

The Facilities-Related Issues in Public University Buildings: A Case Study at Universiti Tun Hussein Onn Malaysia (UTHM)

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Abstract

Public universities, exemplified by Universiti Tun Hussein Onn Malaysia (UTHM), must prioritize the upkeep of well-maintained and modern facilities, encompassing classrooms, laboratories, and libraries, to cultivate an optimal learning environment fostering both student success and a sense of community. The objectives included identifying these issues, understanding their consequences on users, and proposing preventive measures to address them. Neglecting challenges such as insufficient space, outdated equipment, and accessibility issues can detrimentally affect the quality of education and research, impacting students and staff alike. The study at UTHM employed a quantitative approach, utilizing a structured questionnaire with 240 respondents, analyzed through Statistical Package for Social Science (SPSS) version 27. The findings, ranked by the Relative Importance Index (RII), underscored safety, health, and well-being as the top consequences of facilities-related issues, with an RII value of 0.91. Following closely was the potential decrease in the university's reputation and image, registering an RII value of 0.90, while impacts on comfort and extracurricular activities ranked lower with an RII value of 0.83. Lastly, the research emphasizes the pivotal role of a robust maintenance department in proactively managing and enhancing problem-solving capabilities to address building-related issues, safeguarding the overall condition, safety, and functionality of university facilities. Neglecting these issues not only jeopardizes safety and well-being but also entails significant financial implications, underscoring the importance of comprehensive preventive measures in the context of public university infrastructure like UTHM.

1. Introduction

Building facilities in public universities are characterized by the physical structures and infrastructures that facilitate the teaching, learning, and research activities that take place in schools, universities and other educational institution [1]. Among these facilities are classrooms, laboratories, libraries, computer rooms, sports facilities, dormitories, and other amenities that make up the educational environment of an institution. The facilities play a vital role in ensuring that the learning environment for students, faculty, and staff in any educational institution is conducive to learning. In order for students to learn and grow effectively, they are responsible for providing them with modern amenities and resources that they can use. Providing students with a well-equipped laboratory and computer center, for example, would help students develop technical skills.

Libraries and study areas could facilitate access to resources and spaces for research and independent learning. Furthermore, building facilities also enhances the culture and sense of community within public universities. As a result, public universities with excellent facilities attract more students and qualified teachers to their schools. Students will be able to perform at a higher level in the classroom and staff will be able to stay motivated.

However, sometimes the problems often associated with the facilities in public universities can also be a big problem. Students, faculty, and staff can be adversely affected by these issues, as well as the overall effectiveness of a university as a whole, as a result of these issues. Among the most common issues with facilities at public universities are the lack of maintenance, the insufficient space [2], the outdated equipment, and the lack of accessibility [3] for those with disabilities. As a result of these issues, the quality of education and research that an institution is able to provide has a direct impact on how well that institution can provide. These issues must be addressed promptly and effectively by public universities in order to maintain a positive learning environment and working environment.

2. Literature Review

2.1 Facilities

The facilities that are available to students at public universities play a crucial role in supporting the educational and research activities of the university as they are a key element of the building. Public infrastructure, such as buildings and other facilities, serves the public's economic responsibility by satisfying social and administrative needs [4]. The public university buildings usually include a number of facilities, such as classrooms, laboratories, libraries, lecture halls, administrative offices, and dormitories for students. In this section, we will explore the existing literature on facilities in public university buildings, including their importance, challenges, and strategies for maintenance and management. The facility is defined as "a building or area used for the purpose of providing a specific service or is used by a particular industry." In other words, a facility is a building or a collection of buildings that serve a particular function. The term "public university facility" refers to any building on a public university campus that is used for the purpose of teaching, research, or student housing, and is defined in the following way.

Facilities issues are problems or challenges related to the physical structures and spaces in which an organization operates and in which it operates [5]. Among the structures that can be categorized under this category are buildings, grounds, equipment, and other tangible assets. A wide range of challenges can come up when it comes to the facilities in public university buildings, including inadequate or outdated facilities, insufficient space for growing student and faculty populations, accessibility issues, concerns about safety and security, and sustainability challenges. The facility issues which can arise at an institution can undermine the ability of the institution to impart a high-quality education and research environment to students and faculty, as well as affect the institution's reputation and its ability to remain financially viable. Managing and planning public university facilities [6], in an effective and efficient manner is crucial to addressing these issues and ensuring that these buildings remain functional, safe, and efficient.

2.2 Facilities-related Issues at Public University Buildings

The prevalence of facilities issues in public university buildings, as outlined in the list, there are eighteen (18) facilities issues can be attributed to a combination of systemic shortcomings and operational challenges. Firstly, insufficient maintenance and repair [7], coupled with delayed action, suggest a lapse in the proactive upkeep of infrastructure. This neglect can lead to a cascade of problems such as broken furniture, malfunctioning equipment, and non-functional air conditioning and lighting systems. Vandalism [8] is indicative of security concerns and the need for enhanced monitoring to protect university assets. The state of cleanliness in lecture rooms and the lecturer's table underscores the importance of custodial services and a robust cleaning regimen. Inefficient space utilization points towards a need for better facility planning and management. Poor air quality [9], noise disturbances [10], and inadequate lighting [11] reflect environmental factors that impact the overall well-being and productivity of students and staff. The non-functional public address system adds to the communication challenges within the university. In essence, the recurring facilities issues can be linked to a lack of comprehensive maintenance strategies [12], insufficient investment in infrastructure, and a need for improved operational protocols to ensure the sustained functionality and conducive environment of public university facilities. Addressing these root causes require a holistic approach involving regular maintenance schedules, investment in quality infrastructure, enhanced security measures, and the implementation of effective facility management practices to create an environment conducive to learning and research in public universities.

3. Methodology

3.1 Identify Research Problem and Objective

The research initiation involved identifying issues related to facilities in public universities. To gain comprehensive understanding of the subject, the researcher conducted preliminary background research. Acquiring information on facilities-related issues was crucial for the researcher to outline the study's objectives and propose preventive measures for addressing such issues in public university buildings. This knowledge not only facilitated the introduction of the study but also informed the formulation of the problem statement, defined the scope, and highlighted the significance of the study, ensuring a coherent flow throughout the research.

3.2 Literature Review

By reviewing journals, articles, theses from previous studies, and academic papers, the study analyzed the literature to determine the consequences of facilities-related issues in buildings to users and stakeholders. The study focused on facilities-related issues in public university buildings. The main concept of the case study was required to be relevant to the primary issue.

3.2.1 Observation

This study utilized on-site observation in lecture rooms at the Faculty of Civil Engineering and Built Environment (FKAAB) to identify facilities-related issues that impact the users focusing on public university buildings, with the resulting tailored to align with observed consequences at FKAAB. Researchers examined the building including the equipment and functionality, noting signs of wear or malfunctions that could affect users. This ensured a targeted and relevant exploration of facilities-related issues in FKAAB lecture rooms.

3.3 Development of Questionnaire

This study used a structured questionnaire that had been employed in previous studies and was prepared in accordance with the study's objectives. An effective questionnaire required well-written research questions and strong writing skills to ensure that responders could understand both the purpose and the questions in the questionnaire [13]. The questionnaire was divided into two parts: In part A, questions were asked about general information and demographic data using four different items, including gender, age, race, highest academic qualification, and current year in university. The questions in part B related to objective two, which focused on the consequences of facilities-related issues in buildings for users.

3.4 Population and Sample Size

3.4.1 Population

In this study, the population consisted of the students from the Civil Engineering and Environment Department at Universiti Tun Hussein Onn Malaysia (UTHM). The survey focused on students within the civil engineering department. According to the provided data, there were 450 respondents specifically from the targeted group, comprising students in semester 1 of the academic session 2023/2024, who were users of the buildings. The university's website provided the information.

3.4.2 Sample Size

In this study, Krejcie and Morgan tables were used to determine the sample size of a population. They had developed a table to fill in the gap that previously existed in order to establish an appropriate sample size for a specific population. Krejcie and Morgan refer to the sample size as based on the population. In this study, 450 civil engineering students at Universiti Tun Hussein Onn Malaysia (UTHM) participated. According to the table, the study population is 450 and the sample size is 208. The letter N refers to the population and the letter S refers to the sample size.

3.5 Pilot Study

Preliminary and pilot studies constitute integral elements of well-structured research endeavors. Specifically, a pilot study functions as a scaled-down iteration of a full-scale investigation, serving the dual purpose of testing research instruments and conducting a trial run for the entire study. Essentially an experiment in itself, a pilot study allows researchers to ascertain if the collected data effectively addresses the research question. Furthermore, preliminary analysis based on the pilot test results can be undertaken to validate the relevance of the data. Incorporating feedback from the pilot research, early identification of inappropriate or overly complex research instruments is possible, providing a preemptive warning for necessary adjustments. According to [14], an experiment is defined by The Free Dictionary as "a small-scale experiment undertaken to decide whether to launch a full-scale project." Other researchers recommended involving 10 to 30 respondents in a pilot survey, employing a straightforward calculation to test hypotheses. For the particular study discussed, 14 participants engaged in the pilot studies. During the pilot studies, participants were requested to provide comments or feedback on the questionnaire. The ensuing analysis of responses aimed to identify areas for improvement in addressing challenges faced by respondents while answering the questions.

3.6 Reliability Test

Various variables were tested for reliability and validity using the data collected through the questionnaire. In order to determine the internal consistency of each of the main constructs, Cronbach's alpha coefficients were calculated. The Cronbach's alpha coefficient was used in this part to ensure that the independent variable and the measurement were significant. According to the requirements, several of the scales used to describe the constructs appear to have a reasonable degree of dependability, as every computed statistic falls within a range of 0.60 to 0.75.

3.7 Distribution of Questionnaire

In order to achieve the sample size, the questionnaires were distributed to 450 students in the Civil Engineering and Environment department at Universiti Tun Hussein Onn Malaysia (UTHM). With the help of these questionnaires, it was possible to quickly communicate with the target population, pose a range of questions, analyze data in real-time, and make well-informed and prompt decisions once the questionnaires had been distributed.

3.8 Respond Rate

The percentage of individuals who responded to a survey could be calculated as follows: When dividing the total number of respondents by the total number of individuals to whom the survey was sent (known as the sample), one was able to determine the percentage of people who responded. To obtain a percentage of the total, one simply multiplied the above figure by 100, in order to convert the figure to a percentage. In the construction sector, there had to be a response rate of not less than 30%. According to this formula, if a questionnaire was sent to 80 people and 60 completed or answered it, this meant that 75% of the questionnaire was completed by the target group. This was because sixty percent of 80 multiplied by one hundred equaled seventy-five percent of the respondents responding to the questionnaire.

3.9 Descriptive Analysis

3.9.1 Average Index

The data analysis utilized the Average Index Method, where responses from the questionnaire were assigned a scale. This method calculated the mean of all responses on the Likert scale, indicating whether respondents disagreed, were neutral, or agreed with each question or statement. Scores were assigned to each question, and interpretations were linked to score ranges. Following the methodology outlined, the Average Index Method was employed to determine scores and interpretations for each range.

$$\text{Average Index} = \frac{\sum ax}{\sum xi} \quad (1)$$

3.9.2 Relative Importance Index (RII) Method

In this study, the Relative Importance Index (RII) method is employed to assess the significance of different challenges encountered by public institutions in their current maintenance management practices. The RII values, ranging from 0 to 1, serve as a measure of the relative importance of each problem. It is noted that as the RII value increases, the impact or frequency of occurrence of the corresponding variables also increases. The calculation of RII is conducted for each factor according to the following formula:

$$RII = \Sigma\Sigma W / (A*N) \quad (2)$$

4. Results and Discussion

4.1 Reliability Test

The researcher aimed to ascertain the adequacy of the indicators or items employed in the survey questionnaire for describing the variables. Consequently, the data analysis commenced with a reliability test. As depicted in Table 1, the calculated value of Cronbach's Alpha is 0.913, signifying a remarkably high level of internal consistency. As a result, all variables have demonstrated reliability and are deemed acceptable for subsequent study.

Table 1 Cronbach's Alpha Coefficient Results

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.913	0.919	14

4.2 Analysis of Demographic

As previously stated, the survey encompassed a total of 240 respondents affiliated with the Faculty of Civil Engineering and Built Environment at Universiti Tun Hussein Onn Malaysia (UTHM) in Parit Raja, Johor. The researcher incorporated four key pieces of information to be gathered regarding the respondents' background, namely gender, age, current enrolled study, and the academic year they are currently pursuing at the university. The data collection method employed was an online survey questionnaire administered through Google Forms and distributed to students within the Faculty of Civil Engineering and Built Environment.

4.3 Objective 1: To identify facilities-related issues in public university buildings

Table 2 succinctly delineates eighteen (18) prevalent facilities issues in public university buildings, derived from both literature review and critical observations.

Table 2 Facilities-related issues in public university buildings

No.	Facilities Issues
1.	Insufficient maintenance and repair
2.	Late of maintenance and repair action
3.	Vandalism
4.	Environment in lecture room
5.	Poor air quality
6.	Noise disturbances
7.	Aircond not function
8.	Broken furniture
9.	Cleanness of lecture room
10.	Inefficient utilization of space
11.	Equipment malfunction
12.	Inadequate lighting
13.	Broken door
14.	Uncleanness of lecturer's table
15.	Public address system cannot function
16.	Lighting system cannot function

4.4 Objective 2: To determine consequences of facilities-related issues in public university buildings

The analysis of the studies is based on the Relative Importance Index (RII) method and ranking to determine consequences of facilities-related issues in public university buildings.

The Relative Important Index (RII) to determine consequences of facilities-related issues in public university buildings

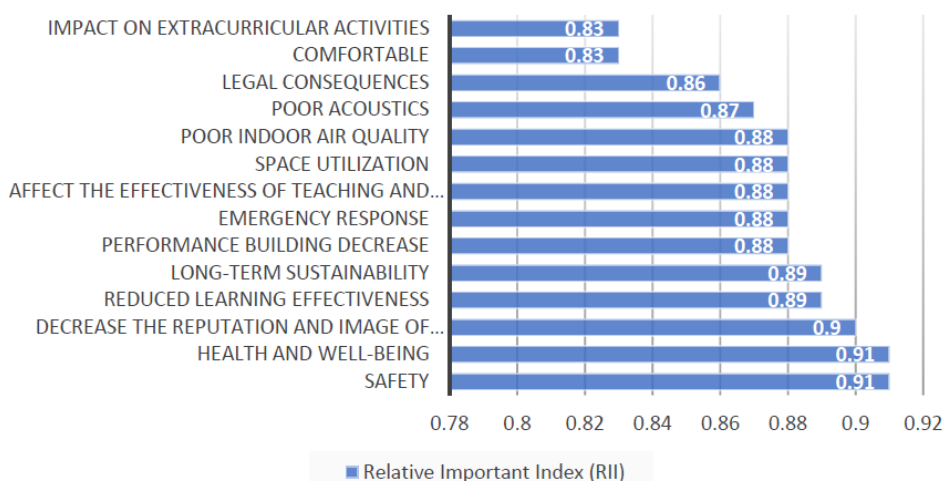


Fig. 1 The relative important index (RII) to determine consequences of facilities-related issues in public university buildings

In tandem with the Relative Importance Index (RII) findings presented in Figure 1 and Table 3, it is valuable to explore the relationship between RII values and the mean scores assigned by respondents to each consequence related to facilities issues in public university buildings. The RII, serving as a prioritization tool, highlights factors perceived as most critical by respondents. Safety and health, along with well-being factors, achieved the highest RII value of 0.91. Students consistently express agreement with consequences related to safety, health, and well-being within university facilities, driven by their paramount concern for personal welfare. Issues such as compromised environments, faulty equipment, or inadequate safety measures directly impact their physical well-being, prompting support for consequences addressing these concerns. Additionally, students recognize the crucial role of a conducive and safe learning environment in academic success, reinforcing their support for relevant consequences. Acknowledging their role as stakeholders, students understand the link between the university's reputation and their own credentials, driving agreements with consequences related to a decrease in the university's reputation. Lastly, a sense of responsibility and advocacy for positive change within the university community further motivates students to support consequences, viewing it as a proactive step towards ensuring a high-quality educational experience.

Conversely, examining factors with lower RII values, such as comfort and impact on extracurricular activities, allows for a nuanced interpretation. Although these factors may have lower prioritization in the RII ranking, the acknowledgment that their RII scores (0.83) are still within the range of agreement suggests that respondents generally consider them important. On the flip side, delving into factors with lower RII values, such as comfort and the impact on extracurricular activities, allows for a nuanced interpretation. Despite their lower prioritization in the RII ranking, the acknowledgment that their RII scores (0.83) still fall within the range of agreement suggests that respondents generally consider them important. To obtain a holistic understanding, it is beneficial to compare these RII values with the mean scores for comfort and the impact on extracurricular activities. If the mean scores are relatively high, it implies that, despite a lower RII ranking, respondents individually find these aspects noteworthy. In essence, combining RII values with mean scores enriches the analysis by elucidating not only the overall prioritization but also the consensus and individual perceptions regarding the consequences associated with facilities issues in public university buildings. Concerns about legal consequences being perceived as excessively punitive or disproportionate to the severity of facilities-related issues may lead to apprehensions about creating an adversarial atmosphere rather than fostering a collaborative

problem-solving approach. Disagreements may also arise regarding the subjective nature of comfort, as some students prioritize other aspects of their university experience over immediate comfort-related concerns. Furthermore, students engaged in extracurricular activities may resist consequences they perceive as hindering their participation, arguing that stringent measures could limit their ability to pursue a well-rounded university experience and develop skills beyond the academic realm. In essence, disagreements with consequences related to legal matters, comfort, and extracurricular activities may stem from perceptions of fairness, differing prioritization of university experience aspects, and concerns about potential limitations on their engagement in diverse activities.

Table 3 Ranking of the consequences of facilities-related issues in public university buildings using Relative Important Index (RII)

No.	Consequences	Level of agreement using Likert Scale					Mean	RII	Rank
		1	2	3	4	5			
1.	Safety	1	1	24	58	156	4.53	0.91	1
2.	Health and Well-being	2	2	19	61	156	4.53	0.91	2
3.	Decrease the reputation and image of the University	1	3	21	62	153	4.51	0.90	3
4.	Reduced learning effectiveness	-	3	26	70	141	4.45	0.89	4
5.	Long-term sustainability	-	2	27	74	137	4.44	0.89	5
6.	Performance building decrease	2	4	29	61	144	4.42	0.88	6
7.	Emergency response	-	4	30	68	138	4.42	0.88	7
8.	Affect the effectiveness of teaching and instruction	-	5	26	76	133	4.40	0.88	8
9.	Space Utilization	1	3	24	84	128	4.40	0.88	9
10.	Poor indoor air quality	1	6	27	71	135	4.39	0.88	10
11.	Poor acoustics	1	1	38	70	130	4.36	0.87	11
12.	Legal consequences	2	4	36	74	124	4.31	0.86	12
13.	Comfortable	1	10	42	82	105	4.17	0.83	13
14.	Impact on extracurricular activities	3	4	55	75	103	4.13	0.83	14

1: Strongly disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly agree

4.5 Objective 3: To propose preventive measures to address the facilities-related issues in public university buildings

Based on operational challenges and critical observations, the literature review highlights six (6) control measures aimed at preventing facilities issues in public university buildings. Table 4 succinctly summarizes the preventive measures for these facilities-related issues as outlined in the review.

Table 4 Preventive measures to address the facilities-related issues in public university buildings

No.	Preventive Measures	Author (Researcher and the Year)
1.	Preventive maintenance	Jacobsson et al. (2020)
2.	Corrective maintenance	López-Santana et al. (2023)
3.	Adequate budget	Horvat et al. (2019)
4.	Facility upgrades and renovations	Jowkar et al. (2022)
5.	Teamwork between maintenance staff	Sanyal et al. (2018)
6.	Communication	Gamil et al. (2019)

5. Conclusion

A robust maintenance department plays a crucial role in proactively managing and planning all tasks to enhance problem-solving capabilities. Effectively addressing building-related issues is key to maintaining the overall condition of the facility. The implementation of appropriate maintenance methods not only ensures the security of building users but also contributes to the building's durability, safety, availability, and quality. These factors are pivotal in building maintenance management, aiming to elevate productivity and satisfaction with activities conducted within and around the institution. The primary objectives of this research include identifying facilities-related issues, determining their consequences, and proposing preventive measures to address these issues in public university buildings.

One of the most significant consequences of facilities issues, directly impacting safety, health, and well-being, underscores the critical importance of effective maintenance strategies. Among the various consequences, the maintenance cost emerges as the most influential, emphasizing the financial implications of neglecting or inadequately addressing facility-related issues in public university buildings. To optimize the resolution of these consequences, the maintenance management department of UTHM is encouraged to propose comprehensive preventive measures. This proactive approach is essential to ensure optimal results and safeguard the overall well-being and functionality of public university buildings.

6. Limitation of the study and Recommendations for future research

The researcher encountered logistical challenges in distributing questionnaires at the Faculty of Civil Engineering and Built Environment (FKAAB) in Universiti Tun Hussein Onn Malaysia (UTHM) due to class schedule conflicts and time limitations in communication with academic and industrial staff and students during both Pre- and Post-Questionnaire sessions. Despite an initial target of 240 respondents, some questionnaire forms remained unfilled after distribution. Attempts to utilize social media platforms like WhatsApp and Telegram for survey dissemination faced difficulties, with respondents showing hesitancy to participate, even after direct message follow-ups. Additionally, obtaining accurate student enrolment figures proved challenging due to the absence of data on the faculty website and in the office. External pressures on respondents and potential difficulties comprehending certain terminologies among those lacking a background in building maintenance management were noted. Time constraints on each question and response may impact data accuracy, making it challenging to derive comprehensive insights into overall practices. Moreover, the limited sample size and potential non-completion of all questions by respondents could affect the representativeness of the findings.

It is crucial to acknowledge that the number of respondents does not fully capture the diversity of practices in public universities in Johor. This more general research study, lacking a critical perspective on the consequences of facilities issues in public universities, suggests a recommendation for future research to focus on a specific factor for a more targeted examination. While the current study primarily explores the consequences of facilities issues, it is advised that future research narrows its scope to delve into a particular aspect. Furthermore, the researcher is encouraged to enhance the clarity of question interpretation to cater to respondents with average knowledge, facilitating their comprehension and relating the questions to their specific circumstances. To improve representativeness, future studies should aim for a higher number of respondents and a larger sample size. Adequate preparation and the application of an appropriate data collection strategy are crucial to address potential challenges and ensure the research timeline aligns with desired outcomes. Considering these key factors will contribute to a more accurate and comprehensive understanding of the consequences of facilities-related issues in public university buildings, enhancing the utility of the research for future endeavours.

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