

ISSUES AND CHALLENGES FACED BY GOVERNMENT OFFICE BUILDINGS IN PERFORMING MAINTENANCE WORK

Azlan Shah Ali, Shirley Jin Lin Chua*, Dg Badariah Ag Ali^a

Department of Building Surveying, Faculty of Built Environment,
University of Malaya, 50603 Kuala Lumpur, Malaysia

Article history

Received

19 April 2016

Received in revised form

29 June 2016

Accepted

18 October 2016

*Corresponding author
shirleychua88@um.edu.my

Abstract

In Malaysia, most of the building managers faced problems in conducting maintenance operation due to unclear plan and unsystematic approach. Improper maintenance management and practices could affect the performance levels of the maintenance works and the productivity of the building users. This paper aims to examine the issues and challenges faced by government office building managers in selecting an appropriate maintenance strategies. This study adopted mixed method which is a combination of both qualitative and quantitative methods. Three government office buildings in Kota Kinabalu, Malaysia were selected as the case study. Structured interviews were conducted with the building maintenance managers and 200 questionnaires were distributed to the buildings occupants. A total of 67.5% questionnaires were valid for data analysis. The results showed that there are significant correlation between the frequency of services breakdown and the productivity of the building user. Top management, human resource and technical problems were identified as the issues and challenges faced by building managers in conducting maintenance work. Based on the data obtained, the performance level of building maintenance services are analysed using three selected performance indicators. From the findings, it is proven that the issues and challenges faced affect the performance levels of the maintenance works. In contrast, if the building managers do not face too many issues and challenges in implementing the maintenance works, the maintenance strategies will perform in an optimum level.

Keywords: Maintenance strategy, building maintenance, building manager, issues, challenges

Abstrak

Di Malaysia, kebanyakan pengurus bangunan menghadapi masalah dalam menjalankan operasi penyenggaraan akibat daripada sistem perancangan yang kurang jelas dan tidak sistematik. Pengurusan dan amalan penyenggaraan yang tidak betul boleh menjejaskan tahap prestasi kerja-kerja penyenggaraan dan produktiviti pengguna bangunan. Kertas ini bertujuan untuk meneliti isu dan cabaran yang dihadapi oleh pengurus bangunan pejabat kerajaan dalam memilih strategi penyenggaraan yang sesuai. Kajian ini menggunakan kaedah campuran yang merupakan gabungan kedua-dua kaedah kualitatif dan kuantitatif. Tiga bangunan pejabat kerajaan di Kota Kinabalu, Malaysia telah dipilih sebagai bangunan kaji selidik. Temubual berstruktur telah dijalankan dengan pengurus penyenggaraan bangunan dan 200 soal selidik telah diedarkan kepada pengguna bangunan. Sebanyak 67.5% soal selidik telah dikenalpasti sah untuk proses analisis data. Hasil kajian menunjukkan terdapat hubung kait yang signifikan antara kekerapan kegagalan servis dan produktiviti pengguna bangunan. Masalah pengurusan atasan, sumber manusia dan teknikal telah dikenal pasti sebagai isu-isu dan cabaran yang dihadapi oleh pengurus bangunan dalam menjalankan kerja penyenggaraan. Berdasarkan data yang diperolehi, tahap prestasi perkhidmatan penyenggaraan bangunan dianalisis menggunakan tiga petunjuk prestasi dipilih. Berdasarkan hasil kajian, dibuktikan bahawa isu-isu dan cabaran yang dihadapi memberi kesan kepada tahap prestasi kerja-kerja penyenggaraan. Sebaliknya, jika pengurus bangunan tidak menghadapi terlalu banyak isu-isu dan cabaran dalam melaksanakan kerja-kerja penyelenggaraan, kerja penyelenggaraan akan dilaksanakan di tahap yang optima.

Kata kunci: Strategi penyenggaraan, penyenggaraan bangunan, pengurus bangunan, isu-isu, cabaran

© 2016 Penerbit UTM Press. All rights reserved

1.0 INTRODUCTION

Maintenance is an essential component in the building industry and shall be handled practically.

Every different type of building with different functions will have a different approach of maintenance management conducted. In practice, maintenance works is always conducted not according to its actual

needs as it is influenced by the budget allocation. However, over-spending in maintenance and remedial works for building and facilities maintenance management in Malaysia occur due to unclear plan and unsystematic approach [1]. In addition, Hussain [2] highlighted that Malaysian government assets are on the high risk due to poor maintenance. Hence, implementing a suitable maintenance strategies will help in optimising the building performance and value of money. This is agreed by Chanter and Swallow [3] that an effective maintenance strategy shall be planned to avoid any unwanted situation happen that might risk the performance of a building.

Lee and Scott [4] pointed out that maintenance strategy is practised in order to extend the building life cycles and its services. However, the most difficult task faced by maintenance manager is to select the most appropriate maintenance strategy in order to reduce the financial expenditure [5]. In selecting the maintenance strategy, some strategic options and alternative decisions need to be taken into account by the management. The allocation of maintenance resources play an important role to allow the maintenance manager to choose the most suitable maintenance strategy. Besides, it is highlighted by Lee and Scott [4] that ground rules shall be made to ensure the allocation for maintenance resources are available for the maintenance management. Failure in planning the maintenance strategies impact on low quality of maintenance work due to several aspects such as lack of knowledge in maintenance works, fails in providing advice during the design and planning stage and inadequate performance standard [6]. As a consequences, many buildings in Malaysia do not meet their standard requirement and function.

In order to ensure the correct maintenance strategies are practised in a comprehensive way and optimised, the performance of the maintenance strategies should be measured to describe the current performance levels and recommend any necessary action in order to improve it. Besides, the issues and problems faced in maintenance works need to be identified and overcome to ensure the right maintenance strategies are implemented. Thus, this research seek to identify the issues and challenges faced by building manager in managing maintenance works for government office buildings. The problems and issues emerged should be pointed out and solved so that the suitable maintenance strategies will be practised by the maintenance management in Malaysia.

1.2 Building Maintenance Management

Institute of Asset Management emphasized that maintenance management is the art and science of making the right decisions and optimizing the management of physical assets that aimed to minimize the whole life cost of assets and other critical factors such as business continuity or risk to be considered objectively in decision making [7]. Buildings and infrastructure of an organization need to

manage and maintain in order to create an environment that supports the primary objectives of the organization [8]. In order to implement an effective building maintenance, selecting the most appropriate maintenance strategy is very crucial. Kevin and Penlesky [9] described maintenance strategy as a combination of elements such as maintenance policies, backing up equipment and upgrading equipment. Generally, Seeley [10] divided maintenance into two main type based on British Standard 3811: 1984 which are the planned maintenance and unplanned maintenance. In planned maintenance, the works can be subdivided into another two groups: preventive maintenance and corrective maintenance. Under the preventive maintenance, it consists of scheduled maintenance and the condition-based maintenance. On the other hand, the scope of unplanned maintenance is only focused on corrective maintenance.

1.3 Issues and Challenges In Selecting Maintenance Strategies

According to Rahman *et al.* [11], the implementation of good maintenance is failed to be practiced due to some significant issues and problems. These factors have become a common problem faced by the building manager in maintaining a building. Alshehri *et al.* [12] and Rahman *et al.* [11] classified the issues and challenges faced by the building manager in three main categories of top management problems, human resources problems and technical problems.

a. Top Management Problems

Top management problems can be understood as the problem related to the management of the maintenance process, the performance and execution of the management throughout the maintenance process. According to Lee and Scott [4], most of the maintenance personnel do not understand the management and operational situations as they are too depending with the technology development. The details of top management problems are as following:

- i. *Lack of knowledge in maintenance scope*
A good quality of maintenance operations can be achieved by having an effective maintenance management, especially from the top management. According to Rahman *et al.* [11], it is crucial for a maintenance works to have a proper management and leadership of people as it will reflect the successful of the maintenance process. [12] stated that the maintenance personnel background, education level and experience in maintenance scope plays an important role as it will influence the management system of a building.

- ii. *Procurement management*
Based on the research by Alshehri *et al.* [12], the procurement system for government projects normally required three different quotations from three different contractors or suppliers. The quotation will be selected and given to the contractor or supplier with the lowest price. In order to carry out the maintenance jobs, the main concern of the contractor is to gain profit and reduce the cost of the project. Hence, they do not really take into the consideration regarding on other issues especially the quality of the works and time consuming.
- iii. *Unqualified maintenance contractor*
According to Ali and Chua [13], most of the maintenance personnel do not understand the management and operational framework in maintenance process and they are too relying on technology. Besides, Alshehri *et al.* [12] find out that most of the worker appointed by the maintenance contractors for maintenance works are a foreign worker with the level of experience in maintenance ranged from unskilled to skilled workers but most of them are unskilled workers. It also very often that the contractors do not provide an excellent and skilled worker to perform the works where it will cause waste of time and effort.
- iv. *Government regulations and rules*
The policy of government also does influence the decision of top management in selecting the suitable maintenance approach as they have to offer the maintenance contract to the lowest bidder. Based on the research of Alshehri *et al.* [12], the disadvantages of appointing contractor with the lowest bid is it did not consider the economy fluctuations and the age of the building. Usually, the maintenance works required for an old building is more complicated and the price of spare parts and expertise labour for the works will increase along with the rise of living standard.
- v. *Stakeholder communication*
In every maintenance works, communication is a crucial thing as a good communication will ensure the department's goal, objectives and plans are carried out as intended [11]. Every staffs and contractor in maintenance department should be exposed and briefed the objectives of the building management to achieve the standard quality in maintenance operations.
- vi. *Financial issues*
According to Rahman *et al.* [11], financial problem is a problem associated with the budget planning that aims to control and plan the allocation of budget and resources in order to achieve the management objectives. The

allocation of maintenance budget is usually planned based on the previous year's budget, but the building manager often faced difficulties in determining the quantity and the accurate cost for maintenance works. Therefore, the building managers will face overruns or underestimates of the budget due to the difficulties in assessing the exact quantity [12]. In addition, from the study of Ali and Chua [13], it stated that there will be an argument with the operational maintenance team regarding the allocation of budget for maintenance works is always below the needs and requirements. While, in the other hand, the top management always criticises the quality and productivity of the maintenance works which is ineffective and useless. As a result from the ineffectiveness of maintenance approach, the budget allocation for maintenance works becomes more difficult to obtain. Horner *et al.* [5] mentioned that the insufficient budget allocated for maintenance works will cause a delay in performing the maintenance works as to cover the needs for maintenance requires high costs.

b. Human Resource Problems

The weaknesses and human error in making a decision are categorised under the human resource problems. According to Rahman *et al.* [11], the experience of the building manager and their attitudes in understanding the scope of maintenance works are factors that lead to human resource problems. The future discussion on human resource problems are discussed below:

- i. *Lack of supervision from maintenance team*
Based on the study by Alshehri *et al.* [12], the role of supervision is found out to be a most important role compared to the others in the maintenance department. The common problem happened in the public sector is the appointed supervisors will only performing their job as supervisors but do not know anything in technical about the maintenance works and they just signed the maintenance report submitted by the contractor. According to Ali and Chua [13], most of the supervisor is a lack in understanding the management and operational framework which lead to negligence of works.
- ii. *Lack of engineers and specialist*
Indifferent with construction works, every different scope of works in maintenance does require different manpower to carry out the works as some of the services or nature of works need a specialist and skilled workers [12]. Some of the maintenance works will be timed consuming as the availability of the expertise for the works are unavailable locally and will be

dependent on other countries. Therefore, it is very vital creating a work that can be carried out by the available manpower in our country when needed.

iii. *Unclear job description and department structure*

From the research conducted by Zakaria and Hamzah [1], it has been noted that most of the maintenance departments does not have a proper approach improving the maintenance operations. Sometimes, the building maintenance organisation was also unclear and has different names such as support services, service management and service centre. According to Rahman *et al.* [11], this problem also happened due to lack of coordination between the top management team and the operational team.

iv. *Lack of awareness*

In maintenance operations, it is important for the maintenance worker understanding the needs of maintenance to ensure the building occupants are able to perform their activities and the business continuity [12]. The building managers should know the maintenance works that need to be carried out for the building as they need to plan the budget and finance the maintenance works in order to keep the building to an acceptable condition. Besides, the building manager also needs to aware with the maintenance works carry out to prevent any breakdown and failure of the system.

c. Technical Problems

Rahman *et al.* [11] defined technical problems as a problem that associated with technical scopes in maintaining a building from the beginning to the end of building life cycle. It can be divided as follows:

i. *Lack of maintenance software tool*

An effective software system that describes the operation, maintenance and renovation of a building helps the maintenance department in making the decision for budget allocation [12]. By having the maintenance software, it will help the building managers in planning the maintenance by distributing the budget accordingly and determine the effective total life period of a system.

ii. *Shortage of spare parts*

The decision of maintenance personnel in selecting the maintenance strategies that should be carried out in a building are relying on the availability of the maintenance resources. According to Lee and Scott [4], although the maintenance strategies conducted are aimed to enhance the sustainability of a building but due to the limited

resources, it has been neglected. This is supported by Ali *et al.* [14], where he pointed out that the budget allocation for maintenance works influenced the quality of maintenance works performed. Furthermore, from the study conducted by Alshehri *et al.* [12], it is quite hard to find suitable spare parts in the local market especially for an old system or machine. This will lead to complicated of maintenance process as the spare parts need to be purchased from the outside market. The process of ordering the replacement parts from the outside market also will increase the maintenance cost and delaying the maintenance process. Besides, the worst situation that may happen due to unavailability of the spare parts is it will stop the whole process of maintenance and building operation.

iii. *Failure of preventive maintenance/maintenance strategies*

According to Ali and Chua [13], the building owner does claim the maintenance strategies applied is ineffective and failed to optimise the building function and system installed. This is supported by Lee and Scott [4] as some of the maintenance strategies are planned earlier where the unnecessary replacement will be carried out according to the task description. While [12] stated that preventive maintenance does not carry out according to a schedule where it does requires daily, weekly, monthly and yearly inspection as the maintenance team are busy performing the emergency breakdown maintenance.

iv. *Development of new technologies*

There is a various type of works can be carried out in maintenance process and sometimes it is complex. According to Baek [15], the rapid growth of modern technologies has leads to the complexity of the products thus required better quality and higher reliability. Sometimes, the condition of the building does not fit with the installation of new technology system. Alshehri *et al.* [12] stated that renewing or replacing an old system inside a building will require more maintenance works and maintenance cost.

1.4 Measurement of Maintenance Performance

The productivity of maintenance can be defined as a ratio of a building condition and the maintenance cost that will be used in maintenance policy justification and the budget allocation [16].

a. Maintenance Efficiency Indicator (MEI)

Maintenance efficiency indicator examine the building maintenance inputs by calculating the annual maintenance expenditure. The expenditure

for the maintenance operation will be calculated by referring to the physical and performance state of the asset. Based on Lavy and Shohet [17], MEI aims to determine the efficiency of the practice maintenance activities.

b. Urgent Repair Request Indicator (URI)/ General Repair Request Indicator (GRI)

According to Enshassi and Shorafa [18], the performance of the maintenance management can be measured using the urgent repair request indicator (URI) by dividing the number of urgent repair requests submitted by the building occupants with addition of the number of general requests for repair of the building facilities and number of urgent repair requests submitted by the building occupants. The number of URs can be reduced if the maintenance staffs can perform the maintenance works according to the schedule by keeping the equipment and the systems in a good condition. If the URI values are high, it means that lots of urgent repairs that need to be faced by the maintenance staffs and their performance and schedule are distracted. In the long term duration, the building performance will be influenced by the high value of URI which leads into the loss of business and prestige.

c. Building Performance Indicator (BPI)

Based on the study of Lavy and Shohet [17], building performance indicator (BPI) aims to calculate the actual physical performance score of every system installed in a building. BPI take into the account of the design parameters and the development of construction technology in a building. Besides, BPI provides a new perspective view for the building manager that creates a concurrent link between the physical performance score and the financial issues of the building components. According to Enshassi and Shorafa [18] the building's condition and the systems inside the building are rated by using a scale, between 0 and 100.

2.0 METHODOLOGY

This study is aimed to obtain a comprehensive research on the issues and challenges faced in selecting the suitable maintenance strategies by using both quantitative and qualitative approach. In selecting the samples for this study, the purposive sampling method is used in order to minimize the scope of the sample population. Purposive sampling confined to specific types of people or building that can provide the desired information because they are the only ones who have it or conform to some criteria set by the researcher [19]. The sampling frame for this study focused on the high rise buildings which function as a government offices building. The targeted population in this study is focused on the buildings

located in the capital of Sabah which is Kota Kinabalu. The validity of the building status was confirmed with Ministry of Works and Public Works Department, Kota Kinabalu before being selected as research samples. Table 1 shows the information gathered from Ministry of Works and Public Works Department, Kota Kinabalu.

Table 1 List of government office buildings in Kota Kinabalu

NO.	NAME OF BUILDING	MAINTENANCE AUTHORITY
1	Federal House of Kota Kinabalu	Ministry of Works
2	Kota Kinabalu Government Complex	Ministry of Works
3	Wisma Dang Bandang	Ministry of Works
4	Tun Mustapha Tower	Public Works Department
5	Wisma Innoprise	Public Works Department
6	Wisma Perindustrian	Public Works Department

Based on the technique of purposive sampling, only three buildings will be used for the final samples out of six buildings. However, the samples need to have at least three similar criteria to be selected. There are three buildings selected as the final samples by having three similar criteria which are:

- Building function: Office building
- Building age: 35 – 40 years
- Categories of building: High rise building

In addition, the remaining samples were excluded from the study due to limitation of getting the information from the building manager, having different building characteristic and does not meet the criteria stated above. Once the case studies have been selected, structured interviews were conducted with the building manager, maintenance manager, building technicians or the building owner to find out their opinion on the maintenance works that have been conducted, especially for the maintenance strategies aspect. Besides, from the interview session, the current and past maintenance strategies that have been used for the building were identified.

The questions asked for the interview session are divided into four main part as below:

- Part 1: Background of the interviewee's
- Part 2: General information of the building and the maintenance plans for the building
- Part 3: The performance of maintenance works conducted

Part 4: Challenges and issues faced in implementing the maintenance strategies

In Part 1, the questions asked are in regard to the background of the respondent such as the job position of the respondent, his or her working experience for the current position and his or her experience in the fields of maintenance work.

For the second part of the interview questions, the information regarding the building will be asked such as the building history, the building background, the building users and the core business of the building. In addition, the maintenance works performed for the building also will be questioned to get the information on how the maintenance works were conducted in the building. Indirect types of questions will be asked to the interviewee to avoid from bias answer regarding the maintenance works performed in the building.

The questions in Part 3 are to recognise the level of the maintenance works applied in the building. Basically, the performance levels of the maintenance works conducted in the building are queried. The maintenance costs of the building are also required in order to evaluate the effectiveness of the maintenance strategies implemented. In addition, the number of complaints on the building services every month also will be asked to measure the level of the maintenance works in the building and how they managed the complaints. Three types of performance indicators are used in order to analyse the performance of maintenance strategies implemented. The performance levels of maintenance strategies practised for the case study buildings were analysed individually using the Likert scale rating of 1 (Very poor) to 5 (Excellent).

Lastly, Part 4 questions are mainly focused on the challenges and issues deal by the maintenance team in performing the maintenance strategies and how does the building manager handling the problem. From the issues and challenges pointed out by the interviewees', they will have to rate the problem by using the Likert scale rating of 1 (Not at all) until 5 (Very high). The arrangement of the interview questions is organised in orderly to ensure the interview session run progressively.

After conducting the interview session, a set of questionnaire form will be distributed to the building users and the building management bodies. The questionnaire is aimed to seek the building users' perception regarding the services performance and the maintenance works that have been conducted on the respective buildings. Besides, the distributed questionnaire form also intended to know the user level of understanding in connection to the scope of maintenance works generally and maintenance strategies specifically. The structures of the questionnaire form are divided into three main parts which are:

Part 1: Respondent's particular

Part 2: General knowledge about maintenance and the building

Part 3: Effects of defective of maintenance works

The first part of the questionnaire is aimed to obtain the background information of the respondents such as the gender, ages, occupational status and their frequency of visiting the building. The second part of the questionnaire will ask the respondents knowledge and understanding on the maintenance works. Besides, the satisfaction level of the user regarding the services performance and the respond of the complaint submitted will be asked.

In the third part of the questionnaire, the effects of the defective elements of the building will be questioned. Moreover, in this section the respondents will be asked whether the maintenance works performed for the building disturbing the user activities or not. Three types of Likert scale rating with different description were used in the questionnaire to analyse each and every different variable. For the question of services breakdown frequency, a Likert scale rating of 1 (Very rare) until 5 (Very frequently) was used while for the effects of the services breakdown on the respondent's activities were analysed by the rating of 1 (Not at all) until 5 (Very high). In the other way, the overall quality and performance of the maintenance services for the building were analysed by using the Likert scale rating of 1 (Very poor) until 5 (Excellent).

Once completed the data collection, the data obtained were analysed quantitatively and qualitatively. All of the information gathered from the observation, questionnaire sheets and interview session will be analysed critically using suitable measures to conclude the research work. In order to achieve the research objectives, the data collected will be processed and discussed analytically. The technique chosen to be used in analysing the data depends on the types and number of variables being studied. The data obtained from the questionnaires sheet are analysed by using the software of Statistical Package for Social Sciences (SPSS) version 20th.

3.0 RESULTS AND DISCUSSION

3.1 Issues and Challenges in Selecting Maintenance Strategies

Based on the interview sessions with the building managers, the knowledge of the building manager on maintenance aspect from their perspective was obtained as shown in Table 2. It shown that the building managers has certain level of knowledge and experience in planning and conducting maintenance work.

Table 2 Summary of building managers knowledge in maintenance

	Case Study A	Case Study B	Case Study C
Working experience in maintenance industry	15 years	4 years	1 ½ years
Educational background in maintenance field	Management	Diploma in Mechanical and Electrical Engineering	None
Overall knowledge on maintenance aspect	Excellent	Major in mechanical and electrical system	Well known in lift system and operation

Based on the interviews, there are several issues and challenges mentioned by the building managers in selecting the suitable maintenance strategies which are as follows:

a. Top Management Problem

Results from the analysis of the issue in top management show that the problem faced by the building manager of Case Study B is rated as high followed by Case Study A and Case Study C with a fair rating. Rahman *et al.* [11] described top management problem as issues that relate with the ways of maintenance risk being manage, plan, organise and execute. A poor management process will lead to the problem in implementing the maintenance strategies for a building. Table 3 show the mean values for top management problems for the three case studies.

Table 3 Mean values of top management problems

	Case Study A	Case Study B	Case Study C
Top Management Problem	3.00	4.00	3.25
	Fair	High	Fair

From the interviews conducted, it was found that the top management issues faced by the building manager in each case study was differ from one another. The discussions of the findings as follow:

i. Lack of knowledge in maintenance scope

This issue was faced by the building manager in Case Study A and Case Study B. Both of the building managers stated that they have zero knowledge regarding maintenance work and their academic background and expertise were also not in building maintenance aspects. According to the building manager for Case Study B, the building manager was transferred from doing office work to maintenance work in

order to fill up the vacancy in maintenance department while the building manager in Case Study A started getting involve in maintenance industry by applying a job vacancy in maintenance field at hospital. In contrast with Case Study C, the building manager have knowledge in maintenance aspect as he previously studied maintenance management.

The knowledge level of the top management in maintenance department are influencing the productivity of works as they play an important role in managing the flow of maintenance work. The absence of management and leadership of the top management will lead to the delay of work and failure of maintenance work. Hence, the educational background and experience of the building manager are very crucial in order to implement the appropriate maintenance strategies for a building.

ii. Unqualified maintenance contractor

In order to maintain a government office building, the maintenance contracts are normally given to the lowest tender price in competitive bidding. Normally, the contractor will try to run the maintenance operations at a minimum price to ensure that they gain profit from the project. Based on the interviews conducted, both of the building managers in Case Study B and Case Study C stated that most of the maintenance works performed by the outsource contractor do not meet the expected requirement. As the payment of the maintenance operations is low, the contractors usually will provide an unskilled worker to perform the maintenance work as the wages for unskilled worker were lower. As a result, it will lead to wastage of time and effort in maintenance operations. On the other hand, most of the in-house maintenance staffs in Case Study B were unfamiliar with maintenance works as they are not qualified in maintenance field.

iii. Government regulations and rules

According to the building manager at Case Study A, although they can perform all of the maintenance operations by using in-house staff but they still have to outsource some of the maintenance works due to the requirement set by the Ministry of Public Works such as maintenance works that need competent person especially for electrical calibration. A qualified contractor need to be appointed and maintenance report need to be submitted to the Ministry as a proof of compliance. Besides, the Ministry also encourage them to outsource the maintenance works for any system that are still under warranty to the specialist company.

According to the building managers in Case Study B and Case Study C, both of the buildings do have too many procedure to follow for the maintenance aspects. The building managers need to prepare paperwork for every maintenance works that need to be outsourced. Both, the preparation and the approval of the paperwork will take very long time in order to ensure that the works can be carried out. Thus, the maintenance process is delayed especially for major maintenance works.

iv. Stakeholders communication

Communication is an important aspect in performing a maintenance work as the worker will get a clear understanding on the objectives and goals for every work carried out. Findings from the interview session with the building managers reflected that Case Study B and Case Study C do not get the actual plans and objectives for the maintenance works that should be performed for their building. Without a good communication between the top management and the maintenance departments, the implementation of maintenance strategies by the building manager will become more difficult.

v. Financial issues

This issue was faced by the building manager at Case Study B and Case Study C. According to the managers, maintenance works was not a priority for the building compared to 15 years ago. The budget allocation for maintenance works is reducing from year to year. As a result, the building managers face difficulties in executing the maintenance works due to insufficient budget.

b. Human Resource Problem

The results showed that the human resource aspect gives a very high influence for the building manager of Case Study B and high for Case Study C in implementing and selecting the suitable maintenance strategies for their building. On the other hand, the decision of the building manager for Case Study A does not distract by the human resource problem. The details of the analysis were shown in Table 4.

Table 4 Mean values of human resource problem

	Case Study A	Case Study B	Case Study C
Human Resource Problem	1.80	4.20	3.60
	Small	Very High	High

The human resource problem is the problems that arise from weaknesses and human error such as the

working experience and the attitudes in maintenance works [4]. The details of the findings from the interviews are as following:

- i. Lack of supervision from maintenance team
According to the building managers of the case studies, all of the buildings are implementing the planned preventive maintenance strategy for the maintenance operation. The building manager in Case Study A considered that it is his responsibilities to supervise the maintenance work for the building. Normally, the building manager fixes any failure or breakdown happened inside the building without waiting for any complaint submitted. This is supported by Alshehri *et al.* [12], where some parties think the supervision role is the most important duty to be carried out in the maintenance department.

In contrast, Case Study B and Case Study C will only perform the maintenance works according to the complaint submitted by the building users as the maintenance personnel for the building is not sufficient to carry out the inspection work. As for Case Study C, the building manager cannot cope with the daily routines of the maintenance schedule, hence, the inspection for maintenance works will only be performed during the weekly, monthly and yearly routines. Alshehri *et al.* [12] stated that the maintenance team in public sector usually does not know about the technical operation in maintenance works, therefore, they will only receive and signed the maintenance report submitted from the contractor.

- ii. Lack of engineers and specialist
The requirement of manpower for every maintenance works for a building usually, will differ according to the type of works and services. In the process of maintenance operations, it is crucial for the maintenance department to have a personnel with expertise and competent for every scope of maintenance works [12]. According to the building managers, some parts of the maintenance jobs need to be outsourced to any specialist contractor as they did not have a competent person to conduct the maintenance especially for the electrical, air conditioning and lift system. Even though the in-house worker able to perform the maintenance job, yet the worker does not have a qualified certificate to carry out the work. Hence, there will be some amendment in carrying out the maintenance operation as the building manager need to outsource the works that can be done by the in-house staff to any competent contractor.

iii. Training and motivation

Based on the interview, both of the building managers of Case Study B and Case Study C stated that the encouragement from the management to the maintenance staff to attend any training course are unfavourable as maintenance was not a core business. This is supported by Alshehri *et al.* [12], where there is a lack of encouragement from the top management for the workers to participate in maintenance and operation field. In contrast, Case Study A top management encourage and motivate the maintenance staff to join any training for maintenance field but they will not support the fees for registration of any certificate of competency.

iv. Unclear job description and department structure

From the interviews, it has been noted that the maintenance department for Case Study B and Case Study C does not receive a clear briefing of the goals and objectives of the management for the maintenance operation. In addition, the building managers also do not have structured approaches in order to improve the maintenance process. Besides, the building manager in Case Study B also stated that the maintenance department needs to cater or organise every function carried out in the building especially at the exhibition foyer which is actually not the scope of works of the maintenance department. In contrast, the building manager of Case Study A was told the objectives of the management where they want to reduce any emergency maintenance to 5% and applying the planned preventive maintenance for 95%. Hence, the building manager will brief and arrange the works every day with the maintenance personnel.

v. Lack of awareness

Based on the study conducted, the awareness of building maintenance operations for Case Study B is very low as the management of the building assume the maintenance works are not important for the building. According to Alshehri *et al.* [12], it is vital for the building manager and the management to understand the necessary of building maintenance to facilitate the building function and the occupants. While, for the Case Study C, the building manager aware on the importance of building maintenance but the maintenance works conducted are based on the situation and priority. The building manager will conduct the maintenance for any complaint or breakdown that happened at the Ministers' office or room in advance than the other space inside the building. Besides, the maintenance operation also will be conducted if the system

breakdown or failure will influence all of the building occupants.

c. Technical problem

The study found that both, Case Study B and Case Study C building managers faced a high influenced of the technical problem in selecting the suitable maintenance strategies for the building. For Case Study A, the influences from technical problem toward the action of the building manager in selecting the appropriate maintenance strategies were fair. Table 5 represent the results from the interviews conducted.

Table 5 Mean values of technical problem

	Case Study A	Case Study B	Case Study C
Technical Problem	2.33	4.00	3.67
	Fair	High	High

According to Rahman *et al.* [11], technical problem in maintenance works can be described as the issues associated with technical aspects in conserving a property from the early life until the end cycle of the property. The problems that faced by the building managers are as follows:

i. Shortage of spare parts

Based on building manager of Case Study A, the problem of lack of spare parts for maintenance works is rarely faced by them as they always ordered the parts earlier and kept it inside the store. But, sometimes they faced this problem especially for the parts that require a big space to keep such as the equipment for air conditioning and cooling tower. In addition, the unavailability of the spare parts also arises as some of the parts are not available in the local market and need to be ordered from outside market.

While for Case Study B and Case Study C, the building managers stated that the only spare part that available at the maintenance department is only for replacement of the light bulb. Thus, the other system that needs to be replaced will take a longer time as the absence of the spare parts in the storage. In order to purchase the suitable spare parts, the building manager needs to prepare paperwork and provide the details to the top management. Hence, this procedure will delay the maintenance operation and the productivity of the maintenance department.

ii. Failure of preventive maintenance

It has been noted throughout the interview that the selected maintenance strategy for Case Study A met the management objectives to implement 95% of the maintenance operation as preventive maintenance and the other 5%

was emergency maintenance. The building manager of Case Study A stated that the biggest issue that he faced in selecting the maintenance strategy for the building is to handle the major breakdown which may lead to the emergency maintenance. According to the building manager, every year he will try to reduce the probability of emergency maintenance to be carried out. While for Case Study B, the maintenance strategy applied was preventive maintenance but most of the planned maintenance works were not carried out properly due to budget constraint and lack of maintenance personnel. Sometimes there were repetitive complaints received as the team was unable to perform the maintenance work within the time frame. While for Case Study C, the building manager stated that the maintenance department is unable to cope with the daily maintenance inspection as scheduled as they did not have enough staff to perform the inspection. The maintenance department was also incapable in doing the planned preventive maintenance perfectly as the team are sometimes busy with the corrective maintenance.

iii. Development of new technologies

The findings showed that all of the case study buildings were aged between 35 to 40 years; therefore, most of the systems operated inside the building were outdated. The development of new technologies in the market influenced the maintenance process carried out because the spare parts for the old system were hard to find. Besides, the replacement of the old system with new technology will need a lot of procedures and the building manager will have to prepare paperwork for the replacement. According to the building managers, they cannot simply replace the system inside the building as they need to ensure that the new system is suitable and fit for the building. Table 6 below shows the overall rating of the issues and challenges faced by the building managers in implementing the maintenance strategies.

Table 6 The overall rating of the issues and challenges faced by building managers

Issues	Case Study A	Case Study B	Case Study C
TOP MANAGEMENT PROBLEM			
1) Lack of knowledge in maintenance scope	2	5	1
2) Procurement management	-	-	-
3) Unqualified maintenance contractor	1	3	3

Issues	Case Study A	Case Study B	Case Study C
4) Government regulations and rules	4	3	3
5) Stakeholder communication	1	4	4
6) Financial issues	1	5	3
Mean value	3.00	4.00	3.25
HUMAN RESOURCE PROBLEM			
1) Lack of supervision from maintenance team	1	4	4
2) Lack of engineers and specialist	4	4	4
3) Training and motivation	2	4	4
4) Unclear job description and department structure	1	4	3
5) Lack of awareness	1	5	3
Mean value	1.80	4.20	3.60
TECHNICAL PROBLEM			
1) Lack of maintenance software tool	-	-	-
2) Shortage of spare parts	2	4	4
3) Failure of preventive maintenance/ maintenance strategies	1	4	5
4) Development of new technologies	4	4	2
Mean value	2.33	3.67	3.67
Overall Mean Value	2.37	3.95	3.51

3.2 Maintenance Performance

A total of 200 questionnaires have been distributed at the respective case studies and received 135 copies of return and valid for data analysis. From the feedback, 30.4% were respondents from Case Study B and 34.8% each from Case Study A and Case Study C. The respondents were asked to rate the frequency of the services breakdown and their effects towards the occupants daily activities. The mean value were calculated as shown in Figure 1. The result shows that breakdown of lift system, air conditioning system, ventilation system, electrical system and plumbing system have high impact on the user daily activities inside the respective building. On the other hand, the breakdown of the firefighting system have fair impact on their daily activities.

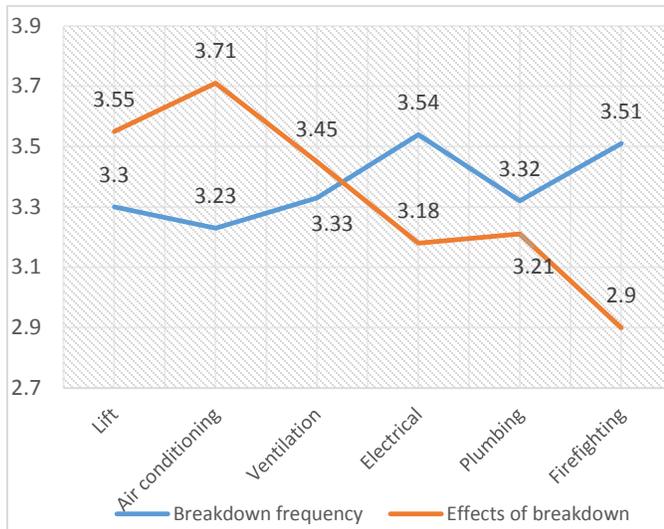


Figure 1 The relationship between the services breakdown frequency and their effects on building user daily activities

As the breakdown of the building services affected the building user daily routine, the building users were asked whether they have made complain when a breakdown occurred. A total of 60 out of 135 of the respondents experienced submitting a complaint for the past 12 months. Based from the data obtained, the respondents made complain for nine elements in the buildings in the past 12 months. Some of the respondents complained more than 1 services at once. From all of the complaints, the most frequent element that has been reported is the electrical system followed by plumbing and air conditioning system. The numbers of complaints submitted by building elements and services can be referred to Table 7.

Table 7 Numbers of complaints for each type of service

Types of Services	Percentage (%)
Electrical	38
Plumbing	18
Air conditioning	18
Lift	6
Telephone and cable	5
Structure	4
Road	4
Door	4
Fire System	3

The feedback received by the respondents who complained about the breakdown of the services were also examined. The components that been reviewed to analyse the feedback received by the complainers are the time of respond, the medium for submitting a complaint, the knowledge level of the maintenance department in overcoming the problem, the attitude of the staff and the availability of the staff. Based on the study, most of the complainers were satisfied with the response they

received from the complaint submitted. Only 25.0% of the respondents did not satisfied with the knowledge level of the maintenance department in dealing with the problem faced by the building. Table 8 represent the result details from the feedback analysis.

Table 8 Summary of feedback from the complaint submitted

Feedback	Yes	Percent	No	Percent
Respond of complaint in a timely manner	47	78.3	13	21.7
Medium of complaint is effective	51	85.0	9	15.0
Satisfaction on knowledge of maintenance department	45	75.0	15	25.0
Attitude of maintenance staff	52	86.7	8	13.3
Availability of maintenance department	49	81.7	11	18.3
Satisfaction on service received in the building	113	83.7	22	16.3

From the survey conducted, 83.7% of the respondents were satisfied with the services they received from the maintenance department in the building while 16.3% of the respondents did not satisfied. In addition, the mean value for the overall satisfaction scored 3.53 and labelled as 'Good' according to the 1 to 5 likert scale. The overall satisfaction level of the respondents towards the maintenance services of the buildings was illustrated in Figure 2.

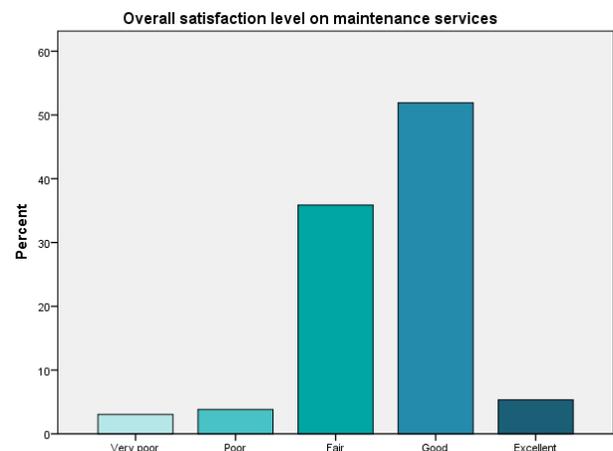


Figure 2 Overall satisfaction level on building maintenance services

3.3 Analysis of the Performance Levels of Maintenance Strategies Practiced

The performance level of maintenance strategies practiced in the case studies were analyzed. The performance level of maintenance approach

practiced are evaluated using three types of indicators. The selected performance level indicators for this research are the maintenance efficiency indicator (MEI), urgent repair request indicator (URI) or general repair request indicator (GRI) and building performance indicator (BPI).

The mean value of maintenance strategies performance for the case study buildings are evaluated by using the Likert scale method and the mean value of the performance level of maintenance indicators are calculated. From the data collected, the results show that the maintenance performance for Case Study A categorised as 'Excellent' followed by Case Study C as 'Good' and Case Study B as 'Average' as shown in Table 9.

Table 9 The maintenance performance

Performance Indicator	Case Study A	Case Study B	Case Study C
MEI	5	3	3
URI/GRI	5	3	4
BPI	4	4	4
Mean Value	4.67	3.33	3.67
	Excellent	Fair	Good

The annual maintenance expenditure for the case study buildings was taking into consideration in order to measure the performance levels of the maintenance strategies practiced. Based on the interviews session, the annual expenditure in maintenance scope was obtained. The building manager for Case Study A stated that maintenance cost used by the building was around RM80, 000. On the other hand, the maintenance expenditure for Case Study B was around RM2 million and Case Study C was RM1.2 million. According to building manager of Case Study B and Case Study C, sometimes the planned maintenance expenditure for the building were not enough and they have to request additional budget from the management. Most of the additional budget was used for the payment of outsourcing works and breakdown repairs. Besides, the maintenance cost estimated for the building were not sufficient to carry out the planned maintenance works thus the maintenance operation was delayed until the approval of the additional maintenance budget.

Based on the data obtained, the relationship between issues and challenges faced by the building manager in performing the maintenance strategies and the performance levels of the maintenance strategies practiced are analyzed. The result showed that the relationship between the variables has a significant correlation between each other. If the issues and challenges faced by the building manager were less in maintaining the building, the better the performance levels of the maintenance strategies. From all of the case studies, Case Study A faced the lowest problem in selecting the maintenance strategy. Hence, the performance level of the maintenance operations is at excellent level. In

contrast with Case Study B, the building manager faced a highest number of problems in selecting the maintenance strategy, therefore, the performance levels of the maintenance operations carried out for the building is on an average level. The mean value of the issues and challenges faced by building manager and the performance levels of the maintenance strategies are illustrated in Figure 3.

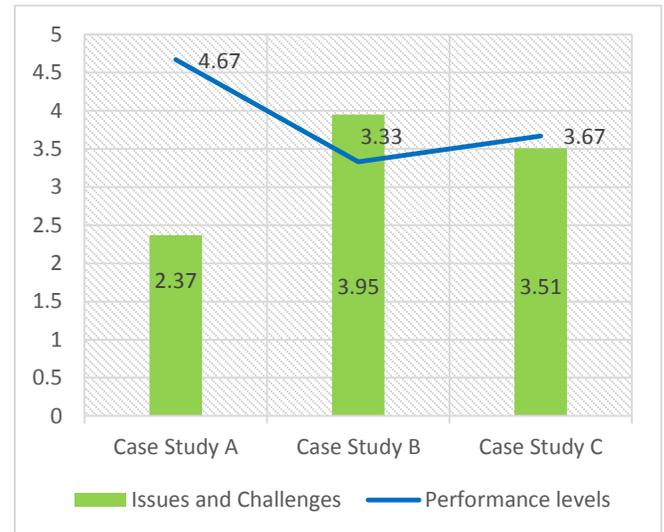


Figure 3 Relationship between issues and challenges faced by building managers and the maintenance performance

4.0 CONCLUSIONS

Implementation of good maintenance strategies in Malaysia was affected by a significant issues and problems which cause the failure of the practices. From the case study buildings, there a few issues and challenges have been identified faced by the building managers in performing the maintenance strategies for the buildings.

The management system is a crucial aspect in arranging a maintenance strategy for a building. Without good management process, maintenance operation in a building will not be carried out properly and meet the expected target. The management, planning, organisation and execution of maintenance risk shall be conducted by top management. Hence, the top management people shall have a good knowledge in maintenance scope to ensure the maintenance strategies applied was suitable for the building

Furthermore, a manager with good working experience and attitudes in maintenance works also needed in selecting the appropriate maintenance strategies for a building. If the maintenance personnel do not have adequate knowledge and experience in maintenance works, selection of maintenance strategies will become tougher especially for any emergency maintenance. Besides, the maintenance personnel tend to perform the works according to

their capability without following the proper procedure. Therefore, the maintenance personnel should aware of his or her scope of works and the building needs.

In addition, technical problems always happened in selecting the appropriate maintenance strategies especially to conserve the property from the beginning until the optimum life cycle of the building. The rapid growth of technologies has led to the difficulties in the process of finding the spare parts for a component. Besides, some maintenance personnel tend to select the unsuitable maintenance strategies for a building based on the availability of the budget. Therefore, all of the issues and challenges need to be overcome in order to ensure the selected maintenance strategies by the building managers successful.

References

- [1] Zakaria, A. and S. Hamzah. 2007. Pelan Kualiti Dapat Elak Projek Hadapi Masalah: Majlis Aset Kebangsaan Mampu Tingkatkan Kecekapan Penyelenggaraan. *Berita Harian*. Malaysia. 2.
- [2] Hussain, A. M. 2011. Asset Management in Malaysia. *Ministry of Works Malaysia (Kementerian Kerja Raya Malaysia, KKR) Strategic Planning Conference 4-7 May 2011*. Malaysia: Ministry of Works Malaysia (Kementerian Kerja Raya Malaysia, KKR).
- [3] Chanter, B. and P. Swallow. 2007. *Building Maintenance Management*. UK: Blackwell Publishing Ltd.
- [4] Lee, H. H. Y. and D. Scott. 2009. Overview Of Maintenance Strategy, Acceptable Maintenance Standard And Resources From A Building Maintenance Operation Perspective. *J Build Apprais*. 4(4): 269-278.
- [5] Horner, R. M. W., M. A. El-Haram, and A. K. Munns, 1997. Building Maintenance Strategy: A New Management Approach. *Journal of Quality in Maintenance Engineering*. 3(4): 273-280.
- [6] Au-Yong, C. P., A. S. Ali, and F. Ahmad. 2014. Improving Occupants' Satisfaction With Effective Maintenance Management Of HVAC System In Office Buildings. *Automation in Construction*. 43: 31-37.
- [7] Royal Institution of Chartered Surveyors (RICS). 2012. *RICS Public Sector Property Asset Management*. Guideline 2nd Ed. Royal Institution of Chartered Surveyors (RICS): UK. 1-77.
- [8] Mustapa, S. A. H. b. S., H. Adnan, and K. Jusoff. 2008. Facility Management Challenges and Opportunities in the Malaysian Property Sector. *Journal of Sustainable Development*. 1(2): 79-85.
- [9] Kevin, F. G. and R. J. Penlesky. 1988. A Framework For Developing Maintenance Strategies. *Production and Inventory Management Journal*. First Quarter: 16-21.
- [10] Seeley, I. H. 2003. *Building maintenance*. 2nd ed. Britain: Palgrave.
- [11] Rahman, M. A. A., Z. A. Akasah, M. S. Abdullah, and M. K. Musa. 2012. Issues And Problems Affecting The Implementation And Effectiveness Of Heritage Buildings Maintenance. *The International Conference on Civil and Environmental Engineering Sustainability (IConCEES 2011)*. Johor Bahru, Malaysia.
- [12] Alshehri, A., I. Motawa, and S. Ogunlana. 2015. The Common Problems Facing the Building Maintenance Departments. *International Journal of Innovation, Management and Technology*. 6(3): 234-237.
- [13] Ali, A. S. and S. J. L. Chua. 2011. Issues and Challenges in Implementation of Planned Maintenance. *The Malaysian Surveyor*. 46(4): 33-37.
- [14] Ali, A. S., S. N. Kamaruzzaman, R. Sulaiman, and Y. C. Peng, 2010. Factors Affecting Housing Maintenance Cost In Malaysia. *Journal of Facilities Management*. 8(4): 285-298.
- [15] Baek, J. G., 2007. An Intelligent Condition-Based Maintenance Scheduling Model. *International Journal of Quality & Reliability Management*. 24(3): 312-327.
- [16] Roka-Madarasz, L. 2011. Performance Measurement for Maintenance Management of Real Estate. *Acta Polytechnica Hungarica*. 8(1): 161-172.
- [17] Lavy, S. and I. Shohet. 2010. Performance-Based Facility Management – An Integrated Approach. *International Journal of Facilities Management*. 1(1): 1-14.
- [18] Enshassi, A. A. and F. E. Shorafa. 2015. Key Performance Indicators For The Maintenance Of Public Hospitals Buildings In The Gaza Strip. *Facilities*. 33(3/4): 206-228.
- [19] Sekaran, U. and R. Bougie. 2009. *Research Methods for Business: A Skill Building Approach*. 5th ed. United Kingdom: A John Wiley and Sons Ltd. 468.