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“Rethinking Built Environment: Towards a Sustainable Future”

Organiser:
**Research, Industrial Linkages, Community
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Co-organiser:
**Department of Built Environment Studies & Technology (JABT),
Faculty of Architecture, Planning & Surveying (FSPU)**

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The Effectiveness of the Maintenance Management System Implementation for High-Rise Building

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Abstract

Building maintenance is required when the building is completed to keep it in good condition. Therefore, the best way to accomplish outstanding maintenance is to provide maintenance management that meets the user's anticipated demands as closely as possible. However, when it comes to building and infrastructure management and maintenance, we have many shortcomings, such as occupants living in high-rise buildings face several problems, disastrous defects as the roof collapses and can lead to injuries and accidents. Therefore, this research aim is to analyse the effectiveness of maintenance management toward high-rise building. In order to achieve the aim of the study, the objectives of this research are to identify the factors contributing to maintenance problem that faced in managing maintenance works, to determine the effect of unsystematic maintenance management toward high – rise building and to suggest the suitable solution to improve the maintenance management systems toward high – rise building. This study used a quantitative approach and questionnaire as the data collection instrument. The result indicates that one of the most significant contributors to the maintenance problems is insufficient budgets to efficiently run maintenance operations. Furthermore, the most major effect of unsystematic maintenance management that has been identified in this research is financial effect where it may have a huge effect on construction project progress. Thus, the suitable solution to improve the maintenance management systems is by having strict supervision for monitoring the construction sites so that remedial work can be carried out immediately.

Keywords: *Building maintenance, Maintenance, Maintenance management, Maintenance problems*

1.0 Introduction

A building is an asset whose value varies according to the quality (and amount) of maintenance invested in it. Maintenance is an ongoing process to maintain building, equipment, and infrastructure in the best condition for daily use. It is also to guarantee that the buildings are in good shape for a lifetime. Maintenance management required productivity and effectiveness for strategic planning in achieving the sustainability of the condition of facilities (Zul-Atfi Ismail, 2016). Moreover, the building maintenance is required when the building is completed. It is an operation to repair the damage and secure and track the building to stay in good condition. The development of a good management system would therefore affect the quality of work, expense, time, and satisfaction of employees. Most buildings are inseparable from defects or damage, despite numerous preventive measures taken during design and construction (Mohd Nasrun Mohd Nawawi, Nurul Azita Salleh, Herman Shah Anuar, 2014). Next, according to Husaini and Tabassi (2014), the best way to accomplish outstanding maintenance is to provide maintenance management that meets the user's anticipated demands as closely as possible. However, the building management system practised in the country, such as maintenance, is not systematic. This is agreed by Ali et al., (2016), who said that Malaysian government assets are at immense risk because of insufficient maintenance. This paper therefore, focuses on the establishment of factors contributing to maintenance problems that are faced in managing maintenance works.

1.1 Problem Statement

We can provide sophisticated buildings and infrastructure, but when it comes to building and infrastructure management and maintenance, we have many shortcomings and issues (Mohd Nasrun Mohd Nawi, Nurul Azita Salleh, Herman Shah Anuar, 2014). Next, according to Ismail et al., (2016) mentioned maintenance management is the main concern in the building industry today. Therefore, several problems due to the roof structure collapsed during construction for SMK Taman Connaught in Kuala Lumpur, injuring three labourers on January 15, 2010. Then, on November 14, 2013, a few ceilings at a Hospital Serdang in Selangor collapsed for the third time due to structural failure (steel corrosion). Besides, it also has a disastrous defect, as the roof of Terengganu Stadium collapsed and the Jaya Supermarket building in Petaling Jaya collapsed. These failures are caused by the failure of technical and administrative services in maintenance management. (Ismail & Kasim, 2013). Therefore, this research will help in identifying the factors that contribute to maintenance problems that are faced in managing maintenance works in order to help minimise the problems and improve the maintenance work to be more systematic so that all buildings in Malaysia are in good condition and last longer.

1.2 Aim

The aim of this research is to analyse the effectiveness of maintenance management toward high-rise building.

1.3 Research Objective

- 1) To identify the factors contributing to maintenance problems that are faced in managing maintenance works.
- 2) To determine the effect of unsystematic maintenance management toward high-rise building.
- 3) To suggest a suitable solution to improve the maintenance management systems toward high-rise building.

2.0 Literature Review

2.1 Maintenance Management Problems

2.1.1 Insufficient Budget

According to Hauashdh et al., (2020), the shortage of funds is because Malaysia's property developers are unable to raise maintenance fees from consumers who are unhappy with the state of their buildings. As a result, most maintenance companies do not have adequate funds to run their maintenance operations efficiently.

2.1.2 Lack of Supervision From the Maintenance Team

Site supervision has a significant effect on the overall performance of the building, and supervisors have also indicated that supervisors play an important role in mitigating construction defects. It can lead to building deficiencies and affect the quality rating of the buildings without adequate monitoring of the supervision work (Yacob et al., 2019).

2.1.3 Unqualified Maintenance Contractor

According to Ganisen et al., (2015) stated that they do not have sufficient training to carry out special maintenance, particularly for dealing with high-tech equipment or services installed in the building. If

there is an issue with special building facilities or equipment, these untrained maintenance workers will not identify the problem on time.

2.1.4 Lack of Expert Building Maintenance Professionals

According to Ali et al., (2016) some parts of the maintenance work must be outsourced to some specialist contractor because they did not have a qualified person to perform the maintenance, particularly for the electrical, air conditioning and lift systems.

2.1.5 Lack of Maintenance Software Tools

The shortage of software tools for maintenance creates issues in the maintenance decision-making process. As a result, the lowest recommended incentive for organisational efficiency and quality is an unacceptable decision relevant to maintenance planning (Hauashdh et al., 2020).

2.1.6 Shortage of Spare Parts and Low Quality

According to Hauashdh et al., (2020), stated in the local market in Malaysia, the lack of availability of original spare parts and equipment contributes to low-quality maintenance activities. Substituting or replacing low - quality replacement parts and materials typically causes more defects and increases the frequency of breakdowns.

2.1.7 Lack of Preventive Maintenance Approach

The absence of preventive maintenance leads to unbudgeted spending and affects the total maintenance funds allocated, contributing, in most instances, to the unavailability of supplies to perform maintenance tasks. Therefore, problems will arise when handling construction maintenance work when construction maintenance management has neglected to follow a preventive maintenance plan (Hauashdh et al., 2020).

2.1.8 Lack of Communication

According to Ali et al., (2016), there is poor communication in the maintenance departments. Employees, including engineers, are not informed of the department's goal, priorities, or plans.

2.1.9 Defective Material

Okuntade Tope Fem (2014) confirmed that the use of defective materials might be the cause of several structural defects, and a structure constructed with faulty roofing materials that allow water to leak into the structure may be an example.

2.2 Effect of Unsystematic Maintenance Management

2.2.1 Building Defect

Defects can be referred to as fault on anything that detracts from perfection, whereas damage to a building can be seen when it was not completely functional on any structure, material, equipment, and even aspect of the house. The common types of defects such as crack on wall (Yacob et al., 2019).

2.2.2 Incapable and Unsafe Operation of Building Services

Building Services Management problems may cause building services to be unsafe or incapable of functioning and affect the productivity of a building. Similar problems were found because common problems arise due to poor maintenance of buildings such as defective electrical circuits.

2.2.3 Health and Safety Issue

According to Dahal & Dahal, (2020), inadequately maintained buildings and facilities could cause discomfort and cause accidents and injuries to individuals especially when the building is lead to defect, it is a physical incident that causes the building to be less safe and something that causes weakness.

2.2.4 Financial Effect

More costly expenditures and costs are needed if ongoing maintenance is not maintained at an adequate level and repair works are not completed (Hamid & Alexander, 2016).

2.3 Suitable Solution for Building Maintenance Management Systems

2.3.1 Strict Supervision

The contractor supervisory team must have the experience, skills, and abilities to handle the construction work and supervise the craft worker effectively while conducting the supervision (Hasan et al., 2016).

2.3.2 Proper Manpower Management

According to Hasan et al., (2016), manpower management is a significant determinant of contractor efficiency and is strongly prioritised by employers regarding the quantity and quality of qualified employees. A construction project that has a well-arranged workforce would deliver a project of high quality.

2.3.3 Training and Education

There is a need to boost the number of institutions to provide appropriate and adequate training for maintenance workers to develop their skills and complete the work effectively. This is because well – trained maintenance workers can increase the quality of the work and minimise maintenance costs (Hauashdh et al., 2020).

2.3.4 Proper Communication Among Parties Involved

Good communication is very important to strengthen the relationship between the construction team and, eventually, increase the quality of construction workmanship (Ali et al., 2016).

2.3.5 Efficient Management

According to Hauashdh et al., (2020), a good organization is defined by a good organisational structure and a simple separation of roles that help reduce the difficulty of the work of an organisation. Consistent division of roles is very critical in leading all workers in their work scope and job duties.

2.3.6 Maintenance Planning

It is a systematic strategy for ensuring the timely and efficient execution of maintenance tasks/schedules, consisting of management activities based on fulfilling the organisation's goals and achieving results in service delivery by effective maintenance planning (Mkilania, 2016).

3.0 Methodology

This study adopted a quantitative method which is questionnaire and simple random sampling. The distribution of the questionnaire will take place in Kuala Lumpur. The respondent will be from a G7 contractor who works in the maintenance company that registered with Construction Industry Development Board (CIDB). According to Krejcie and Morgan (1970), the sample size for the population of 330 is 181. However, for a number of reasons such as the Movement Control Order (MCO), 96 respondents were successful in collecting the online questionnaire through Google Form. 181 questionnaires had been distributed but only 96 respondents were answered and received a response. The analysis tool used to analyse the data is the Statistical Package for Social Sciences (SPSS) Version 26. To analyse the data, a descriptive statistic which is frequency has been used.

4.0 Analysis and Findings

4.1 The Factors Contributing to Maintenance Problems

Table 4.1 Overall result for factors contributing to maintenance problem

| Item | Descriptions | Mean | Perception Level | Rank |
|------|--|------|------------------|------|
| 1 | Insufficient budgets to efficiently run maintenance operations | 3.72 | Strongly Agree | 1 |
| 2 | Lack of preventive maintenance approach | 3.72 | Strongly Agree | 2 |
| 3 | Lack of communication | 3.60 | Strongly Agree | 3 |
| 4 | Lack of supervision from the maintenance team | 3.55 | Strongly Agree | 4 |
| 5 | Defective material | 3.36 | Agree | 5 |
| 6 | Lack of expert building maintenance professionals | 3.33 | Agree | 6 |
| 7 | Unqualified maintenance contractor | 3.30 | Agree | 7 |
| 8 | Shortage of spare parts and low quality of material | 3.27 | Agree | 8 |
| 9 | Lack of maintenance software tools | 3.22 | Agree | 9 |

Note: Below 1.00 – 1.50 = Strongly Disagree (SD), 1.50 – 2.50 = Disagree (D), 2.50 – 3.50 = Undecided (UD), 3.50 – 4.50 = Agree (A), 4.50 – 5.00 = Strongly Agree (SA)

Table 4. above showed the overall ranking of the 9 factors contributing to maintenance problems. ‘Insufficient budgets to efficiently run maintenance operations’ and ‘lack of preventive maintenance approach’ were the main factors that contribute to maintenance problems that are preferred by the respondent with the same highest mean, which is (mean = 3.72). Similar findings have been observed in other studies before, which is a study by Hauashdh et al., (2020) found that the shortage of funds is because Malaysia’s property developers are unable to raise maintenance fees from consumers who are unhappy with the state of their buildings. As a result, most maintenance companies do not have adequate funds to run their maintenance operations efficiently. Then, it was followed by lack of communication (mean = 3.60), and ‘lack of supervision from the maintenance team (mean = 3.55). These are the top four factors that contribute to the maintenance problems. However, the lowest mean score for the factors contributing to the maintenance problem is the lack of maintenance software tools

(mean = 3.22). Overall, all respondents give positive feedback for the factors listed with the ‘strongly agree’ and ‘agree’.

4.2 Categories of Effect of Unsystematic Maintenance Management on Building

Table 4.2 Overall mean of effect unsystematic maintenance management on building by respondent

| Item | Categories | Mean | Rank |
|------|---|------|------|
| 1 | Financial effect | 3.74 | 1 |
| 2 | Health and safety issue | 3.60 | 2 |
| 3 | Building defect | 3.54 | 3 |
| 4 | Incapable and unsafe operation of building services | 3.47 | 4 |

Note: Below 1.00 – 1.50 = Strongly Disagree (SD), 1.50 – 2.50 = Disagree (D), 2.50 – 3.50 = Undecided (UD), 3.50 – 4.50 = Agree (A), 4.50 – 5.00 = Strongly Agree (SA)

Analyzing from effects breakdown for each category, the mean score for the main categories is identified. According to Table 4.2, the category of ‘financial effect’ (mean = 3.74) takes the first rank among all the others. According to Dahal & Dahal et al., (2020), reported defective building design not only adds to the final cost of the product, but also to the considerable cost of repair. Thus, there can be a negative impact of building maintenance concerns on project costs, length, and resources. Then, the second effect followed by ‘health and safety issue’ (mean = 3.60) category as the second rank for these categories. These findings were supported by two authors: Dahal & Dahal (2020), and Hamid & Alexander (2016). These authors also lined out that the building functionality will be lost and, due to the poor handling of maintenance issues, there will be serious problems with users and property safety. Meanwhile, the third-highest of the mean score for these effects categories is ‘building defect’ (mean = 3.54) and lastly is the ‘incapable and unsafe operation of building services’ (mean = 3.47). Overall view of these effects, all respondents give positive feedback for the effects listed.

4.3 Solution to Improve the Maintenance Management Systems

Table 4.3 Overall result for solution to improve the maintenance management systems

| Item | Descriptions | Mean | Perception Level | Rank |
|------|--|------|------------------|------|
| 1 | Having a strict supervision for monitoring the construction sites | 3.75 | Strongly Agree | 1 |
| 2 | Offering training through programmers and workers will gain more education and knowledge | 3.73 | Strongly Agree | 2 |
| 3 | Have a proper manpower management so workers would deliver a project of high quality | 3.68 | Strongly Agree | 3 |
| 4 | Have a proper communication among parties involved | 3.66 | Strongly Agree | 4 |
| 5 | Having an efficient management | 3.50 | Strongly Agree | 5 |
| 6 | Having a good maintenance planning | 3.49 | Strongly Agree | 6 |

Note: Below 1.00 – 1.50 = Strongly Disagree (SD), 1.50 – 2.50 = Disagree (D), 2.50 – 3.50 = Undecided (UD), 3.50 – 4.50 = Agree (A), 4.50 – 5.00 = Strongly Agree (SA)

Table 4.3 showed the rank of 6 solutions to improve the maintenance management systems. According to Table 4.3, the mean score of all the variables is only slightly different. ‘Having strict supervision for monitoring construction sites’ (mean = 3.75) was the highest ranked for the solution to improve the maintenance management systems. According to Hasan et al., (2016) that one of the requirements of recent practices in the construction sector is to increase efficiency by strict monitoring

of construction sites so that if there are workmanship issues, they can be detected, and remedial work can be carried out immediately. Then, it is followed by ‘offering training through programmers and workers will gain more education and knowledge’, (mean = 3.73).

Next, the third solution is ‘have proper manpower management so workers would deliver a project of high quality’, with (mean = 3.68). This statement is supported in research by Hasan et al., (2016), who ruled out that manpower is the only productive resource; therefore, construction productivity relies primarily on human effort and efficiency, so manpower management should be skilfully arranged in any construction project. The respondents strongly agreed for ‘having proper communication among parties involved’ (mean = 3.66) and ‘having an efficient management’ (mean = 3.50) as the solution to improve the maintenance. Lastly, the lowest mean score for the solution is to ‘having a good maintenance planning’ (mean = 3.49). Overall view of these solutions, all the respondents give positive feedback for the factors listed with the ‘strongly agree’ and ‘agree’.

5.0 Conclusion

In a nutshell, the implementation of good maintenance strategies in Malaysia was hampered by a variety of issues and problems. The study has revealed the factors that contribute to maintenance problems that are faced in managing maintenance works such as insufficient budgets, lack of preventive maintenance approach and lack of communication. All these factors could give an effect to the lifespan of the building. Despite that, it needs effective maintenance plans such as having strict supervision and having proper manpower management, so that it would help to improve the maintenance work to be more systematic so that all the buildings in Malaysia will be in good condition and last longer.

References

- Ali, A. S., Chu, S. J. L., & Ag Ali, D. B. (2016). Issues and challenges faced by government office buildings in performing maintenance work. *Jurnal Teknologi*, 78(11), 11–23. <https://doi.org/10.11113/jt.v78.8363>
- Alshehri, A., Motawa, I., & Ogunlana, S. (2015). The Common Problems Facing the Building Maintenance Departments. *International Journal of Innovation, Management and Technology*, 6(3), 234–237. <https://doi.org/10.7763/ijimt.2015.v6.608>
- Awg Husaini, A. I., & Tabassi, A. A. (2014). Performance assessment of maintenance practices in government office buildings: Case study of parcel E, Putrajaya. *MATEC Web of Conferences*, 10. <https://doi.org/10.1051/mateconf/20141003002>
- Dahal, R. C., & Dahal, K. R. (2020). A Review on Problems of the Public Building Maintenance Works with Special Reference to Nepal. *American Journal of Construction and Building Materials*, 4(2), 39–50. <https://doi.org/10.11648/j.ajcbm.20200402.12>
- Femi, O. T. (2014). Effects Of Faulty Construction On Building Maintenance. *International Journal of Technology Enhancements and Emerging Engineering Research*, 2(3), 73–79.
- Ganisen, S., Hakim Mohammed, A., Jawahr Nesan, L., & Kanniyapan, G. (2015). Critical success factors for low cost housing building maintenance organization. *Jurnal Teknologi*, 74(2), 31–40. <https://doi.org/10.11113/jt.v74.4520>
- Hasan, M. I. M., Abd Razak, N. N., Endut, I. R., Abu Samah, S. A., Mohd Ridzuan, A. R., & Saaidin, S. (2016). Minimizing defects in building construction project. *Jurnal Teknologi*, 78(5–2), 79–84. <https://doi.org/10.11113/jt.v78.8494>
- Hauashdh, A., Jailani, J., Abdul Rahman, I., & AL-fadhali, N. (2020). Building maintenance practices in Malaysia: a systematic review of issues, effects and the way forward. *International Journal of Building Pathology and Adaptation*, 38(5), 653–672. <https://doi.org/10.1108/IJBPA-10-2019-0093>
- Ismail, Z.-A., & Kasim, N. (2013). Maintenance management practices for building facility: a case study. *International Journal of Engineering Research and Applications*, 3(4), 487–497. <https://doi.org/10.6106/JCEPM.2014.4.3.021>
- Ismail, Z. A., Mutalib, A. A., & Hamzah, N. (2016). Case study to analyse problems and issues in IBS building maintenance. *International Journal of Applied Engineering Research*, 11(1), 226–232.

- Mkilania, J. N. (2016). Factors affecting best maintenance practice in Tanzania public sector. *International Journal of Mechanical Engineering and Technology*, 7(3), 139–149.
- Mohd nasrun mohd nawi, nurul azita salleh, herman shah anuar. (2014). a Review Study of Maintenance and Management Issues in Ibs Commercial. *International Journal of Computer Informatics & Technological Engineering*, 1(1), 42–46.
- Waziri, B. S. (2016). Design and construction defects influencing residential building maintenance in Nigeria. *Jordan Journal of Civil Engineering*, 10(3), 313–323. <https://doi.org/10.14525/JJCE.10.3.3605>
- Yacob, S., Ali, A. S., & Au-Yong, C. P. (2019). Establishing Relationship Between Factors Affecting Building Defects and Building Condition. *Journal of Surveying, Construction & Property*, 10(1), 31–41. <https://doi.org/10.22452/jscp.vol10no1.3>

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Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
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Tuan,

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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

“BERKHIDMAT UNTUK NEGARA”

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
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