A comparative study on integration of courtyard in creating environmental sustainability space for eclectic buildings

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Abstract. Buildings are categorised into various types such as residential, educational, assembly and etc. This paper is described one type of assembly building namely mosque and its elements. The mosque is comprising of several elements such as courtyard, prayer hall, arcades, minaret, dome, the ablution rooms and toilets. It should be designed to accommodate the worshipper to feel comfortable and humble in the presence of God while performing the ‘solah’. In tropical region, especially in Malaysia; the existence of the courtyard in traditional mosques is still questionable whether it has fully considered the environmental benefits or it is simply a trend adopted from the Middle East. Previous studies have found that the purpose of having a courtyard inside a mosque is either for spatial reasons or it may be negligible. Hence, this study is conducted to understand the courtyard in a specificity of architectural style and the effects on spatial organization in traditional mosque design. The observation methods are used at the fieldwork in selected traditional mosques. From the observation two types of building indicator of space and form are identified for better understanding of courtyard characteristics of selected traditional mosques.

1. Introduction

Assembly building is defined as a place to gather people for such purposes as a place of worship, deliberation, educational establishments and etc. The mosque ‘masjed’ is a sacred place for Muslims to perform their prayers and devote themselves to the Almighty God. The word ‘masjed’ has comes from the Arabic word, ‘sajad’ which refer the prostration of Muslims ‘sojoud’ during performing prayer. In general, the architecture of the mosque is designed to have a rectangular plan whose length is in line with the Qibla (Mecca direction) and has a dome, courtyard, arcades, minaret and prayer hall [1]. According to [2] was reported that the first mosque in Medina was established in 622 AD by Prophet Mohammed (PBUH). The design was comprised of a large courtyard which has three gates and enclosed by the walls. There were accommodations rooms attached next to the mosque for multipurpose usage and cater the guests of Islam. Within the mosque compound, the palm trees have been planted to give shade and protect people from the sunlight while providing a covered area for them. This proved that the implementation of passive design is begun from thousand years ago. The mosque also functioned as a focal point and multi-use for Muslims such as a center for learning and for the dissemination of the Islamic Dawa "Islamic Call", a judicial center, a meeting place of the Shura Council, a place to
exchange views, a media platform for news broadcasting and reporting, and a house of hospitality and accommodating strangers [3].

As spread outside the Arabian Peninsula, there is an increase in the number of mosques around the world; the same goes to the size and shape of the mosques itself. Over more than 1400 years, most mosques strictly follow the prophet’s model [4]. The al-Masjid al-Jami’ is a large mosque where Friday prayer being held for Muslims congregation and usually located at the centre city where the populations is higher. The mosque as a center of worship of the Almighty God and the community center should be accompanied by natural elements [5]. Islamic teachings emphasize on minimizing the destruction of the environment and avoid the wastage. The appreciation of Islamic teachings is not only focused on worship, but also maintaining the environment as a claim that should be emphasized. The mosque designs also evolved in response to the available local materials and needs as the concept of a sustainable mosque being promoted in the present day especially in Malaysia. The Malaysian mosques practice a variety of art styles influenced by various sub-cultures and foreign influences [6]. The different architectural elements made the different styles of mosque designs. Most of the construction of mosques in Malaysia since the arrival of Islam in the archipelago has been sustained by considering the environmental factors. For hot and humid climate, especially in Malaysia, the mosque's design is influenced by the design elements of Traditional Malay House (TMH) and is perfectly suited to the local climate.

Generally, courtyard often connected with a mosque and helps the people defining the mosque architecture as well as the spaces of the mosque [7]. It is also one of architectural elements that have been used for socializing after performing ‘solah’ or while waiting for prayer call. Beside that, the function of the courtyard from the side of psychological is that it gives the therapeutic for reflection of the soul. Nowadays, the role of courtyard is questionable especially its presence in the tropic. It is whether the concept of its existence is only adaptation from the Middle East or it is being considered at an early stage of design. As the role of traditional mosque is reclaimed as a multifunction that constituted of devotion to Almighty God, Islamic educational, political, legislation matters and social culture, the organization of spaces should be designed with thermally comfortable to preserve welfare of the occupants. Moreover, this type of building being is dominant and highly honored among the societies besides the other religious building. Thus, it is viable to gain and boost the awareness of the importance in conserving the environment as well as saving the energy matters. Therefore, the objective of this study was to identify the characteristic of courtyard in traditional mosques based on observation. Before elaborating on the findings from the case studies selected, the next section was explained the literature review which covered of history and functionality of courtyard in mosques. The scope of study is focused on the two traditional mosques located in a small state in southern part of the west coast of Peninsular Malaysia also known as Malacca.

2. Research methodology

In conducting this study, various sources of available information in connection with the study is made and methods of obtaining the necessary data for the study are considered to analyze the characteristics of courtyard in traditional mosques by observation [17]. The direct observation at fieldwork was applied in this study to identify the characteristics of courtyard based on an observation method for qualitative research recommended by [18]. Two mosques were selected to assess their courtyard design and operation status. Table 1 shows five indicators established for the literature review on courtyard of traditional mosque were proposed to justify based on their appropriateness in defining the courtyard of traditional mosque. Thus, are important as it will help to reveal the aspects needed for a better understanding courtyard typology in traditional mosque. Each of these indicators will be analyzed as described in the flowchart as shown in Figure 1 which referred to the underpinning theories as proposed by prominent architectural scholars.
Table 1. Five indicators of data collection

| Building Indicator          | Process                                                                 |
|-----------------------------|-------------------------------------------------------------------------|
| **FORM**                    |                                                                         |
| - Settings                  | - Clarify the basic structure, focusing on architectural morphological elements, identify additional elements. |
| - Building scale            | - Compare the size and scale of courtyard in traditional mosque       |
|                             | - Analysis on building section and elevation to determine the size of elements by comparing to human scale referring to the drawing and on site observation. |
| - Detailing, structural     | - Observe and identify architectural elements that portray the usage of natural elements. |
| and ornamentations          |                                                                         |
| **SPACE**                   |                                                                         |
| - Spatial organization      | - Analyze the floor plan by identifying the entry point and movement pattern within the interior spaces on direct observation |
| - Courtyard                 | - Functions, fountains, ablution area, shape, size, volume, features   |

Figure 1. Process of data collection
3. Results and Discussions

Kampung Hulu located in the heart of Melaka in Melaka Tengah, Melaka. The mosque was built by the locals with Dutch funding during the colonization of Malacca by the East India Company (Figure 2 and Figure 3). Before the arrival of the Dutch in 1624, the Portuguese destroyed other heritage house of worship except Christian churches in Melaka. The Dutch government has commissioned local people to lead the construction of this mosque, Dato ‘Samsudin Bin Arom, an immigrant from China who had converted to Islam. The original building was subsequently repaired by Sheikh Omar bin Hussain Al-Attas and named as Kampung Hulu.

![Figure 2. Kampung Hulu Mosque](image1)

![Figure 3. Drawings of Kampung Hulu buildings (M T Rasdi, 2000)](image2)

The building is designed according the focal point between the entrance to the center of Qibla wall. This mosque is rectangular in plan and has a verandah on the sides and the entrance area which acts as a transitional space between the entrance and prayer hall. The verandah also functions as an extra room/space during the Friday congregation. According to [22], the verandah replaces the existence of the courtyard which is not the common practice in South East Asia. The technologies, materials and appearance for construction also began to affect change from colonialism in the middle of the 19th century. One of the prominent characters of this mosque is the level of the floor is not raised on stilts.

The design concept of this mosque is similar to Traditional Malay House (TMH) where the guests are welcome and greeted at the front door (public space) and then invited to the anjung or verandah (semi-private space). The inner living room or Rumah Ibu (private space) is only for relative and close people. The spatial organization of the mosque has implemented this design concept where the worshipper is welcome to the mosque at the entrance point (public space) then leading to verandah as transitional space (semi-private space) and directly go to the main prayer hall (private space) to worshipping God. The design of this mosque is similar to the ideal Prophet’s Muhammad (PBUH) mosque because of the simplicity in its design and oriented towards the wall.

This building has its own courtyard which allocates a fountain and also functions as ablution area. The fountain is placed right beside the entrance of this mosque (Figure 4). This is because it is a way of purification for the worshipper before performing solah. The walking distance from the ablution to the main prayer hall also at minimum which avoid the risk of getting foul.
Kampung Keling situated in the dense area of Melaka Town, Melaka (Figure 5 and 6). It was built as early as the year of 1748 but in 1872, the mosque was refurbished with brickwork. The concrete tower of the mosque is separate from the main building which is on the west wing and the ablution area is located in the south wing. The site of this mosque is said to be the actual site where Indian Muslim traders who came to Malacca in the 14th – 15th century performing their *solah* in this mosque after arriving in Malacca.

Figure 4. Fountain for ablution purpose

Figure 5. Kampung Keling

Figure 6. Drawings of Kampung Keling
The Kampung Keling Mosque is a mosque located at Jalan Tukang Emas, Melaka Tengah, Melaka, Malaysia (Figure 7). Locate in close proximity with the Cheng Hoon Teng Temple and Sri Poyyatha Vinayagar Moorthi Temple. The Kampung Keling Mosque is the oldest mosque in Malaysia which is still remains its original design (Figure 8). At the time of the mosque was built, the surrounding area of the mosque is populated by the community from the Southern India, which called "Keling" (from the word Kalinga).

![Figure 7. Location of Kampung Keling](Image)

![Figure 8. Main entrance of Kampung Keling](Image)

Multiple styles in designing the mosque symbolise the rapid development of architecture in Malacca at that time which influenced by the Hindu-Buddhist and Chinese architecture. The Kampung Keling Mosque was built using a square plan, and not in rectangular or hexagonal as practiced in Middle Eastern countries. The mosque’s area surrounds and decorated with the Corinthian columns as well as the verandah and the prayer hall. The corinthian columns also marks the separation between the mimbar of the hall.

The three tiered pyramidal roof form of this mosque is similar to the roof profile of the Kampung Hulu which characterized the mosques in Malacca. The multiple volume expression to the building interior and allow air ventilate for passive cooling. The roof is supported by four pillars in the middle of the mosque which creates large interior space for warm air to ventilate upward to the upper level. Beside that, the prominent curvature of the roof ridges is made of cement. There is a minaret that built of brick and has a form like a pagoda within the mosque’s compound.

Decorative motifs that adorn the doors, windows and roof decorations on the roof ridges are also influenced by the Chinese architecture. The influence of European architecture can be seen in the construction of this mosque, especially the implementation of the brickworks and finishing that applied to the inner walls of the mosque. Furthermore, the used of ceramic tiles that imported from China also applied on the floor and walls. The design concept of this mosque was similar to the Kampung Hulu Mosque that implemented the Traditional Malay House (TMH) in a style which responds to climatic condition and local materials.

Kampung Keling also has a fountain in its courtyard. The design and the shape of this fountain is different from the Kampung Hulu Mosque which can be seen on its roof. The fountain in this mosque has an opening on its roof while the fountain of Kampung Hulu mosque used on the gable roof. The columns of this fountain also enriched with the uniqueness ornamentations of natural motifs. Beside that, the used on decorative ceramic tiles on the steps of the fountain highlighted the character of influence traditional Chinese architecture.
4. Conclusion

Based on obtained findings, it was understood that Malaysia traditional building style followed local building traditions and climatic conditions instead of replicating traditional mosques’ elements from the Middle East. The early traditional building, were similar to Traditional Malay Houses and palaces in style and material used. However, with foreign cultural and technical influences, the traditional building faced major alterations in their appearance. It also can be found that the traditional building hold unique identity architecture styles and differ from the traditional mosques style in other Malay states due to its unique historical background. In the other hand, this historical mosque not only demonstrates the most staggering examples of Southeast Asian but also established the style of architectural movement. Alongside those considerations, this paper has listed three important characteristics of the courtyard as a qualitative guideline for architects to assist as a basic understanding for future study in these historical buildings.

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