. The calculation of saving is presented in the results section.

Model Calibration

The model was calibrated or validated by comparing the actual consumption with the simulated model consumption. The monthly loads were

compared, however there were differences between the actual and the modeled consumptions loads of at most 35%. That is probably due to many reasons but mainly: users' behavior or the data in the weather file. In contrast, when comparing the annual figure, the difference is only 23.75%, which makes the model within the acceptable range as suggested by (Rahman et al., 2008).

THE VERTICAL GARDEN SYSTEM

The vertical garden is a new term for a system that was applied traditionally. It is also known as living wall or green wall which basically uses a layer of plants as a finishing face of the wall. The system structurally could be a free stand system or to be hanged on the construction wall. The most common types of the system are shown in Figure 5. They are mainly: 1. plastic container, 2. fabric bags, 3. liner ceramic bricks, or 4. it could come on one pot that has some hanged plants on a steel structure.



FIGURE 5
Different types of vertical garden systems.

(Elonahome, 2019)

Due to the limitation of this paper for the conference, a simple simulated green wall has been simulated in the selected mosque building. The wall is created by adding steel frames fitted on the actual wall. The actual wall (base case scenario) is respectively made out of paint, plaster, blocks with polystyrene layer and finished from outside with natural stones. Figure 6 illustrates sections in both walls without the details of the base case as the point to present the vertical garden wall. The type of the plants has not been chosen due to the limitation of the simulation software. However, it is recommended to choose plants that require minimum amount of water. Additionally, the concept of reusing the grey water after ablution in mosque is highly endorsed. This water is quite clean and needs only basic filtering after it is stored in a specific tank rather than getting rid of it.

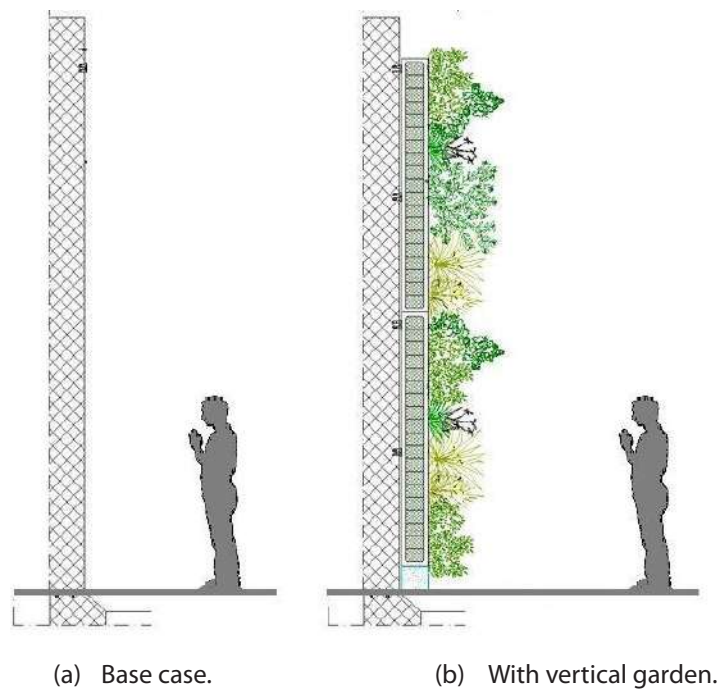


FIGURE 6

Sections of the base and the vertical garden system.

(Reproduced from Bibliocad, 2017)

RESULTS

After applying the system of vertical garden wall as mentioned above, the results from simulation are positive and promising. The results have been obtained on three main factors: 1. the inner surface temperature,

2. the saving in cooling loads, 3. the improvement in the internal thermal comfort on free run mode. On relevant study of living green wall, (Vaezizadeh et al., 2016) found that the inside surface temperature of the wall has gone 20% down after applying the system. In this paper, the average inside surface temperature of the wall has dropped from 37°C to 29°C in the simulated day. This result of decreasing the inside surface temperature was achieved by applying the basic system. Furthermore, a saving of up to 44% in cooling load is reachable particularly during the afternoon prayers (Zhuhr and 'Asr) of the summer day. Figure 7 shows the savings of zone sensible cooling loads during the five daily prayers of the hottest day of the year. Although there is a slight increase in the loads during Fajr prayer, that is expected to be owed to the late night's low temperature.

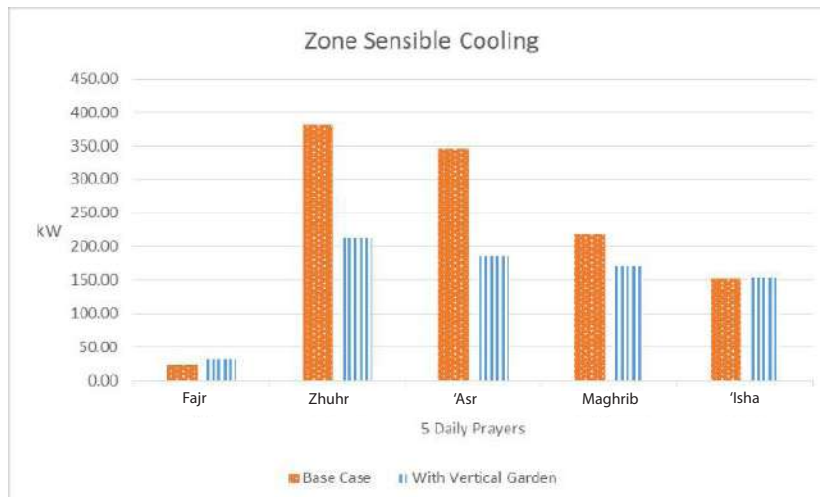
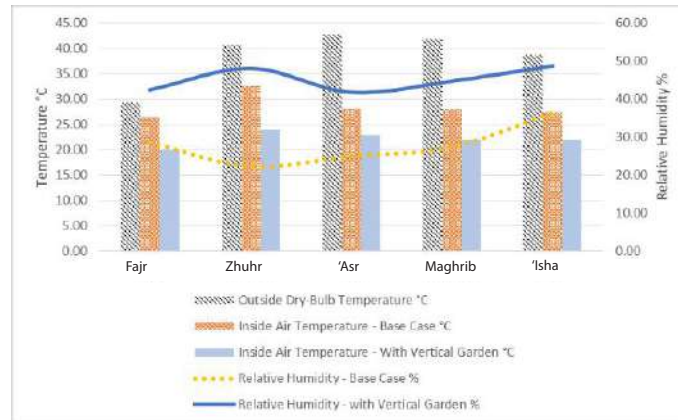


FIGURE 7

The saving of cooling loads during the five daily prayers.

On the other hand, the results are favorable on the side of thermal comfort. When the building was simulated on the free run mode, there is a considerable decrease in the indoor temperatures expressly during afternoon prayers, which require the highest cooling loads typically. In contrast, after applying the Vertical Garden system, the indoor relative humidity has raising up due to the availability of plants and wet atmosphere. It is almost doubled during Zhuhr prayer and enriched during other prayers too. Figure 8 demonstrates the decrease in temperature and the increase in relative humidity of the summer day during the five daily prayers.

**FIGURE 8**

The improvement on indoor temperature and relative humidity.

FUTURE WORK

Due to the limitation of this paper for the conference, many other areas are worthy to be investigated. An example of these is the different types of vertical garden walls and their properties and thicknesses. Other materials and components could be studied too. The types of plant that used are a huge realm that worth a deep study too. In addition, the irrigation system from ablution could be deliberated and designed. Likewise, same research could be carried out on different locations and climates for mosque buildings around the world. On the other hand, there is a great prospect of searching the impact of the green wall on the user's concentrating and reverence during prayer as it known in Arabic by "khushu". Lastly, it will be a great opportunity to validate this study by doing an on-site tangible experiment.

CONCLUSION

In line for the increase number of mosque buildings and the demand of passive or sustainable techniques, an exploration of ways to save in cooling loads and enhance the thermal comfort is essential everywhere but mainly in hot dry zones. By simulating a real case, this paper investigate the benefit of applying the vertical garden system, also known as living or green wall, in a mosque building in hot arid climate of Riyadh, Saudi Arabia. The results revealed a saving in zone sensible cooling loads of up to 44% during the hottest time of the year. Similarly, there is a noticeable improvement in the indoor temperature and the relative humidity of the examined case.

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A nighttime photograph of a mosque entrance. The entrance is framed by a large, multi-layered, illuminated stone archway. Above the archway is a dark rectangular panel with three vertical sections of intricate, illuminated geometric patterns. Below this panel is a horizontal band of Arabic calligraphy. The entrance itself is a dark doorway leading into a brightly lit interior. Inside, a large, illuminated, diamond-shaped chandelier is visible on the left. The background shows a large, light-colored stone wall and a small pyramid structure on the roofline under a dark blue sky.

COMMUNITIES AND SUSTAINABLE SYSTEM

TOWARDS A VISIBLE AND
LOCALLY RELEVANT MOSQUE
ARCHITECTURE IN FRANCE

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TOWARDS A VISIBLE AND LOCALLY RELEVANT MOSQUE ARCHITECTURE IN FRANCE

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INTRODUCTION

THROUGH its history and colonial project, Islam has been a part of France since the 18th century. There is an undeniable need for places of worship for French Muslims. Unfortunately, the political climate, manifesting in often contradictory stances at state level toward the creation of mosques, and restrictions on public funding of places of worship in France make the process of mosque construction drawn out and fraught with challenges. Beyond this key issue of implementation, mosque architecture in France remains in large part influenced by the places of origin of its immigrant Muslim populations, consolidating the image of Islam as foreign to France, rather than a legitimate part of the national religious landscape. The problem is thus, in large part, one of the visibility of Islam in France.

This article represents a report on the current state of the French political context in relation to the creation of mosques, and the development, to date, of the Mosque "O", a mosque project for Paris currently being developed by The Muslim Think Tanks through AMOsq, an organisation set up with the intention of assisting potential instigators of mosque construction projects throughout the convoluted process of construction and subsequent management of the mosque, in collaboration with the

Paris based architecture practice TXKL. This article provides an opportunity to situate the project in its broader context, as well as to reflect on the work carried out thus far and to pre-empt some of the challenges that await us.

REVIEW OF RELATED WORK

A number of studies have been carried out on various aspects of mosque design which have informed our own. These can be categorised according to two themes: the specific challenges of new mosque design and construction in France, and the broader issues associated with designing a mosque that meets both the standards required by Islamic tradition and those imposed by the contemporary context within which the mosque will operate.

Gilles Kepel (1987) provides an early survey of the political and social processes surrounding “Islam in France”, taking as a starting point the inauguration of the Grand Mosque of Paris in 1926 and tracing its progressive political transformation into the “Islam of France” and its insertion into political debates around identity and assimilation, often cross-cutting intergenerational differences in attitude toward the question among Muslims.

Sidi Mohamed El Habib Benkoula (2005, 2007) examines the factors that influence mosque design in France, from the perspective of the varying treatment received by different religions when faced with various state legislative mechanisms and the diversity of financial means available to Muslim communities. More broadly, Benkoula discusses the real administrative challenges that must be undertaken by any prospective mosque project throughout the application for a building permit in a context in which the inscrutable diverse interests of numerous actors in the process can result in delays of ten years or more.

The concept of “universal design”, the design of products and environments that can be used by all people, regardless of ability, age, cultural background, or status in life, is addressed in relation to mosque design by Nazem Fawzi Al-Mansoor (2016), with a particular focus on the design of mosque facilities accessible to disabled people. Through an examination of specific programmatic aspects of the mosque and the extent to which they are adapted to specific disabilities – the ability of hearing impaired people to hear the call to prayer for hearing impaired, the ability of physically disabled people to move around the mosque, remove their shoes, perform their ablutions and so on, and the problem

of mobility devices such as wheelchairs not being able to enter the clean spaces of the mosque in order to avoid them carrying dirt on their wheels – Al-Mansoor produces a comprehensive checklist for rendering mosques accessible through design.

Ahmed Mokhtar (2009) considers the question of design standards for prayer facilities to be integrated in public buildings in Islamic countries, often by architects that do not share the same culture or religion as the building's eventual users, focusing on airport prayer rooms. His paper is equally oriented toward a checklist of design standards that can aid in cross-cultural understanding between mosque designers and the users by whom their buildings will be used on a daily basis.

Similarly, French association Green Heaven (2014, in collaboration with the Local Agency for Energy and the Climate of St-Quentin-en-Yvelines) sets out a number of guidelines for designing and running mosques in an ecological fashion, based around the principles of taking responsibility for one's actions; learning to take care of our planet together; and, practicing what you preach.

OBJECTIVE

The act of constructing a mosque in Paris cannot be treated like any other architecture project. The envelope of the building is the last layer to be explored after negotiating a series of administrative, political, and financial challenges as well as defining through design the social milieu within which the new mosque will be situated.

The Muslim Think Tanks (TMTT) is a non-profit organisation that provides a space for exchange around questions related to Islam and to Muslims. The overall goal is concretised through a series of working groups that bring together intellectuals, researchers, public servants, civil society, business people and artists to address, in a heterodox manner, a specific problematic related to Islam. The Mosque working group thus aims to address through a holistic study, all the dimensions that contribute toward the definition of new contemporary mosques in France. AMOsq is an extension of this study that aims to provide an accompaniment to prospective mosque builders to aid them throughout the entire process of design, the administration in liaison with the city planning authorities, fundraising and the putting in place of management once the mosque is completed.

The Mosque “O” project is the first such project to be undertaken by AMOsq and thus represents a pilot through which to develop mosque implementation strategies that may be implemented more broadly through subsequent projects. As shall be elaborated below, the Mosque “O” project is at once a pilot for how to build a mosque in France, but also for how the relationship of French Muslims to French society may be articulated moving forward.

EXAMINATION OF CONTEXT: THE MOSQUE IN FRANCE

Islam has been a part of the history of France since the 8th century. The Umayyad invasion of Gaul and, 800 years later, the Franco-Ottoman alliance in the siege of Nice, testify to France’s involvement in the convoluted history of the Mediterranean, and thus the spread of Islam itself. The French colonial project continued this close, if often uneasy, relationship between France and Islam. While in mainland France, *laïcité* (secularity) was solidified through the 1905 Law on the Separation of Church and State, in Algeria, which was considered to be a part of France rather than simply a colony, an “official” Islam loyal to the colonial state was cultivated and the 1905 law not applied (Davidson 2012, Maussen 2010). As has been noted by Lloyd (1999), the civilising mission of the French colonial project can be viewed as a “legitimate” mask for the political and economic interests that it sustained. *Laïcité*, as a constitutive part of this “legitimacy” could thus be relaxed in instances where it was politically or economically beneficial to do so. With the encouraged and facilitated arrival of migrant worker populations from the colonies that provided labour for the reconstruction of France following the Second World War, the presence of a significant Muslim population brought the problematic relationship between the colonial state and Islam to France’s doorstep. The wish to create favourable conditions for the maintenance of this labour force led to the implementation of generalised policies for family reunification thus amplifying this migration phase of Muslims to France. It was within the context of this initial migration that the first prayer rooms were established in factories and on the sites where migrant staff were accommodated. Prayer rooms were initially provided by factory owners for their Muslim workers, at the encouragement of the state, once more illustrating the expediency of *laïcité* where economic gain is at stake.

However, the end of the colonial period in 1962 exacerbated dormant tensions, with the loss of France’s colonies experienced as an insult to national pride, provoking an intensification of racism and anti-immigrant

violence on the part of French right wing groups that has endured and found a new resurgence today.

The 1905 Law on the Separation of Church and State, though often not stated as such, also provides for the freedom of exercise of religion, and thus to non-discrimination in a pluri-religious society and the right to establish places of worship under protection of the law. In practice, however, the 1905 Law is generally evoked as a constraint on religious visibility, most often targeting Islam as the second largest religion in France, as well as the most “visibly different” in terms of the racialised make-up of its population – largely Arab and black – its physical appearance – men with beards wearing jillaba, veiled women – and its concentration in relatively restricted areas due to the history of its migration and socio-economic make up. The tense historical relationship between France and Islam thus feeds into current political controversies around the visibility of Islam within France, mosques providing one recurrent object of contention in debates around communitarianism, supposed radicalisation and breaches of the republican value of *laïcité*, along with the burkha, its summer-time variant the “burkini”, halal butchers, and instances of violence carried out in the name of Islam that loom large in the public conscience. The conflation of these controversies in mainstream public debate thus leads to a situation where visible – or audible – manifestations of Islamic faith – or even forms associated more broadly with “Arab” culture – become a factor in or indicator of a generalised security threat. As in the colonial period, debates around “visible manifestations” of Islam tend to mask stark socio-economic inequalities that divide migrant populations, and thus often Muslims as a distinct group, from the “French” majority; factors that are easy to reject as subsidiary to supposed threats to French national identity and public safety.

Though the state is prohibited from collecting census data on citizens’ race or religion, it is estimated that there are between two point one million (declared Muslims between the ages of 18–50, including converts, from 2010 INSEE and INED survey) and five to six million (2010 French Ministry of the Interior estimate based on the number of immigrants and their descendants from majoritarily Muslim countries) Muslims in France. There is a need for places of worship that accommodate these populations. However, given the complex position of Islam in France, any proposal for a new mosque must first overcome a political environment that is naturally anathema to its coming into being, as well as attempt, once completed to act as an aid to communication and a positive for French Muslims in relation to their communities.

More broadly, the means through which Islamic faith is expressed can be seen as an opportunity to have a direct impact on the future relationship between France – and at a larger scale, Europe – and its Muslim populations, and indeed to contribute to the elaboration of a French or European identity and associated set of values that leaves space for the expression of Islamic faith. The creation of a new mosque provides one potential site for the elaboration of this idea.

CASE STUDY: MOSQUE “O”

The failure of the existing building to occupy the full capacity of the site offers an opportunity for the association that manages the mosque to respond proactively to the demand for the mosque to have a greater capacity. The fact that the mosque does not have the capacity to allow all those who wish to attend Friday prayer to safely occupy the building, while many are unable to enter the building at all and are then forced to choose between praying in the street or at home, provides a lever for the association in negotiations around the construction of a new mosque with the local mayor’s office. As opposed to the state at the national level, which is able to treat the “Muslim problem” in an abstract theoretical sense, often as a threat to French national identity, local authorities are less able to ignore the needs of their Muslim populations. They must find pragmatic ways to address the tension between the practical problems of mosque capacity shortage, its impact on the local area and the political tendency to attempt to render Islam invisible in public. The lack of mosque space results in buildings that fail fire safety inspections, crowds that block roads and pavements around the mosque, public praying and so on. In this sense, the problem of mosque capacity shortfall is shared. The perceived communitarianism of the Islamic community in France is exacerbated through these day-to-day issues, further dividing the population of the area into distinct Muslim and non-Muslim groupings. The construction of a mosque with a greater capacity may thus be seen by the local authority as a solution, politically justified through reference to the problems that beset the current mosque and impact the area as a whole.

PROJECT

To date, the development of the Mosque “O” project has advanced upon three distinct parallel tracks: through the establishment of an entity, AMOsq to assist the client, the mosque association, in taking decisions in relation to the project; through an interrogation of program, carried out as part of a

broader research study on contemporary mosques, of which a small aspect is described here; and, the regulatory context that applies to the building and the site that play a significant role in defining the form and function of the building.

Implementation

The role of assistant to the project client is to assist the client in defining, managing and operating a built project, providing expert advice and assistance, facilitating project coordination, and allowing the project client to fulfil their obligations while retaining the role of final decision maker. The use of project management assistance is justified by the size, complexity or specificities of the project concerned, a recourse that can also be triggered by the need for specific skills that must be sought externally.

In the case of a non-professional client, someone who may only occasionally or exceptionally be in the position to engage such a project, they may lack a number of skills required in project management, further justifying the need for such a service. The building of a religious building such as a mosque, which implies specific administrative processes and construction safety regulations, implies the need for such assistance.

AMOsq, a play on words of AMO – Assistance à la Maîtrise d’Ouvrage, is a project client Assistance service specifically oriented to mosque construction projects. AMOsq was developed in response to The Muslim Think Tanks observed struggle for local Muslim communities to fund their mosques as well as to achieve the construction of mosques that respond functionally to their specific needs, enabling their spiritual engagement with God and their fellow Muslims. The objective of AMOsq is to “professionalise” mosque implementation in France throughout the entire duration of the project, from analysis of the opportunity and feasibility of a project, evaluation and management of the project budget, definition of its functional and technical requirements, conformity to locally established construction norms and quality, coordinating between the various project stakeholders, the conduct of tendering procedures and the awarding of contracts, verification of the deliverables in accordance with specifications, definition and implementation of communication and training plans – but also the needs specific to a mosque project in France – crowd-funding, other forms of fundraising and political lobbying. All of these functions are carried out within the framework of an Islamic philosophy, entailing a specific knowledge of and attention to the religious requirements of the mosque, how these mutually interact with various regulations and laws

that condition the planning, construction and operation of the finished building, and in particular, with specific consciousness of the broader implications entailed by the attempt to construct a mosque in the specific political context of France, in Paris especially.

The financing of mosques and religious buildings in general are subject to the French principle of *laïcité*, in that the state does not finance religious buildings or contribute to the finances of cults in any form. Religious buildings built before 1905 – primarily churches – are owned by the state and subsequently made available to religious institutions. New places of worship, on the contrary, must be financed privately. Foreign public or private funds remain the exception with places of worship being for the most part financed by the donations of the faithful (ref: Rapport no. 345 (session 2014–2015), French Senate). However, collecting sufficient donations to fund the construction of a mosque is a time consuming process that can take many years and threaten the feasibility of a project. The creation and operation of an entity such as AMOsq aims to optimize the fundraising process with a dedicated and specialised team, in order to allow the mosque to be built in a much shorter time. As well as publicising the mosque project on a broader scale and putting in place functional processes for the collection of donations, AMOsq's role gives it a legitimacy to seek out and secure funds from other sources – cultural and religious institutions, business stakeholders, private philanthropists and so on – whether in France or abroad.

Program

The program of the new mosque is the most explicit point of departure from the “traditional mosque” building, aiming to provide a space for a community that can include Muslims and non-Muslims, locals and travellers, and people of different generations. As a program that is usually radically specific – a space for Muslims to gather and pray – the radical departure of the new mosque is the insistence on flexibility.

This decision has a number of practical implications, integrating the possibility for a prayer space to be used successfully for other functions and vice versa, as well as a recognition that in a political context where religious buildings, with the exception of those built before the 1905 French law on the Separation of the Churches and the State, may not receive public funds for their construction or upkeep, certain additional programs offer the possibility of generating income that can assist in the operational and maintenance costs of the building.

More fundamentally, the inclusion of other programs alongside those traditionally associated with the mosque must be carefully considered. Beyond a more standard feasibility study for a cultural institution or a combined commercial and public function, the addition of programs to the mosque can be seen as a broader reflection on the mosque's prospective role in the community and, more broadly, as a manifestation of Islamic identity in a political context of hostility.

In order to define the program, an initial workshop was led by The Muslim Think Tanks with five focus groups made up of Muslims of various backgrounds, in order to gauge their reaction and affinities to a series of programmatic propositions. These were presented as a series of individual options but that can be divided into three distinct categories.

1. Alternatives: services that are available elsewhere, particularly in the public sphere, but which may be considered by Muslims to be discriminatory, cause anxiety due to the way they are delivered and administered, or that they would feel more comfortable using in a majoritarily Muslim environment. These were a medical centre, a childcare service, a swimming pool, a gymnasium, and a halal hairdresser.
2. Neutral ground: services and business initiatives that suggest a shared use and sociability that is broadly oriented, thereby allowing members of the non-Muslim community to be make use of their local mosque. These were: a shared work space, a library, a communal vegetable garden, an exhibition space, and a florist.
3. Outreach: services and activities motivated by Islamic values that provide a means for these to be demonstrated positively within the local community. These were: initiatives to feed and talk to homeless people, distribution of clothes, visiting the sick, and religious classes.

These categories may be further subdivided into programs that would exist in parallel as "Muslim" versions of generally available public or commercial services and those in which the Islamic aspect of the program provides a specific opportunity for the mosque to offer a service that is not otherwise available in a similar form and that might play a positive role in communicating and representing Islam within the local community.

Outreach and neutral ground options were selected by all focus groups, with acts of solidarity and the library the most heavily featured, followed by religious classes and the vegetable garden. Several options – florist,

gymnasium, and halal hairdresser – were not selected by any of the five groups, while a number of groups explicitly rejected certain options – though this was not a requirement of the exercise – such as the swimming pool, the gymnasium, and the halal hairdresser.

A second range of options concerned the communication around the mosque and its day to day activities. All of the groups selected a combination of: a Facebook page, an online payment system for zakat, donations, and other mosque related payments, circulation of the minutes of mosque administrative committee meetings, an “ideal mosque” smartphone application, a regular newsletter, and in mosque Wi-Fi access. Unsurprisingly, the responses indicate a general tendency toward greater communication and smooth running technological systems.

Further categories of options offered to the focus groups related to the interior spaces of the mosque, the form of lighting preferred, the materials used, the introduction of greenery or art installations, and decoration, though these will not be discussed here.

Regulations

The Mosque “O” project takes as a site a restricted urban parcel in the east of Paris. At the angle of a wide boulevard with a tree-lined esplanade at its centre, and a narrow residential street, the parcel is constrained by 22.5m height restriction, with the last 4.5m drawn back at the 1:2 angle to create a classically Parisian roof line. The surrounding buildings vary in height and style, making up an urban tissue that reflects the area’s industrial history and the traditionally working-class make up of its inhabitants. Today, the area’s significant immigrant population is confronted with a steadily growing influx of young creative types, the halal butchers being joined by trendy bars.

Though the parcel has a capacity for six stories within the Local Urbanism Plan, as is the case with many surrounding residential buildings that have built to this limit, the current Mosque only ascends to one storey with a partial utilisation of a loft in the roof, falling into a small percentile of low buildings that have survived within the centre of Paris, especially given its privileged corner site.

The principal consideration in any new proposal to increase the capacity of the mosque, once the envelope of the building has been defined with

reference to the local urban plan, is the issue of fire safety. Whereas the construction of a new and bigger mosque in other contexts might be a question of expanding the prayer hall horizontally into a larger site, in Paris, one of the most densely populated cities in the world, the space to expand laterally is simply not available. Vertical expansion requires a reconsideration of how the mosque is traditionally used as a communal space for prayer with a particular form of circulation that takes the visitor through a determined process from the moment of their entry into the building. However, the perhaps more immediate question is how to safely welcome up to 1,500 people into the building at one time. Building regulations in France provide a set of very specific requirements that define the number and dimensions of fire exits, stairs, corridors, and so on, based not only on fire safety but access for people with limited mobility. The question of how to expand the mosque in the sense of its use can thus not be separated from the realities imposed by building regulations, providing two frameworks that must coexist in tension from the very beginning of the design process.

What this means in reality is that the site of only 254m² may be inhabited by a mosque with a capacity of up to 1,500 persons for prayer, but this requires four separate staircases to serve four stories in addition to the ground floor and basement, the total area of the stairwells equivalent to approximately 20% of the total surface area of the building.

The capacity of the building for prayer is primarily constrained by its categorisation as a lieu de culte. The regulation for this type of building sets the calculation of its capacity according to one person per seat, half-metre of bench or, in an aspect of the regulation oriented specifically toward mosques, per half-metre square of the floor area reserved for prayer. The number and dimension of the exit doors, staircases, and circulation is calculated according to this total prayer space as it is distributed throughout the building. The primary function of the mosque as a space for prayer and its security requirements as a building must thus be viewed in tandem so that the total space taken by the circulation does not impact on the capacity of the mosque to welcome the maximum number of people to pray and, conversely, that the building is not made unsafe by providing prayer spaces that have a capacity greater than the security measures of the building are designed for.

The commitment to setting a limited capacity for the new mosque, as a requirement for planning approval for the building, requires that the client must set in place a management plan for assuring this limit once the building

is completed. The way in which these functions in reality are integrated into the design of the mosque, enabling the movement of congregation in, around and out of the building. For example, though each floor may be evacuated by at least two or more stairwells in an emergency, for day-to-day use, the clarity of circulation around the building, and the ease of managing the large numbers entering the building, may be improved by dedicating one stairwell to each floor.

CONCLUSION

The construction of new mosques in France is fraught with difficulties, reflecting contemporary manifestations of a historically tense relationship between France and the Islamic religion. Each decision taken in the design process in the relation to the use of the mosque is thus rendered political in so far as the result will have an impact beyond the walls of the mosque itself, in relation to the national discourse around Islam, the more localised policies of the local authority, the mosque's neighbors, as well as more abstract entities such as building regulations, that are nonetheless connected to very concrete issues surrounding safety and accessibility. The Mosque "O" project in Paris, a collaboration between AMOsq, a part of The Muslim Think Tanks, the Paris based architecture office TXKL and a local mosque association, aims to provide a pilot model from which processes of programming, regulatory conformity, spatial design, funding, implementation and management of mosques may be established and applied to future mosque projects in France.

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