

Building Defect: A Case Study at Universiti Tun Hussein Onn Malaysia

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Abstract

Defects can have a significant impact on construction performance. A defect is not usually an outcome of a single cause, but rather occurs when multiple interrelated causes combine, forming a defect's pathway. The safety, comfort, convenience, and health of building inhabitants are affected by any component, part, or section of a structure that fails. The goal of this study is to look into the defects that occurred at the FKAAB building in Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja. Employing a hybrid methodology involving visual inspection and a comprehensive questionnaire, this study endeavours to shed light on the building defects that occurred at the FKAAB building in. The visual inspection has been done to identify the type of defects that occurred in FKAAB building. The questionnaire also has been distributed to FKAAB building users. Therefore, questionnaire survey was carried out to obtain data from 374 respondents. The data obtained were analysed using mean, standard deviation and frequency by Statistical Package Social Sciences (SPSS). As the result of this study, preventive maintenance was chosen by the FKAAB building users as suggestion on how to improve the current practices of maintenance management at FKAAB building. As from the questionnaire, there is no critical defects occurred in FKAAB building. The overall comfortless for in the building area based on FKAAB building users perspective are in good conditions, which are the same results for the visual inspection. This study proposes potential for maintenance strategy to overcome the defects at FKAAB building.

1. Introduction

Construction, a human-created endeavor, involves significant expenses and complexities. Post-construction inspection, often visual, is crucial for identifying defects [1]. Buildings, shaped by various factors, serve diverse societal needs, providing protection, security, and living spaces. Defects in construction can arise from multiple causes [2], with common issues identified at handover including incomplete tile grouting, incorrect fixtures, and inadequate paint application [3]. Low-cost housing tends to experience more defects, attributed to lower-quality materials and limited construction experience [4]. Effectively addressing these challenges through thorough inspection and maintenance practices is crucial for sustainable construction performance.

The study, as per Ahzahar (2011), underscores that building defects, arising from design faults, manufacturing issues, defective materials, and other factors, can significantly impact the safety and comfort of occupants [5]. The Malaysian climate, characterized by heavy rains and sunlight, accelerates deterioration, affecting construction materials in rural areas. Categories of building faults include issues in foundation, floors, walls, roofs, and various

structural components. These defects manifest in diverse ways, from unpleasant odors to compromised structural integrity. The study, focusing on a visual inspection of the FKAAB building, aims to emphasize the crucial role of proactive building maintenance in ensuring occupant comfort and safety, addressing and preventing defects that may otherwise impact the building's value and occupants' well-being [5]–[7].

This study aims to identify the type of defect that occurred in FKAAB building, to evaluate the condition of defects at FKAAB building from the respondent's perception of FKAAB users and propose potential for

2. Methodology

The research methodology for this study encompasses various crucial components, including the study's location, sample size determination and data collection. The primary objectives of the research revolve around identifying type of defects in FKAAB building in Universiti Tun Hussein Onn Malaysia (UTHM).

The initial phase involves planning and designing, aimed at gathering preliminary information related to the research title. This phase relies heavily on a comprehensive literature review, drawing insight diverse sources such as books, journals, thesis reports, and articles. To ensure a comprehensive understanding, the research adopts two methods to gain the data for this research. The first method is visual inspection which is to identify type of defects that occurred in FKAAB building. The second method is a survey questionnaire which is to evaluate the condition of defects at FKAAB building from the respondent's perception of FKAAB users. For this questionnaire, the target respondents are FKAAB building users. The sample size for this project is 331.

Moving on to the second stage, an expert review is conducted to get feedback from the expert for the questionnaire. It is a reasonably quick and inexpensive technique of assessing new survey questions [8]. It can be done either individually or collectively. Additionally, experts are only limited by their judgements while doing informal analyses, which frequently results in open remarks on the survey questions that need to be examined. Seven experts have received the questionnaire. These questionnaire sets have been evaluated and approved by experts with at least five years of experience in the field.

In the third stage, the actual study for the questionnaire survey has been conducted. The analysis of the data is gained from the visual inspection result for the visual inspection method. For the survey questionnaire method, the data has been analyzed using Statistical Package for the Social Sciences (SPSS), a set of statistical computer tools, was used to analyze the data from the questionnaire survey. Based on the data analysis, the score from the questionnaire was utilized to assess the mean value, standard deviation and frequency. In this way, objectives can be well determined. The data obtained was released in the form of tables and charts. Thus, the data analysis has achieved the purposes stated.





3. Result and Discussion

The result obtained involves the examination of data collected by visual inspection at FKAAB building and questionnaires, which adds to the obtained findings. The obtained result was thoroughly examined to address the objectives of this study, which include identifying the type of defect that occurred in the FKAAB building, evaluating the condition of defects at the FKAAB building from the perspective of FKAAB users, and proposing a maintenance strategy to address the defects at the FKAAB building. The questionnaire data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). Before that the questionnaire has been reviewed and approved by the 7 experts in this field for 5 years. The descriptive analysis conducted in this research included the calculation of frequency, mean, and standard deviation. The questionnaires included in this research have three distinct components. Section A: Demographic Respondent, Section B: Respondent's Perspectives on the Issues of the Defects and Section C: Recommendation of the Maintenance Method. The data has been analyzed and the study's conclusions, together with a concise summary, are presented.

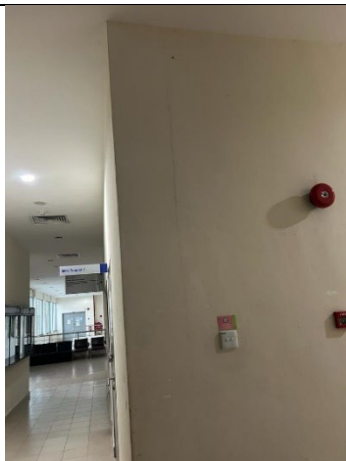
3.1 Visual Inspection Result

The data was acquired during the evaluation site visit. It addresses the structural defects of the FKAAB building. The reason of taking the defect pictures is to acquire data. Prior to doing the visual inspection, the state surrounding the FKAAB building was evaluated. The building is situated in Batu Pahat, Johor, at Universiti Tun Hussein Onn Malaysia. Next, an evaluation of the building's defects was acquired. Table 1 shows the type of defects that has occurred at FKAAB building.

Table 1 Result of visual inspection

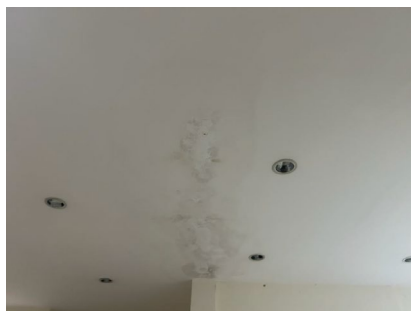
Point	Pictures	Type of Defect
1		The defect that has occurred at level G southeast tower building are ceiling defect.
2		The defect that has occurred at level G southeast tower building are peeling paint.
3		The defect that has occurred at level 1 Academia block 2 building are peeling paint
4		The defect that has occurred at level 1 south east tower building are dampness

5



The defect that has occurred at level 1 south east tower building are cracking

6



The defect that has occurred at level 1 south east tower building is dampness.

7



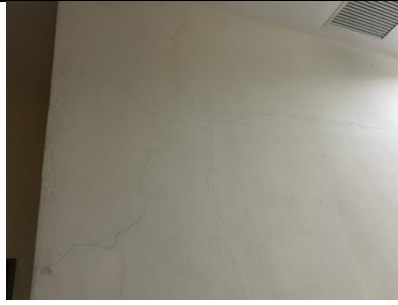
The defect that has occurred at level 1 south east tower building are algae growth and dampness

8



The defect that has occurred at level 1 south east tower building are dampness

9



The defect that has occurred at level 1 south east tower building are cracking

10



The defect that has occurred at level 1 south east tower building are algae growth

3.2 Questionnaires Result

Questionnaire in form of Google Form has been distributed using Google Form link to all of FKAAB building users via WhatsApp and Telegram community group. A total of 374 respondents has been recorded.

3.3 Data Analysis

3.3.1 Question 1: Implication of the Building Defect in Terms of Inconvenience, Discomfort, and Financial Loss

The data from question 1 indicates a strong consensus among FKAAB building users, with 39.8% strongly agreeing and 39.6% agreeing that building defects cause inconvenience, discomfort, and financial losses. This substantial agreement, totaling 79.4%, underscores a prevailing sentiment regarding the negative impacts of defects. A minor dissent of 0.3% in the "Strongly disagree" category suggests a small proportion with an opposing view. The cumulative percentages reinforce a consistent pattern, emphasizing the widespread belief that building defects have tangible adverse effects. These findings highlight the importance of addressing building defects promptly to enhance user experience and mitigate potential financial repercussions.

3.3.2 Question 2: Personal Experiences with Safety Concerns Arising from Building Defects

The data for question 2 provides insights into respondents' personal experiences with safety concerns arising from building defects. The majority, represented by 60.2% in the "Strongly agree" category and an additional 38.0% in the "Agree" category, indicates a substantial proportion of respondents who have experienced safety concerns due to building defects. This combined total of 98.2% highlights a prevalent sentiment among FKAAB building users that defects have indeed led to safety issues. The minimal frequencies in the "Neutral," "Disagree," and "Strongly disagree" categories (1.9% in total) suggest a negligible number of respondents with opposing experiences or neutral perspectives. Overall, the data strongly suggests that a significant majority of respondents have encountered safety concerns related to building defects, underscoring the importance of addressing such issues to ensure the safety and well-being of occupants.

3.3.3 Question 3: Reporting Building Defects and Damages to University Authorities

The data that has been gathered from question 3 reveals that a significant majority of respondents, accounting for 98.1%, indicated that they have not made any complaints about defects and damages of the building to university authorities. In contrast, only 1.9% of respondents reported having made such complaints. This suggests a low frequency of reporting building defects to university authorities among FKAAB building users. The data underscores a potential gap in communication or a lack of awareness among respondents regarding the avenues available for reporting issues to the university authorities. Further investigation into the reasons behind the low

reporting frequency may be crucial to improving the effectiveness of the feedback and resolution process, ensuring that building defects are addressed promptly and comprehensively.

3.3.4 Question 4: Level of Damage at the Corridor

Based on question 4 provides insights into respondents' perceptions of the level of damage at the corridor. The majority of respondents, comprising 59.9%, reported a moderate level of damage, indicating a substantial proportion of the corridor exhibiting noticeable issues. Additionally, 19.3% reported low levels of damage, while 20.6% considered the corridor to be in good condition. The negligible frequency in the "Very critical" category (0.3%) suggests that respondents perceived the corridor's damage level as generally moderate or lower. These findings indicate a need for attention to address the moderate and low-level damages, emphasizing the importance of proactive maintenance measures to ensure the overall condition and safety of the corridor within the FKAAB building.

3.3.5 Question 5: Level of Damage in the Classroom

Based on data of question 5 shows respondents' perceptions of the level of damage in the classrooms. The majority of respondents (78.3%) reported a moderate level of damage, indicating a significant proportion of classrooms with noticeable but not critical issues. Additionally, 20.1% reported low levels of damage, while 1.3% considered the classrooms to be in good condition. The frequency in the "Very critical" category is minimal at 0.3%. These findings suggest that, overall, respondents perceive the classrooms to have varying degrees of damage, with the majority characterizing the issues as moderate. Addressing the reported damages, especially those at the moderate and low levels, could be crucial for maintaining a conducive learning environment within the FKAAB building classrooms.

3.3.6 Question 6: Level of Damage at the Toilets

From question 6 offers insights into respondents' perceptions of the level of damage in the toilets. Notably, the majority of respondents (58.6%) reported a low level of damage, suggesting that a significant portion of the toilets are perceived to have noticeable but not critical issues. Additionally, 20.6% reported a moderate level of damage, while 2.60% considered the toilets to be in good condition. The frequency in the "Critical" category is minimal at 0.3%. These findings indicate that while a considerable number of respondents perceive the toilets to have some level of damage, the majority do not view the issues as critical. Addressing the reported damages, particularly those at low and moderate levels, could contribute to enhancing the overall condition and user experience in the FKAAB building toilets.

3.3.7 Question 7: Overall Comfortness in the Building Area

The data from question 7 provides insights into respondents' perceptions of the overall comfortness in the building area. The majority of respondents (78.6%) reported the building area to be in good condition, indicating a prevalent perception of satisfactory comfort. Additionally, 19.3% reported a moderate level of comfort, while only a small percentage (1.9%) perceived the comfort level as low. The frequency in the "Very critical" category is minimal at 0.3%. These findings suggest an overall positive perception of the comfortness in the building area, with a significant majority characterizing it as in good condition. However, addressing the reported moderate and low comfort levels may further contribute to enhancing the overall comfort and satisfaction of the occupants within the FKAAB building.

3.3.8 Question 1: Common Building Defects Requiring Regular Maintenance

The data based on question 1 part C outlines respondents' perspectives on common building defects requiring regular maintenance based on regular practices. Cracking emerges as the most frequently mentioned defect, with 38.8% of respondents identifying it as a typical issue requiring maintenance. Fungi and small plant attacks, as well as defective plaster rendering, follow closely with frequencies of 19.8% and 21.9%, respectively. Peeling paint is also recognized, with 18.7% of respondents mentioning it as a common defect requiring attention. Ceiling defects have the lowest frequency at 0.8%. These findings provide valuable insights into the perceived priority areas for regular maintenance, with cracking, fungi attacks, and defective plaster rendering being highlighted as prevalent concerns that may require focused attention within the FKAAB building.

3.3.9 Question 2: Best Practices for Building Maintenance

The data in question 2 section C reveals respondents' perspectives on the most recommended way for building maintenance based on the provided options. Preventive maintenance emerges as the most favored approach, with 39.8% of respondents endorsing it as the most recommended way. Proactive maintenance follows closely with a frequency of 21.1%, indicating a significant preference for proactive measures to address potential issues before

they escalate. Corrective maintenance and predictive maintenance are also acknowledged, with frequencies of 20.1% and 19.0%, respectively. These findings emphasize a consensus among respondents that preventive measures are highly recommended for building maintenance, underlining the importance of proactive strategies to ensure the longevity and optimal performance of structures within the FKAAB building.

3.3.10 Question 3: Enhancing Maintenance Management Practices for the Building

The data based on question 3 section C 11 sheds light on respondents' suggestions for enhancing maintenance management practices within the building. An overwhelming majority of respondents, comprising 96.5%, advocate for the implementation of preventive maintenance programs. This strong endorsement underscores a consensus among FKAAB building users that proactive measures are essential for mitigating issues before they escalate. A smaller percentage, 2.7%, suggests regular inspections as a means of improvement, emphasizing the importance of consistent monitoring. A minimal proportion, 0.8%, recommends centralized maintenance management. These findings highlight a clear preference for preventive maintenance strategies and regular inspections as key recommendations to enhance the current practices of maintenance management within the FKAAB building.

4. Conclusion

In conclusion, the comprehensive research on building maintenance at the FKAAB building in UTHM has successfully achieved its objectives. Visual inspection identified several defects, primarily architectural in nature, with no critical issues affecting the building's structural integrity. Respondents' perceptions, gathered through survey questionnaires, indicated a positive overall comfort level in the building, aligning with their endorsement of preventive maintenance practices. The proposed maintenance strategy focuses on preventive measures, emphasizing a proactive approach to address architectural defects systematically. The recommendation suggests implementing preventive maintenance interventions at regular intervals to enhance the FKAAB building's durability, aesthetics, and user satisfaction. The study's findings and recommendations provide valuable insights for future research in related fields, emphasizing the importance of proactive maintenance practices in sustaining building quality and user comfort.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review.

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