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DESIGN FRAMEWORK FOR ABLUTION SPACES OF ICONIC MOSQUES IN MALAYSIA

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ABSTRACT

Mosques are places where Muslims perform prayers and other social activities. Those are built as a place for humans to worship the Almighty Allah at all times, as well as to provide an environment that responds to the needs of devotees and educates the future generation by the Quranic verses and the Prophet's teachings. Derived from the Holy Quran and the Prophet, purity is compulsory at all times for Muslims, and has many meanings that are applicable during prayers and the day. The ablution room is integrated into all mosque designs because it is an unseparated element. However, Malaysian mosques have been questioned in their application of some Islamic regulations to uniform a hygienically clean space that can respond the needs of Muslims. The design of the ablution rooms in Malaysian mosques is encountering a serious issue regarding the spaces' cleanliness. Although the ablution room has been designed to respond the Muslim's need to conduct the ablution practice and to cleanse a person spiritually and physically, several problems related to its design aspects were revealed. This research investigates the cleanliness of the Malaysian ablution space. It examines how the design aspects of the ablution rooms of the Iconic Malaysian Mosques impact the area's cleanliness and its users. Five case studies were selected for this study. Three methods of study were utilized: physical observation, architectural drawing analysis, and interviews. Aspects of design form, ventilation, cleaning status, and user experience were discussed. This research suggested that the larger mosques in Malaysia were suffering from serious hygiene issues that resulted from many aspects, including poor design, ventilation systems, and users' abuse. The research suggested some design guidelines for future and existing ablution areas that will improve the cleanliness

KEYWORDS:
Ablution Space, Design, Hygiene, Mosques, Malaysia

INTRODUCTION

Currently, the superiority of a country is measured by the development of its architecture and city planning design. Many cities are famous for specific buildings that are considered monumental and recognizable by their names. However, Islamic architecture has gone through numerous changes that give the uniqueness of the current style of the Islamic pattern. The history of Islamic cities has shown considerable evidence of the richness of Islamic architecture, elements, and details.

The recent and rapid development in Malaysia and the construction of many modern buildings have led to many fluctuations in its historical and traditional architecture. Mosques are the identity of this country, which for several years, have attracted the attention of designers and planners. They gave priority to reproduce monumental buildings that reflected the identity and heritage of the country. As a result, many mosques in the recent decades were built on a large scale and revolutionized the architectural identity of mosques in Malaysia and globally.

In Malaysian history, the country's heritage was rich in mosque architecture. Mosques in many provinces in Malaysia display various designs and use different elements to construct many mosques that reflect the culture and people of the country. Provinces like Terengganu, Melaka, and others have very famous traditional mosques. The researchers attempted many studies to document and record the physical planning drawings to preserve the country's heritage.

As a place for Muslim prayers and other social activities, Mosques were built as a means of worshiping the Almighty Allah. It is an environment that respond to their needs to educate future generations of the Quran and the Prophet's teachings. Derived from the Qur'an and Prophet, purity is compulsory at all times for Muslims, and it has many meanings that are applicable during prayers and the day. Muslims are required to pray five times a day, and they need to perform an ablution action before having

prayer. The ablution room is always integrated in every mosque design because it is an unseparated element of its design.

Ablution is a ritual activity that requires a Muslim to clean specific body parts in a sequence, starting with washing the face, hands, forehead, and both feet. It is required before each prayer, sometimes washing twice or three times [1]. Cleanliness is one of the important aspects of Islam, and it has physical and mental attributes for the human being. The ablution gives the purity of a wholesome concept that should be obtainable from buildings, clothing, and surrounding areas. In addition, it provides a healthy and dynamic environment and community [2].

Özdemir & Frank define cleanliness and purity as a Muslim's important value [3]. They are an aid to worship – a preparation. Without them, the canonical prayer is considered invalid. The Qur'an frequently refers to the terms cleanliness and purity because they are ideal in Muslim piety and consciousness. Özdemir further explains the dimensions of purity and cleanliness. The internal one refers to emptying or cleaning the self of all pride that might result from self-love and being an Allah-fearing person. The external dimension is physical hygiene. In Islam, external and internal are not separated as faith and action.

Prophetic experience is identified by the idolater's correspondents that dirt and impurity both internally and externally. Purity and cleanliness are categorized as religious, like studying and learning about truth and religion. Being in a state of uncleanliness is not allowed during canonical prayer. Ablution is necessary as a ritual act of purity and cleanliness. Ablution or *wudu* is the status of being clean and pure for praying. The Qur'an and hadith demand it. Muslims are obligated to perform ablution because it is a revelation from Allah. It is the bedrock and the heart. Lack of ablution makes the prayer unacceptable.

Prophet Muhammad (PBUH) introduced the ablution practice for Muslims. He carried out the Quranic teachings and requirements of his followers. In imitating the Prophet and his trusted instruction, Muslims follow his steps with the same manners. It maintains the unity, solidarity, and security of Muslims everywhere [3].

According to several studies conducted by Mokhtar, Nur, Suhaimi, and Zulkifli, the mosques in Malaysia raised several concerns related to the cleanliness of spaces [4]-[7]. The studies investigated several mosques and their facilities that focused on the ablution room and prayer area. As a result, the hygienic problem was revealed from several sites that must be studied and improved because it impacts the user's health and social life.

The ablution room is always crowded during praying hours. Therefore, it is essential to develop these facilities to avoid any unintended consequences in the future. From the researchers' reports, the main issues revealed included dirty locations, size, ventilation, poor treatment of users, and inexperienced staff. These issues led to bad smells, unclean spaces, and diseases. Therefore, it suggests a need to be further studied to create spaces that are properly designed and take into consideration in future and existing designs.

ISSUES AND PROBLEM STATEMENT

The aim of this research focused on studying the ablution rooms of Malaysian mosques regarding sanitation factors. Although the ablution room is considered a sacred place to perform the religious activity of ablution, numerous pieces of evidence show that this space has suffered from several factors that make it questionable for its cleanliness. The ablution room is a space in which the ablution activity is carried out, and it is required of all Muslims before proceeding to the prayer hall to pray. Several researchers have discovered that the ablution room is suffering from a cleanliness issue. While Malaysia is moving towards modernization, the need for bigger spaces to accommodate as many people as possible for the prayer hall has forced architects and designers to find alternative solutions to address this matter. The answer is to build the mosque's facilities either underground or enclosed within the building to allocate more space for the prayer hall. Constructing the ablution room underground reveals the issue of hygiene as one of many factors that could be resulting from unclean areas. The ablution room activity involves the use of water, and building it underground or within an enclosed space can risk the loss of ventilation. Others suggest that factors including a lack of cleaning staff, expertise, ventilation, space, and material can impact the cleanliness of the space.

Issues related to the design of the ablution space in the Malaysian mosques are vital for Muslim users and need to be investigated. Muslims must be in a state of ablution. Therefore, cleanliness is a priority before initiating the prayer. Several reports indicate that facilities involving the use of water may risk health hazards if they are not designed properly. Furthermore, there are no guidelines to be followed in order to control the ablution space's health and sanitation. Ignoring such an important and essential part of the mosque's architecture design may have poor hygienic consequences. Skin diseases, fungus, and unwanted smells may occur. The previous investigation demonstrated the existence of these in several spaces in Malaysia, including multi-storey buildings (shopping complexes) and individual mosques.

The issue reported by Mokhtar is that the proximity of the ablution room to the entrance and the prayer area can be one of the factors related to the cleanliness level of the ablution spaces [4]. Failures in proper design can increase the chance of skin diseases among users. Environmental factors, including humidity and airflow, also determine the space's hygiene and cause bad smells, fungi, and bacterial accumulation [8]. Another report by Zulkifli suggested that Muslim communities should pay more attention to

the ablution room cleanliness and mosques as a whole [7]. Several factors, including inexperienced workers and users' mistreatment, affect the cleanliness of the space. Humidity, ventilation, and space accessibility have also been highlighted by Hamid, Taib, Wahab, & Alias as important factors in the cleanliness of Malaysian mosques [9]. Investigations of the ablution rooms by Maher (2016) and Suhaimi (2010) suggest the issue of ventilation is an epidemic in Malaysian mosques. It has caused poor ventilation, black footprints, and repulsive ablution rooms, mostly garnered from public concern [6] [10]. Maher also stated that among the issues, the location of the ablution room in a dirty basement, poor ventilation, and improper treatment of space was also reported.

The design of the ablution room in Malaysian mosques is encountering a serious issue related to its cleanliness. Although the ablution room has been designed to respond the Muslim's need to conduct the ablution practice and cleanse a person both spiritually and physically, several problems related to its design aspects have emerged. There is an urgent need to investigate the ablution spaces in Malaysian mosques and evaluate those spaces from a cleanliness perspective. The current design of these spaces needs to be studied by understanding the issues impacting the ablution area's cleanliness. There are several ways to enhance the ablution room space from a hygienic point of view. Hence, further analysis needs to be conducted to uncover the solutions to this issue.

Table 1. Previous Research about Design Framework for Ablution Spaces of Iconic Mosques in Malaysia

Author	Issue	Result
Mokhtar 2005	Lack of expertise and facilities management	Failing to adhere to such mosques' requirements could result in improper cleaning for the ablution rooms
Ahmed 2016	Lack of expertise and facilities management Insufficient space, immoral consumer attitudes, and low-quality equipment	Issue of hygiene and barriers in managing mosque facilities. User's abuse impact on the space cleanliness
Zakaria, Rashid, and Ahmad 2016	Size, accessibility, guidelines, and insufficient understanding	Cleanliness issues and design aspects. The size and location of the ablution areas have to be studied
Hamid, Taib, Wahab, & Alias, 2015	The environmental factors	Bad ventilation, unpleasant stench, and unhealthy space, especially if the toilet area is within the same space
Maher 2016	Size, location, ventilation	Moldy prayer lines, pungent, poor ventilation, and repulsive ablution room

METHODS

The research utilized three study methods to investigate the characteristics of the ablution spaces within five Malaysian Iconic Mosques. First, the research was a qualitative approach that used physical observation, architectural drawing analysis, and structured interviews. The case studies consisted of five Iconic Mosques defined by the ITC and the Ministry of Tourism, Art, and Culture in Malaysia (MOTAC). Second, the physical observation was to investigate the characteristics of the existing design of the ablution spaces and their current condition. The second method was an architectural drawing analysis that the researcher used to manually sketch and redraw the existing layout plan of the ablution spaces. These sketches were subsequently transferred to a software application to generate more accurate drawings. Finally, the interview was divided into two sections. The first was conducted with the management of the mosques, and the second part was with experts in architecture. Due to the limitation of space in this paper, not all the research process was explained. Diagram 1 shows the summary process of the research for further discussion.

The study focused on investigating the iconic mosques in Malaysia that were considered as a monumental construction and represented the Islamic country architecture, as well as serving the country from social and cultural aspects. MOTAC define these iconic mosques as rich in history and architecture that represent the aesthetic of Malaysia and its modernity. The ablution room, one of the leading facilities in any mosque, was selected as a case study for the highlighted research to be further analyzed in the methodology section. Five case studies were selected for further discussion in this research. The study focused on analyzing the current design form of the ablution spaces to understand the hygiene factors.

The selection of the case study of this research according to specific parameters led to identifying the samples to represent the case studies. As a result, five mosques have been selected (Iconic Mosques of Malaysia) from several others cases. This selection has specific criteria's that have been listed below; The parameters to select the case study are:

1. These mosques have been defined as Iconic Mosques of Malaysia, representing the country's architecture, culture, and identity [11].
2. The case studies of five mosques have been selected based on the high number of stories. Each mosque has the ablution space either underground or within an enclosure, which could be vital to this research.
3. According to the Ministry of Tourism, Art and Culture Malaysia MOTAC, Iconic Mosques in Malaysia attract many tourists. It is essential to investigate such important facilities to enhance the image of Malaysia.

The Iconic Mosques selected for this research are:

1. National Mosque of Malaysia (Masjid Negara
2. Federal Territory Mosque (Masjid Wilayah)
3. Putra Mosque (Masjid Putra)
4. Tuanku Mizan Zainal Abidin Mosque (Iron Mosque)
5. Sultan Salahuddin Abdul Aziz Mosque (Masjid Sultan Salahuddin Abdul Aziz Shah) (state mosque)

NATIONAL MOSQUE OF MALAYSIA

It's located in Kuala Lumpur with a large capacity of 15,000 worshippers. It is surrounded by lush greenery with an area of about 48,562 square meters of land. Initially, Masjid Negara was built on the land of a church in 1965; it currently represents an important element of Malaysian Architecture. The main feature of the mosque is the tall minaret with 73 meters high and 16-pointed concrete star as a roof cover. The architectural concept of the mosque represents an open umbrella, whereas the minaret is a folded one. The roof was utilized to obtain a large space for the main assembly hall. However, the mosque underwent a major renovation in 1987. The umbrella is now decked out in green and blue tiles. The National Mosque of Malaysia stands as a stylish monument against the skyline of Kuala Lumpur.

Figure 1: National Mosque of Malaysia
(Source: Author)

FEDERAL TERRITORY MOSQUE

It was constructed between 1998 and 2000 in Kuala Lumpur with an area of 50,000 square meters near the Complex Government Office along Jalan Duta; it accommodates 17,000 worshippers. The opening was on October 2000 and officiated by the 12th Yang di -Pertuan Agong, Tuanku Syed Sirajuddin ibni Almarhum Syed Putra Jamalulail. The architecture of the mosque is a combination of the Ottoman and Malay styles. Also, the mosque was greatly influenced by the Blue Mosque in Istanbul, Turkey. The mosque has 22 domes whose material is a composite of fiberglass fabric and a mixture of epoxy to make it more durable and lighter in weight. The building serves as a community mosque, research and education complex; the mosque facilitates a meeting room, seminar room, library, accommodation hall, and is multi-purpose.

Figure 2: Federal Territory Mosque
(Source: Author)

PUTRA MOSQUE

It is called the pink-domed mosque that is constructed with rose-tinted granite. The mosque accommodates up to 15,000 worshippers at a time. It is influenced by the King Hassan Mosque in Casablanca, Morocco, especially the basement wall of the mosque. The three main elements of the mosques are the prayer hall, the courtyard, and the learning facilities. The prayer hall is simple and beautiful and is supported by 12 columns. The highest point under the dome is 76.2 meters above ground level. The courtyard is colonnades and decorated by several water objects that provide the space with a welcoming and stunning environment. The five-tiered minaret represents the five pillars of Islam, and it is influenced by the design of the Sheikh Omar Mosque in Baghdad. The minaret height is 116 meters which is one of the tallest in the region.

Figure 3: Masjid Putra
(Source: Author)

SUB CHAPTER

TUANKU MIZAN ZAINAL ABIDIN MOSQUE

It is also called the Iron Mosque for its structure, and it is the second principal mosque in Putrajaya, Malaysia, after Putra Mosque. The construction was between 2004 to 2009, and was then officially opened for the public by the 13th Yang di-Pertuan Agong, Tuanku Mizan Zainal Abidin in 2010. The mosque is twice the size of the Putra Mosque in the area; it accommodates about 24,000 residents, including government workers in Putrajaya and the city center. One of the unique features of Tuanku Mizan Zainal Abidin Mosque is the district cooling system and the air conditioning system. The architectural wire mesh was employed in the construction of the mosque and imported from Germany and China. Reinforced concrete with glass covers the main entrance; and the glass creates the illusion of a white mosque from afar. The mosque's interior is decorated with beautiful calligraphy variation, and the main entrance is adorned with a verse of Sura Al-Isra from the Qur'an. A skyway is one of the main features of the exterior path of the mosque that stretches an area of 13.639 square meters. The skyline features a landscape that is adopted from the castle of Alhambra.

Figure 4: Tuanku Mizan Zainal Abidin Mosque (Source: Author)

SULTAN SALAHUDDIN ABDUL AZIZ MOSQUE

It is the largest mosque in Malaysia and the second largest mosque in South-East Asia after Istiqlal Mosque in Indonesia. It is located in Shah Alam, the new capital of Selangor, and was constructed between 1982 and 1988. Four minarets are erected at each of the mosque corners. A blue and silver dome is one of the most distinguishing features of this monument. The architecture of the mosque is a combination of the modern Malay architecture. It accommodates 24,000 worshippers, and it is so large that it can be seen from Kuala Lumpur. Each minaret is 142.3 meters high. The dome is constructed from aluminum and stands 106.7 meters from ground level. Arabic calligraphy decorates the inside of the dome and some other parts of the walls. However, the aluminum material adorns the doorways and the windows as well as some parts of the walls. To reduce the light and glare inside the mosque, the windows are tinted with blue stained glass. The air conditioning system covers the main prayer hall, which the prayer is over two levels. Moreover, the landscape is inspired by the Quranic Garden of Paradise (heaven). Other spiritual galleries are exhibiting a rich array of Islamic art and occasionally hosting some traditional Islamic performances.

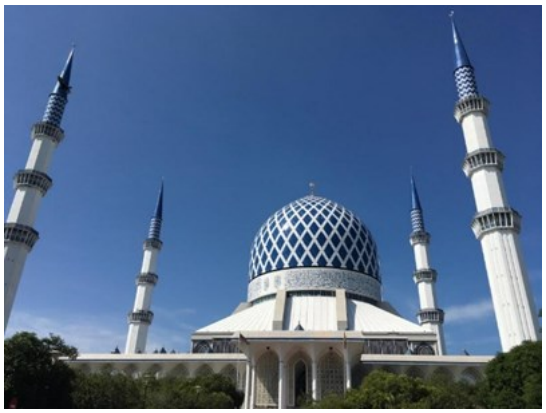

Figure 5: Sultan Salahuddin Abdul Aziz Mosque (Source: Author)

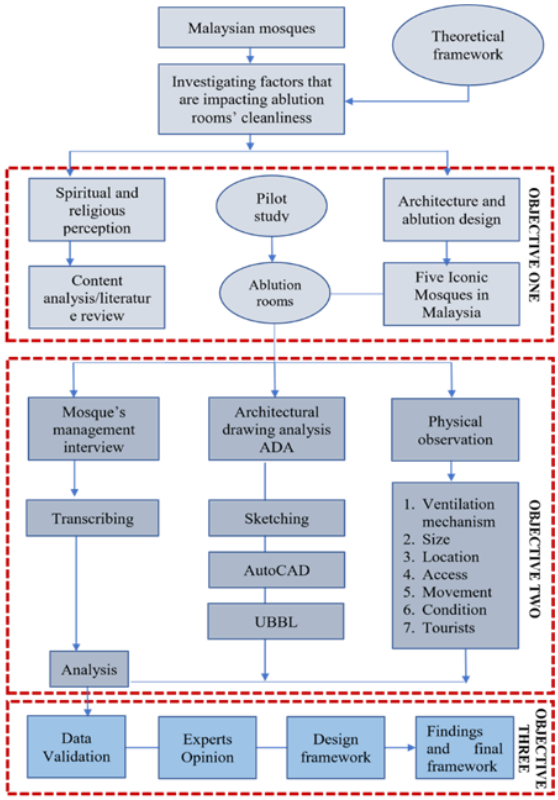

Diagram 1: The process of the research.

RESEARCH FINDINGS

Due to the limitation of the spaces in this paper, the five case studies' findings are listed in tabular form to understand the findings from each method. The table is designed to compare the cases from the aspects which were discussed earlier in each case. The analysis discovered that the favorable ventilation system in most Malaysian Mosques is natural; however, few cases use mixed types of

ventilation. The reason is, at peak hours during the congregation prayer, it requires extensive dryer to help dry out the floors. Most of the ablution areas adapted portable blowers. Also, most of the cases showed that one main ablution area is preferred. Some cases are using smaller spaces with water taps for ablution. Wilayah Mosque and State Mosque have acquired extra spaces for convenient use. In Masjid Wilayah, a smaller ablution room is placed at each entrance. These rooms are mainly using natural ventilation, but the hygiene level of these areas is below the expectation. Among the reported issues: dark spots, fungus, smelly space, and in some cases, no ventilation system used. The findings of this research disclosed that it is not advisable to place the toilet room close to the ablution area for hygiene purposes. Placing the toilet area close to the ablution room creates an unwanted smell and non-fresh environment for the users.

The ablution area location is close to the prayer hall and the main entrance most of the time. In some cases, users have to walk a long distance barefoot to the prayer hall. There are no shoes allowed or provided for public use. Also, the ablution area with an attached toilet has shown that this issue exists in many mosques, and it is unhygienic. In terms of accessibility and entrances to the ablution areas, most cases showed no regulations to guide the worshippers in the ablution room. Some ablution areas only have one entrance which is used as an entrance and an exit. However, Sultan Salahuddin Abdul Aziz Mosque is the only example in this research that deals uniquely with the design of the entrance. A user must use the entrance room as an entrance. It is prohibited to use reversely. This type of guideline can positively impact the space's cleanliness. In Masjid Wilayah, however, Gate-D uses one gate that functions as an entrance and exit. The results from the findings revealed the negative situation of the ablution area floor during the peak hours. The following table demonstrates a comparison of the findings from the physical observation and the drawings analysis.

The following table is designed to state the findings from each interview conducted. Each statement is listed based on the interviewee and the case observed. The table is a conclusion that captioned from the interview. Some questions were eliminated during the interview as the results showed either not common or no answer. These questions were such as the availability of kids changing rooms. Many mosques have no space for such activity; however, State Mosque is the only case adapting this room. The other questions were related to the daily cleaning and hours of cleaning. Most interviewees showed no knowledge of this because the workers had official working hours from 8:00 am to 5:00 pm. The last question is related to the cleaning of mechanical ventilation or ducting system. Only one case study applied to this question which is Mizan Zainal Abidin Mosque. It is stated that the company is responsible for checking periodically if necessary.

The findings revealed that the majority of the interviewees agreed to apply a mixed type of ventilation system in mosque ablution areas. The reason is that the ablution room gets crowded during the peak hours, while natural ventilation is not enough to dry up the floor area. However, all interviewees approved that the natural ventilation system is the best solution for the ablution area design. It stated that natural ventilation can significantly improve space hygiene and can save energy. Most of the observed cases have shown that the ablution areas were used by worshipers from public users and the staff. However, the National Mosque of Malaysia has a specific room for ablution purposes that is only for the management and staff of the mosque. This separation will raise the issue of interaction between the users and the management of the mosque to understand the situation of the public ablution area during peak hours. From the results of the interviews, it was found that Participant 09 had a different statement from Mr. Participant 10 regarding space availability during peak hours. Participant 09 stated that the main ablution area got crowded during the Friday prayer, with many worshippers waiting in queue to perform the ablution. Meanwhile, Participant 10 has a different statement stating that space is enough and there is no such issue. The reason is that the specific ablution area for the mosque staff has created a barrier between the managers and the public users. Department of Islamic Development Malaysia or Jabatan Kemajuan Islam Malaysia JAKIM is managing the Iconic Mosques in Malaysia. Therefore, most of the case studies showed sufficient funds provided. However, in some case studies, the Malaysian government decided to reduce the budget, reflected in the number of workers inside the mosque. The cutting of workers has an impact on the cleanliness of the ablution area. The effect is seen during the peak hours while the workers are not fulfilling the needs of the mosque.

Another point is the working hours. It is stated that the observed case studies have working hours just like any governmental institution. However, due to limited working hours, mosques and ablution area are unattended at night and after 5:00 p.m. Many interviewees reported that during the night or morning prayers, insufficient workers are available. In some cases, like Wilayah Mosque, Participant 08 said that the mosque had to borrow a few workers from another mosque to help out cleaning. Another issue is poor treatment of users and tourists. Although many interviewees reported that most users were careful about the cleanliness of the ablution areas, some said that there were fewer users abuse this sacred place. Reports like throwing trash, spitting, self-hygiene, reckless using, abusing urination facilities, or even defecating in the ablution space

Table 2: Comparison of the findings from the physical observation and the drawings analysis

Case	Ablution room	Ventilation system	Location and Access	Cleanliness and hygiene	Standards
Mizan Zainal Abidin Mosque	A	Mechanical	Under the prayer hall. Multiple entrances. Stairs are leading to the prayer hall	No unwanted smell detected. Dark spots recorded on the floor and dirty surfaces.	Not applicable
	B	Mechanical	Under the prayer hall. Multiple entrances. Stairs are leading to the prayer hall	Dark spots	Not applicable
Putra Mosque	A and B	Natural	Under the prayer hall. Two entrances in each room. stairs are leading to the prayer hall. Long walking distance	Dark spots. Fungus and moist floor.	Achieved
	Outdoor	Natural	Beside the prayer hall.	Unclean	Not applicable
Federal Territory Mosque	Gate-A	Mixed	Below the prayer hall. One entrance. Accessible by stairs	Unwanted smell is coming from the toilet area	Achieved
	Gate-B	Natural	Below the prayer hall. Multiple entrances. Long distance to the prayer hall	Unwanted smell which is coming from animal waste and unattended trash bin. Dark spots were found.	Achieved
	Gate-C	None	Below the prayer hall. The prayer hall is accessible by stairs on the sides of the room. multiple entrances.	Dirty floor. Smelly. Fungus and moist walls.	Not achieved
	Gate-D	Natural	Under the prayer hall. Short distance. Accessible by stairs. One entrance	Footprints and unclean floor. Smell is coming from the toilet area.	Achieved
National Mosque	Outdoor	Natural	Long walking to the prayer hall.	Few dark spots on the water taps units.	Not applicable
	Staff	Mechanical	Long walking to the prayer hall. Staff use only.	None. The room is newly constructed	Not applicable
	Main	Natural	Under the prayer hall. Multiple stairs are leading to the prayer hall. Multiple entrances. Only one is used.	Few dark spots and moist walls from rains.	Achieved
Sultan Salahuddin Abdul [illegible]	Main	Natural	Beside the ablution room. walking distance. One defined entrance and one exit.	Wet floors. Fewer dark spots found.	Achieved
Case	**Ablution room**	**Ventilation system**	**Location and Access**	**Cleanliness and hygiene**	**Standards**
	Additional	None	Around the prayer hall. Three ablution rooms each with one entrance.	Humid. Walls are unclean.	Not applicable

Table 3: Comparison of the findings from the management interview

Case	Participant	Profession	Favorable ventilation system	Space over crowdedness during peak hours	Number of workers	Workers experience	Fund and budget of the mosque	User's mistreatment	Tourist's impact
1	01	Management staff and supervisor		Crowded during Fridays, but manageable	No cleaning workers after 5:00 pm. Shortage of workers			Reckless and mistreat the place of the toilet or ablution room	
	02	Supervisor from the cleaning company					Sufficiently funded as its run by the government		
	03	Head of management department			Manpower is needed	Housekeeping and cleaning skills are required	Budget does not fulfill the mosque needs		
	04	Imam of Masjid Mizan Zainal Abidin	Natural ventilation			More training is needed for workers. Language barriers for some foreigner workers			Signs are needed to manage The tourist's movement inside the mosque
2	05	Guide and volunteer		Manageable during the peak hours	Limited working hours		Sufficiently funded by the government	Throwing rubbish. Abuse the ablution room	Many tourists are visiting Putra Mosques every day. It can bet out of control
	06	Cleaning company staff					Some workers have been working for 5 years and experienced		
	07	Supervisor of the cleaning company		Natural ventilation is preferred				Large mosques in Malaysia are financially well managed	Throwing rubbish. Abuse the ablution room	Some tourists urinate in the ablution area
3	08	A supervisor and assistant director		Mixing between the two system is favorable	The situation is terrible during the peak hours	No enough workers. Working hours is bounded by official time from 8 to 5 pm	Experienced but the number of workers does not fulfill the need	The budget reduced this year.Equipment's are needed	Trash throwing, urinate and defecate sometimes.	As the mosque guide the tourists, no issue was reported
4	09	Security guard		Natural ventilation is preferred	Overly crowded during the Friday prayer	No workers during the night				Homeless people break in during the night and abusing the space.
	10	Chief Unit of Administration of Masjid Negara		Mixing between the two systems is the best solution	Not crowded	Workers are fulfilling the need of the mosque	Lack of manpower			Homeless people break in during the night and abusing the space
5	11	Facility manager supervisor	Mixing between the two systems	The ablution area gets crowded during the Friday prayer	Sufficient number of worker	Inexperienced	No issue in this regard	User's abuse the water taps the floor area and the door knobs. Some other hygiene issues	Nothing has been recorded	

Regarding the tourists' misunderstanding, it was reported that in Masjid Putra and Negara Mosque, the number of tourists is great and requires more attention as sometimes it could be out of control. For example, some tourists urinate in the ablution area or throw the trash. However, mosques like Mizan Zainal Abidin or State Mosque have shown better handling with tourists. The tour guide management is stronger and guides the tourists around the mosque to introduce its facilities. Lastly, the issue of homeless people in Masjid Negara is important to highlight. Some homeless people break into the ablution area at night as the mosque is open 24 hours for users. The problem occurs frequently, but the management is trying to solve it. The following table introduces the findings from the management interview analysis by eleven interviewees. Each table must be typed and consecutively numbered, just like Table 2. The title is written above the table in trebuchet font with eight center bold font, while the source is placed below the table in the same font.

The table 4 lists the findings of the expertise interview. Three experts in the field of architecture discussed the main results of this research. In addition, a list of questions was given to each candidate to provide their statements on the cleanliness issues of the Malaysian ablution spaces. Also, a code is given to each expert and addressed anonymously for a confidential reason.

The discussion revealed that natural ventilation is the best solution for ablution areas; conversely, the study showed the absolute need for certain mechanical equipment, which will improve the quality of the cleaning and the cleanliness of the ablution rooms. The

findings of the expert interview are in line with the physical observation of the study and some of the management interviews like Participant 08, 10, and 11, who showed the significant need for mechanical blowers, especially during peak hours.

Besides, the experts argued regarding the underground ablution rooms; they agreed that the current location of the ablution rooms in many iconic Malaysian mosques is inconvenient for users. The ablution room should be on the ground level and easily accessible; it is rather to place the ablution room outside the mosque to reduce the crowd during the prayers. Designing smaller ablution spaces and distributing them around the mosque is one of the answers. The study's observation showed two cases that employed the use of smaller additional ablution rooms around the prayer hall and the mosque. However, the designers failed to achieve the parameters of the study which resulted in unclean areas.

The experts recommended external water taps. Outdoor ablution areas can be easily maintained and exposed to the natural sunlight that improves cleanliness. Although Putra Mosque showed some attempts to utilize external water taps, they were unclean and not well maintained.

Moreover, Although the literature review did not show any attempt regarding the tourist's impact on the ablution rooms' cleanliness, this study discovered that it is vital to discuss further. The interviewers from the experts and the management highlighted the concern which have been analyzed previously. Furthermore, the expert analysis claimed that the location is essential to avoid the tourist confusion; the role of the tour guide is important. Lastly, placing proper signs that introduce the function and the sanctity of the ablution spaces will be an asset.

In conclusion, UBBL has been used as one of the main references for Malaysian architecture for many years, but it needs improvement as it does not have sufficient guidance for the mosque's design. Most of the regulations are regarding the toilet design; the ablution room requires special guidelines that do not exist in Malaysia. The experts stated that such research could trigger the authorities to enhance the current standards in Malaysia.

Table 4: Validation parameters and conclusion of the expert interview

Expert	Preferable ventilation mechanism	Space availability and location of the ablution and toilet rooms	Tourist's impact	Access to the ablution room	Standards and guidelines
A	Natural ventilation; however, some spaces could differ	Underground ablution room is not the best solution. Outdoor water taps should be provided, it could reduce the pressure on the peak hours. Smaller ablution rooms are recommended.	Placing signs would help the tourist to understand the function of the ablution rooms. The role of the tour guide is necessary.	Having individual entrance and exit help to improve the cleanliness of the ablution rooms	UBBL is not enough for designers, more scientific studies about the ablution spaces would help to come up with a better guideline
B	Mixing mechanisms could be the answer, mechanical ventilation is not efficient and requires regular maintenance.	The toilet room should not be close to the ablution room, it impacts the cleanliness. Scattering the ablution rooms around the mosque in smaller space.	The ablution room should be outside the mosque to avoid the misunderstanding. Proper introductory for nonMuslim tourists would help to avoid the misunderstanding.	The entrance of the ablution room should be defined, having such an order would help to reduce the crowd pressure during the peak hours.	The current standards of the ablution design are not enough, UBBL derived from the British standards and not always applicable especially for mosque's design.
C	Natural ventilation is more efficient and can be implemented as the main mechanism.	The ablution room should be outside the mosque. The toilet room should not be near the ablution room by all means.	Tourism is an essential part of Malaysia. Proper signs and better guidance to introduce the ablution space functionality.	Controlling the movement of users would help to avoid the unnecessary interaction and improving the space cleanliness	Standards like UBBL does offer a certain measure that cannot be applied to the ablution rooms.

SUMMARY OF THE DISCUSSION

Due to the limitation of space in this paper, this section investigated five case studies which are: Tuanku Mizan Zainal Abidin Mosque (Iron Mosque), Putra Mosque (Masjid Putra), Federal Territory Mosque (Masjid Wilayah), National Mosque (Masjid Negara) and Sultan Salahuddin Abdul Aziz Mosque (Masjid Sultan Salahuddin Abdul Aziz Shah) (state mosque). Each case study was analyzed using three methods of investigation: physical observation, architectural drawings analysis, and interviews. Finally, a critical discussion of the findings is compared to the literature reviews of this study.

The results of the physical observation complied with previous research that the lack of natural light can cause many physical issues concerning space cleanliness. It was also explained that the current situation of ablution areas required lots of manpower and cleaning, which only became worst during the congregational prayers. The issue was highlighted in the case of Wilayah Mosques and State Mosque. However, alternative methods were introduced to implement the use of technology to improve the ablution area cleanliness. Their research highlighted the use of automatic smart machines to avoid the interaction in the ablution process, which creates a healthier yet cleaner environment.

Although some spaces have utilized mechanical ventilation, it is possible to integrate the natural ventilation system in the ablution areas by adjusting the design. In separate literature, the study introduced various methods in design to allow the sunlight to enter the space, which is also applicable in underground facilities [12].

The research showed that despite proper mechanical ventilation, previous shreds of evidence found that lack of natural sources such as sunlight and airflow causes several diseases and fungus in the

ablution rooms. An experimental study examined the pollution level in spaces with natural ventilation and compared it to the mechanical system [13]. The study found that the risk of health-related air quality can be caused by mechanical ventilation of HVAC. Furthermore, maximizing the use of doors, windows, and other design elements subsequently increases the airflow in buildings, positively impacting the healthy environment and reducing energy consumption. The findings from the interview approach highlighted the issue of energy consumption, particularly in Tuanku Mizan Zainul Abidin Mosque.

The use of natural ventilation alone does not guarantee a clean space. The study showed that the spatial relationship between the ablution room, prayer hall, and the main entrance has a direct impact on the cleanliness of the ablution areas [4][14][15]. The research carried several cases wherein each different example scenario was applied to understand how the spatial organization impacts the hygiene of the ablution room. Alternatively, walking a long distance from the main entrance to the ablution areas barefoot might increase the risk of infections among users. The implementation of long corridors and stairs also directly impacts the amount of interaction among worshippers.

The finding from the management interview highlighted the major issues regarding the ablution space cleanliness. It also discussed some advantages that can be applied in the other case studies. First, the discussion argued about the best ventilation system that can be used in the ablution spaces, but the majority said that natural ventilation is preferred. This point has been explained by several researchers who explained that enclosed spaces that use water require unique solutions to achieve the best ventilation [4][6] [10][16]. Natural ventilation has been proved to be efficient and can maximize space cleanliness. However, some interviewees (Participants 08, 10, and 11) said that during peak hours, natural ventilation does not fulfill the ablution space maximum ventilation; but a mixing system is the best solution. This research highlighted that mixing natural and mechanical ventilation systems can improve the space's cleanliness as it can maximize the efficiency of the space during peak hours. It was also explained by the modular, which attempted to develop a new concept that improves the cleanliness of the ablution spaces by integrating mechanical equipment [17]. The other important point is the number of worshippers during the peak hours that affect the space cleanliness. Participants 01, 08, 09, and 11 agreed that the situation was terrible during the congregational hour and needed to be improved; their study highlighted such issue in their previous research, which resulted in unclean ablution areas [4][5][6] [7][17]. Such a thing can have a direct impact on the health and safety users. Experience and number of workers are another argument to be considered; most of the participants agreed that the working hours are one of the limitations in many mosques in Malaysia. The government should realize that such an institution requires special arrangements in terms of working hours.

The other fact is the worker's inexperience. Some said that the workers have enough experience, but the number does not cover the mosque area. Others mentioned that the workers were foreigners and could be difficult in communication; whereas some declared that the workers had enough. The research of Maher, 2016, discusses these issues; Mokhtar, 2005; Nur, 2016; Suhaimi, 2010; Zulkifli, 2017 in their research about smaller mosques in Malaysia [4][5][6][7][10]. Additionally, lack of resources and manpower are among the factors that impact the cleanliness of spaces. The previous study highlighted that the authorities' lack of areas and standards are vital points to be addressed. However, it was explained that among the other factors, poor management and inexperienced workers caused many issues in the Malaysian mosques, which were deliberated by interviewing many Malaysian users to evaluate the users' satisfaction [10]. Maher also explained that designers and architects have a significant role in improving the hygiene level in the ablution areas. The issue of user mistreatment has been viral and discussed intensely among the interviewees who explained that there were many cases of users abusing the ablution space by throwing rubbish, urinating, and abusing the water taps and other equipment. Zulkifli, 2017, in his study stated that Muslims must pay more attention to the existing ablution spaces to help them and create a clean space for personal hygiene [7]. Besides, it is one of the essential points in the Malaysian Mosques that should be addressed urgently [9].

Finally, the participants in cases one, two, and four highlighted such an important point regarding the misunderstanding of foreign users and tourists. Many of them are not familiar with the primary function of the ablution rooms and their sanctity. Unfortunately, no research has yet been conducted as this emerged during the pilot study, physical observation, and the management interview. This issue needs to be investigated further in future studies.

CONCLUSION

The findings of this research revealed the Federal Territory Mosque has shown some concerns regarding the cleanliness of the ablution rooms. However, it should be noted that the other cases have shown various other concerns that need to be addressed. The preferred type of ventilation is natural ventilation. Therefore, it is essential to equip the ablution spaces with mechanical blowers or fans during peak hours.

The natural ventilation system is not sufficient during the Friday prayers because the ablution area gets crowded during this time. Larger ablution areas demonstrate a better hygienic environment than the smaller ones. However, most of the mosques are equipped with large-scale ablution areas, including the

Federal Territory Mosque and State Mosque, which use smaller ablution areas having revealed several concerns during the physical observation and drawings analysis. The toilet area should not be inside the zone of the ablution spaces. The physical observation has revealed the possibility of unwanted smells occurring if the ablution area and the toilets are in the same space. Also, the drawing analysis revealed that four ablution rooms do not follow the minimum standards for ventilation. The Gate - C ablution room in the Federal Territory Mosque and three other rooms at the State Mosque have no ventilation system installed. These spaces demonstrate an unhygienic environment that is dirty and smells bad.

Malaysian architecture has been developing rapidly in the last few decades. The five Iconic Malaysian Mosques investigated demonstrate vital issues about the cleanliness of the ablution areas. The methodology reveals that Malaysian mosques encounter numerous matters resulting from ventilation systems, poor design, and user abuse. Although some of the cases have been observed in some aspects, but not in others. It suggests that larger mosques in Malaysia require special considerations. The congregation of Friday has more impact on the cleanliness of the Malaysian mosques and the ablution areas specifically. A large number of devotees demanded more workers and better management systems to maintain the space's cleanliness.

THE MANAGEMENT INTERVIEW

The interviews indicate that Malaysian mosques are questionable regarding their cleanliness. The interview with the management of the five iconic mosques suggests the working hours of the staff and cleaners are not fulfilling the hygienic needs. Mosques require a 24-hour operation to cover the five daily prayers. Lack of funding results in a reduction in the number of workers. User mistreatment and tourist misunderstandings are suggested factors impacting the cleanliness of the ablution areas.

FEEDBACK OF THE EXPERTISE

The experts interviewed confirmed that natural ventilation is preferred in the ablution spaces because it provides adequate ventilation with minimum maintenance. They stated that designing ablution spaces with adequate ventilation is one of the challenging points, and mechanical equipment is not needed if the space is adequately designed. The location of the ablution spaces should always be on the ground level and separated from the toilet rooms. Otherwise, this can create an unhealthy environment and impact the cleanliness of the mosque as a whole. Building the ablution rooms in smaller spaces around the mosque reduces the number of users in each area. However, a specific solution must be applied to avoid the dirty floor, smell, and footprints by introducing different entrances for each space, as demonstrated in the Sultan Salahuddin Abdul Aziz Mosque.

When tourist visits, certain signs should be placed near the ablution rooms to highlight the sanctity of these spaces. In addition, the role of the tour guide is also essential. Finally, the experts stated that Malaysia does not have enough guidelines regarding the design of the ablution spaces. Most of the existing guidelines, such as Malaysian Building By-Law UBBL, are not updated and do not fulfill Malaysian mosques' needs.

DESIGN IMPLEMENTATIONS AND MANAGEMENT PLANS

To enhance the cleanliness of the ablution spaces of iconic Malaysian mosques, proper management and design recommendations are required. To achieve a better and cleaner ablution room, certain points need to be addressed. Therefore, this part of the study proposes design recommendations, appropriate management, and plans that are listed as follows:

1. The natural ventilation demonstrated in most of the case studies has not been properly implemented in the design. The case study of The National Mosque of Malaysia is the only case that maximized the use of natural ventilation in the design of the main ablution space. This use of natural ventilation can be applied in future designs elsewhere.
2. The physical observation revealed that many of the ablution space floors of the case studies suffered from many issues, including dark spots and fungus. Therefore, it is recommended to improve the quality of cleaning, especially during prayer hours.
3. Having one main ablution space is more efficient in many aspects. However, larger mosques in Malaysia demonstrate some struggle in their approach to the ablution spaces because users are forced to walk a long way to get to the ablution space and the prayer hall. Therefore, one of the design recommendations is to install outdoor ablution spaces that are easily accessible. In addition, it reduces the pressure on the main ablution room during peak hours.
4. The architectural drawing analysis reveals few ablution spaces follow the Malaysian standards UBBL regarding ventilation. Therefore, these spaces need urgent attention. Furthermore, they need to be closed and maintained because they can negatively impact the user's health. The Federal Territory Mosque and the smaller ablution rooms at Sultan Salahuddin Abdul Aziz are among the highlighted cases.
5. According to the management interview, many mosque workers are either inexperienced or not experienced enough. There are no set criteria of the selection of cleaners in many iconic mosques in Malaysia. The cleaning company is responsible for the employment of the cleaners. It results in improper cleaning and contributes to subsequent hygiene issues. It is recommended to prepare a guideline for worker selection according to their experience or conduct smaller seminars that introduce the basic cleaning requirements before

the work starts.

6. Iconic mosques in Malaysia are governmentally funded. However, the working hours do not cover the five daily prayers for Muslims. Moreover, according to the research participants, the ablution spaces have no workers during the night and morning prayers, resulting in unclean areas. Therefore, the government should obtain a better solution that allows workers of the mosques to be available 24 hours following the prayer times through night and morning shifts.
7. Bad smells were found in many cases in this study. It is one of the vital issues of this research. The physical observation and the architectural drawing analysis found the issue linked to the fact that some of the ablution spaces were close to the toilet room, or the toilet area was located within the same enclosed space. Such critical issues are architecturally unacceptable. The toilet room should not be near the ablution spaces because it interferes with the cleanliness of the ablution room and is unhygienic. Spiritually, the toilet room considers *najis* or unclean from the Islamic perception. Therefore, the current location of the toilet rooms should be moved or closed.
8. Tourists' misunderstanding and users' mistreatment are among the underlined topics of this study. There is a lack of understanding towards the sanctity of the ablution rooms. The management and expert interviews revealed that Malaysian mosques attract many tourists throughout the year, making it difficult to control the number of visitors. However, certain mosques, including The Federal Territory Mosques, have strict rules that demand the tour guide to accompany tourists during visits and explain the facilities' function. Proper signs need to be introduced and installed in the ablution rooms to highlight the room's purpose. However, the users' mistreatment discussed with management participants clarified that mosques, or any other institution, should be considered for public use. Some worshippers have to pay better attention to their cleanliness.
9. Having a specific entrance and exit for the ablution rooms is a recommended design element in this research. According to the interview conducted and the findings from the physical observation, such a design concept would significantly improve the cleanliness of the ablution spaces. In addition, having specific entrances help during peak hours and in cases where not enough workers are available. Only one case study – Sultan Salahuddin Abdul Aziz Mosque – uses different entrances at the main ablution space.
10. Although Uniform Building By-Laws (UBBL) is used as the primary reference for design guidelines of mosques and other buildings in Malaysia, the expert interviews in this research suggest it is not enough to use this reference for the ablution space's design. Mosque design requires different solutions that should be considered. Moreover, UBBL does not cover all the aspects of mosque design. This research aims to urge the Malaysian government to come up with design recommendations for mosque design and ablution spaces in the future.
11. This research contributes not only to the field of architecture but to the other relevant fields. For example, it will help designers be more aware of the importance of the ablution area and other facilities and how their design can impact the cleanliness of the space. Also, the research suggests some guidelines and design frameworks to be considered by the higher authorities to be implemented in the current and future design of mosques in Malaysia. Moreover, the guidelines can be generalized to be universal as mosques around the world have shared similar characteristics and facilities.

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