

Key Performance Indicators for Maintenance Management Effectiveness of Public Hospital Building

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Abstract. Effectiveness of management in maintenance aspect holds the key element in influencing the performance of overall maintenance management. Similarly, public hospital building needs an effective maintenance management as this type of building in nature is one of the most complex issues in the field of maintenance. Improper building maintenance management adopted by the organization significantly will interrupt the overall operation of the building. Therefore, this paper is aim to identifying the key performance indicator (KPI) of effectiveness of maintenance management for the public hospital building. A total of 32 set of questionnaires were distributed to the maintenance manager for each hospital in the northern region of peninsular Malaysia by using self-administration strategy. The survey answer was analyzed by performing descriptive analysis in SPSS. Overall, the result of descriptive analysis shows that all the ten factors of effectiveness of maintenance management are accepted as KPI since the mean value is at least 3.93 which classified as important and significant. The most significant factor of effectiveness of maintenance management is task planning and scheduling with the mean score of 4.35. While less significant factor is identify as maintenance approach with the value of mean score is 3.93. The both results indicates that the management need to have well-structured planning for the maintenance works and also need to embrace the exact strategy of maintenance approach in order to achieved better overall performance of maintenance management. This study may draw a standard practice for the government in assessing the performance of public facilities in terms of maintenance management.

1 Introduction

Maintenance management of hospital buildings is one of the most complex issues in the field of maintenance [1]. As stated by [2], this scenario is occurred due to the fact that the complex nature of hospital buildings, the delicate mechanical and electrical system and inadequate maintenance budget which could affected the performance and operation of the

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hospital buildings besides the occurrence of numerous building defects. Building defects are becoming ordinary phenomena in the building maintenance services especially for the hospital buildings are over than 30 years old. Therefore, the longer a building is exposed to the atmosphere, the higher tendency for it to deteriorate [3]. Besides that, a common building design error is often occurred, usually in an effort to reduce the initial construction costs which project costing plays an important role in building design [4]. A research conducted by [1] found that the public hospital building in Nigeria is in very poor and deplorable conditions of structural and decorative disrepairs.

The Ministry of Health Malaysia (MOH) principally provides public healthcare in Malaysia and about 53 per cent of annual budget is allocated for health sector [5]. However, in 1997, the Government of Malaysia took the initiative to carry out a major privatization project for the provision, maintenance, and management of hospital support services (HSS) of public hospitals throughout the country [6]. As a result, the government has appointed concession companies (contractors) as a party to manage the maintenance management of public hospital. In Britain, for example, building maintenance activities account for 50 per cent of all annual construction activities. In the USA, 35 per cent of the overall turnover in the construction sector consists of renovation and modification projects [1]. The impact of building maintenance on quality and unit costs has to be understood. Many researchers are involved in the similar scenario of building maintenance. Essentially, the goal of the building maintenance organization especially in a hospital environment is to achieve zero defects in the hospital's physical operation.

The objective of the paper is to identify the key performance indicator for the effectiveness of maintenance management of the public hospital building. By this entire research will give information and data that more systematic and scientific towards improvement of building maintenance management which draw an assessment of the strengths and opportunities to improve maintenance management practices in our country.

2 The effectiveness of maintenance management

In order to identify the effectiveness of maintenance management factors, key performance indicator is the best strategy to measure the performances of the building. This statement is in line with [7] which affirmed that key performance indicator is a fundamental principle in maintenance management. In this study, the building is refers to public hospital. As proposed by [5], routine monitoring and supervision is one of the key elements to assess and identify the performance of organization in implementing plans, policies and procedures of maintenance management that relates to maintenance management. It will indicate the gap between the current performance and expected performance which could assist the organization to identify the opportunities for process improvement [5]. The proper supervision should be implemented in order to ensure that the maintenance work is performed in accordance to the work order conditions and based on standard maintenance procedures [8].

Besides that, routine monitoring and supervision need to be supported by task planning and working schedule. However, task planning and scheduling need to be provided and managed by first line maintenance foreman or supervisor as well as responsible in providing the feedback to the maintenance planner to ensure that the proposed job plans are relevant, efficient and effective [8]. The lack of planning and scheduling will definitely restrict a maintenance operation to meet its objective in delivering the optimum service as planned by the organization. As mentioned by [9], proper work planning can lead to high responsiveness, less unplanned work and less unplanned overtime with consequences of minimizing the overall maintenance cost. In addition, computerized maintenance

management systems (CMMS) can be used to support the organization to automate the preventive planned maintenance (PPM) function and as an aid tool to control the maintenance inventories and material purchase for the purpose of maintenance works. CMMS is acknowledged as an effective tool that has capabilities of reporting the analysis that relates to overall maintenance management aspects quicker and accurate compared to than manual techniques. Other than that, accessibility and accuracy of information can provide more reliable and decisions in proper maintenance work [10]. Therefore, the above elements could be classified as individual factors because all the factors are concern about managerial aspect which influenced by a building maintenance leader.

The practice of maintenance approach is recognized as a factor that highly affects the maintenance performance. For instance, [9] mentioned that the reactive maintenance approach does not tackle the problem at the root level and always lead to repetitive failures. The distinction result between reactive and preventive planned maintenance (PPM) approach where the maintenance work planning program for preventive planned maintenance (PPM) approach drastically reduces errors in day-to-day operations, as well as increase the overall preparedness of plants in the case of an emergency. Moreover, the maintenance approach also will affect the spare part management. Mostly, spare parts are not available at what time required for routine maintenance, downtime is prolonged. In other hand, if too many parts are kept by the management, the utility absorbs excessive costs and overhead expenses due to of carrying the inventory [11]. Another aspect that related to maintenance approach is the type of maintenance work's contract, either it is conducted by in-house or apply an outsource strategy which award the project to the third party. Yet, for the outsource strategy, it still depend on how well the maintenance organizations manage the contract and task as well as "how much" benefit they gain out by applying the outsource strategy. The factor of maintenance approach, spare part management and outsourcing maintenance works could be summarized as a technical aspect as it involves top management who responsible to setting up the overall maintenance approach as well as the organization has to deal with third party for outsourcing maintenance works.

Policy deployment and organization is another recognized factor that influences the maintenance management effectiveness. As suggested by [9], the maintenance organization should consider this factor as one of organizational business strategy in order to improve the overall performance. Nevertheless, the organization also needs to have an appropriate human resource and effective human resource management to run the business efficiently as well to ensure the optimum performance. Furthermore, pointed out that human resource management program is one of the successful factor of maintenance management as the organization must acquire the right person to manage, plan, supervise and execute the maintenance works.

In order to support all the maintenance planning and execution, the allocation and control of budget play an important role in prompting the overall maintenance management. The elements that suggested by [9] in relation to financial are maintenance budget control, cost of monitoring the contractor, and cost control for labor and material aspect. For the purpose of improvise the organizational performance in terms of maintenance management, all the strategy, policy and managerial aspect need to be assessed for the purpose of continuous improvement. This practice is being adopted in Malaysia public hospital as it part of requirement for quality management system with the purpose of obtaining the quality ISO certificate as well as gauge the effectiveness of current practice of maintenance management [6]. The factors of policy deployment and organization, human resource management, financial aspect and continuous improvement could be summarized as an administration and organizational factor as all the factors are under the control of top management.

3 Research methodology

This study is a cross-sectional study where a set of questionnaires has been used as a medium to collect the related data in identifying the key performance indicators for effectiveness of maintenance management for the public hospital. The population for the study is public hospital in northern region of peninsular Malaysia. Overall, there are 32 public hospitals and maintenance manager for each hospital has been chosen to become as a respondent as they are involved in the overall stage of maintenance works and also responsible to monitor, supervise and reporting the maintenance works in the public hospital. Data collection for the current study was conducted based on self-administration method because it involved a short period of time, less expensive, gained quick answer and can clarify on the spot if there are any doubts from the respondents.

A set of questionnaires used in this study is based on 5-point likert-scale, which 1 is strongly disagree and 5 is strongly agree. The result obtained from the survey will be analyzed by performing descriptive analysis in SPSS. Therefore, for the purpose of data interpretation, this study adopted the mean scale developed by [2]. By adopting this mean scale, it enables this study to identify the key factors of effectiveness of maintenance management for the public hospital building. Therefore, this study will only consider mean scale of 3.50 and above as a key performance indicators as this mean scale is categorized as important and significant. The mean scales are as follows; 1.00-1.49 (Not Important and Significant), 1.50-2.49 (Not Important), 2.50-3.49 (Average), 3.50-4.49 (Important and Significant) and 4.50-5.00 (Very Important).

4 Result and finding

This study proposes three main components to be an indicator for effectiveness of maintenance management for the public hospital building, namely individual factors, maintenance aspects and administration and organizational factors. The individual factors consist of 4 factors, while maintenance aspects consider 3 factors and lastly, administration and organizational factors contain 3 factors; in total 10 factors. Figure 1 shows the overall score for the 10 factors of effectiveness of maintenance management. Overall, all the factors have scored at least in the range of 3.50 – 4.49 which indicates that the all factors are perceived as key performance indicators of effectiveness of maintenance management for the public hospital building.

The factor that notches the highest score is task planning and scheduling with the mean value of 4.35. This result demonstrates as very important in influencing the effectiveness of maintenance management as the maintenance work for the public hospital building involves technical complexity which the maintenance works need to be well-organized in order to elude any possibility for delay in completing the maintenance works. It is well acknowledged that the delay in construction works include the maintenance aspect will affect the function and daily routine of the building as well as contribute to the negative impact on overall maintenance management performance. In comparison, the lowest score of mean value is maintenance approach with mean value of 3.93 which classified as important and significant. The mean value of this factor is slightly different with previous studies which found that this factor is the common very important factor in prompting the effectiveness of maintenance management. However, this factor cannot be mistreated because the maintenance approach is a fundamental element in maintenance management and substantially determine overall path and direction of the organization in managing the building maintenance.

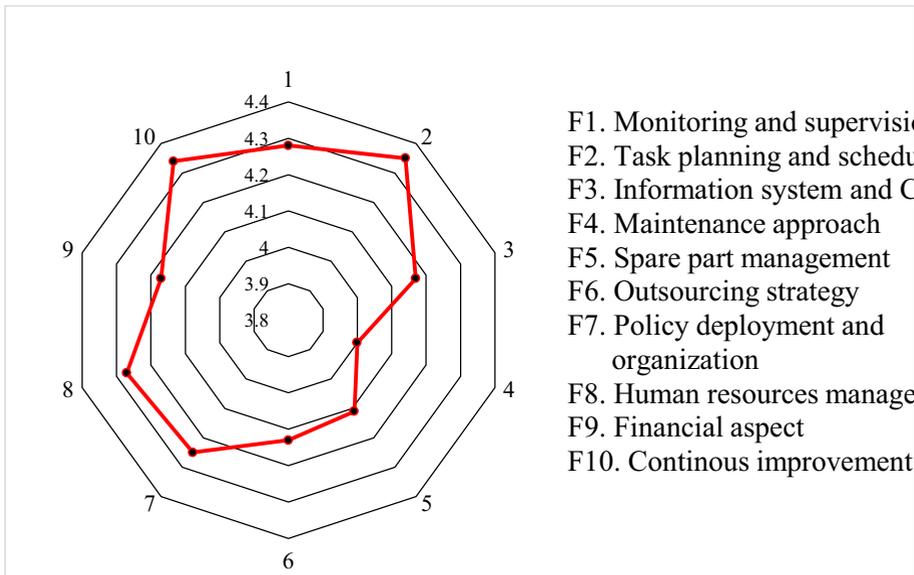


Fig. 1. Overall maintenance management performance ratings

The rest of the factors that consider in this study in identifying the effectiveness of maintenance management had mean values of between 4.11 - 4.34 which fall under the classification of at least important and significant. The factor of continuous improvement has scored 4.34 of mean value. Therefore, the management is advised to conduct a maintenance performance assessment for the purpose of continuous improvement. Continuous improvement is significant in contributing to the effectiveness of maintenance management in the public hospital building as the management could achieve better performance for the following years and could setting up higher target of maintenance performance objective. While, the mean value for the factor of monitoring and supervision, human resource management and policy deployment and organization are classified as important and significant with the mean value of 4.28, 4.27 and 4.25 respectively. This result proves that the monitoring and supervision on the maintenance works particularly for the outsourced maintenance works for the public hospital building is necessary and need to be performed efficiently in order to ensure the effectiveness of maintenance management. In addition, this result specifies that the top management plays an important role in the maintenance management for the public hospital building. This fact is significant as the top management is in the top organization hierarchy and holds the key in any organization. Thus, the mission and vision of the organization is mostly shaped by the top management which it will determine the direction of the organization for that period.

In addition, other factors that perceived as key performance indicator of effectiveness of maintenance management for the current study are information system and CMMS, financial aspect, outsourcing strategy, and spare part management. These factors notched between 4.11 – 4.17 of mean value which classified as important and significant. The effectiveness of maintenance management for the public hospital building could be better by embracing advance technology that is information system and CMMS. The adoption of technology software and hardware is needed in the modern world as it quicker and more effective which assists the organization to draw better alternative planning and result for the maintenance management. Correspondingly, the management on outsource strategy is apparent significant in improving the effectiveness of maintenance management. For certain maintenance works in the public hospital building in Malaysia is being awarded to

the party. Thus, the selection of contractors and supervision on the overall maintenance work progress and quality are need to be more transparent in order to ensure the efficiency of the maintenance works as well as meet the organizational goals. Last but not least, overall organization mission and vision must be aligned with the overall allocation for the maintenance management purpose as the maintenance works involve high expenditures, implicate with complex management and deal with various technical and managerial issues which needs a maintenance expert to manage the maintenance works.

5 Conclusion

The ten factors of effectiveness of maintenance management proposed in this study seem that significantly contribute to the overall maintenance performance for the public hospital building in the northern region of peninsular Malaysia. The result implicates the needs of appointment the competent person to plan and scheduling the maintenance works efficiently. This is due to the fact that the building maintenance works deal with various technical complexity, policies, procedures, and managerial task which requires experienced person to manage the maintenance works. In addition, the competent person also important in figuring out and appointing the suitable contractors to perform the maintenance work for the outsource strategy. The selection of contractors for outsource strategy is important since the quality and work progress in totally depending on the third party, but still can be optimized if the correct approach is adopted by the management. The management via maintenance managers has to perform performance assessment and identify the gap between the current states of performance with the expected performance. By doing this practice, it will enable the administration and organization to maneuver new strategy for the purpose of continuous performance improvement for maintenance management in the public hospital buildings. Overall, this study finds that the three main components, namely, namely individual factors, maintenance aspects and administration and organizational factors has significant impact in determining the overall performance of maintenance management for the public hospital buildings.

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