

# Key Strategies to Overcome Cost Overruns Issues in Building Maintenance Management

Sylvia Gala Mong, Sarajul Fikri Mohamed, Mohd Saidin Misnan

Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

\*Corresponding Author Email: [sgala2@live.utm.my](mailto:sgala2@live.utm.my)

## Abstract

The building maintenance is a crucial part of the life cycle of the building. The maintenance strategies are planned to maintain the condition of the building for specified functions. The maintenance planning requires a comprehensive assessment in determining the effectiveness of building performance, especially in the maintenance budgets planning process. The effective budget preparation will reduce the risk of cost overruns and help the organization to execute the repair works efficiently with sufficient resources. This study attempts to identify the issues related to maintenance cost and proposed the key strategies for improving the sustainable building maintenance budgeting in dealing with the cost overruns. This paper utilizes a qualitative approach through a literature review of secondary data from previous studies. The proposed cost model of maintenance strategies will be used as a basis for further investigation and validation towards promoting the sustainable building maintenance management. The studies identified the push factors that influence the maintenance cost; human factors, tools and equipment, spare parts and materials, funds allocation and available information. Each of the push factors needs to be well-considered to ensure that the maintenance activities can be done efficiently and to avoid the issues of cost overruns.

**Keywords:** Building maintenance; budget; cost uncertainties; maintenance resources; maintenance strategies

## 1. Introduction

In most circumstances, the decision to execute maintenance are grounded on feasibility which represented by a series of ad hoc and irrelevant activities between the immediate physical needs of the building and the availability of funds. The lack of precise understanding of the benefits which accumulate from different levels of upkeep expenditures and little attempt is made to forecast the overall long-term consequences of maintenance works. Maintenance cost comprises of cost for materials, labor, overheads, plant and equipment, management cost and profit (Faremi, Adenuga, Dada, & John, 2014). The maintenance department must ensure that there are adequate funds and resources to keep the buildings in decent shape, to accommodate catastrophes and to support operating and capital investments. The budgetary cost is significant which need to be prepared rigorously to support the needs of building operation and maintenance. Studies have demonstrated few problems had arisen as the resources budgeted by the management are deficient as it unable to support the maintenance programs and have caused cost overruns. The low budget and cost overruns will result in lower building performance and increased risk of poor management of a building (Ali, Kamaruzzaman, Sulaiman, & Cheong Peng, 2010; Au-Yong, Ali, & Ahmad, 2014a; Salonen & Deleryd, 2011). It is necessary to unveil the real

practice of the maintenance budgeting to determine the causes of ill-budgeted of maintenance resources.

The performance and sustainability of the building much depend on the adequacy of the budget for operation and maintenance works. Therefore, a proper budget management is a prerequisite in delivering an effective and efficient building maintenance management, hence to avoid the issues of budget constraints and cost overruns. However, few factors have caused the scarce in the maintenance budget due to uncertainties in maintenance resources and characteristics (Joseph Hung Kit Lai, 2010; Parida, Kumar, Galar, & Stenström, 2015; Sani, Mohammed, Misnan, & Awang, 2012; Shohet, 2003). The insignificant situations of poor maintenance cost would have given negative impacts to the stakeholders resulting in delays, lack of work quality and backlogs (Joseph H. K. Lai, 2010).

Budget planning for maintenance works is complicated and involved much consideration regarding maintenance resources. The maintenance nature itself is more complicated than the construction of the building as it is to maintain the life cycle of the building. Therefore, this study aims to identify the issues related to the maintenance cost and factors that need to be considered for decision making of maintenance cost. Besides, this would be able to assist the author in familiarizing on the level of risk and uncertain-

ty of maintenance cost, hence determine the strategies to overcome the maintenance cost issues in building maintenance management. The paper will conclude by proposing a cost model of strategies to be a basis for further investigation and validation for improving the sustainable building maintenance management.

## 2. Uncertainties of maintenance cost

Maintenance cost usually defines as the budget set aside to support the upkeep, restore and improvement of a building. Each repair works need different values in the various area having to some particularities such as the building types and location, resources availability, funds allocation, materials and spare parts, etc. (Au-Yong et al., 2014a; Au-Yong, Ali, & Ahmad, 2014b; Shah Ali, 2009; Várhelyi, Kaufmann, & Persson, 2015). Planning for maintenance works depends on a large extent upon the accuracy by which the building performance can be estimated. However, the level of precision ought to be coherent with the objectives of the time-scale of the predictions. Some extremely comprehensive strategies can sometimes result in unrelated costs and may distract the capacities of the maintenance resources (Chanter & Swallow, 2007; Kelly, 2006). Therefore, the accuracy of budgeting for maintenance works much depends on the information available such as (i) the nature of the buildings; (ii) the maintenance strategies; (iii) the conditions under which the maintenance to be implemented; (iv) the labor costs; (v) the prices of materials and spare parts and; (vi) funds available to support the maintenance works (Browne, 2005; Chanter & Swallow, 2007; Gupta, Gupta, & Gandhi, 2014; Kelly, 2006; Lee & Scott, 2009; Simões, Gomes, & Yasin, 2011).

The maintenance standard usually has been argued by various researchers and organization on the reliability and standardization among the industry. There are different interpretations and procedures implemented and vary between each agency (Hon Yin Lee & Scott, 2009; Kamaruzzaman et al., 2016; Koussaimi, Bouami, & Elfezazi, 2016; Joseph H. K. Lai, 2010). As the maintenance standards will influence the allocation of the availability of the maintenance resources, there will be different approaches because the maintenance strategies cannot be planned properly and well-organized. It is quite difficult to understand the maintenance standard of the various organizations as it is based on the perception and expectations. Moreover, the method of budgeting for maintenance varies which depending on the preferences of the management and the availability of the source of information. Over-reliance on the historical data also has become one of the primary reasons of the maintenance cost overruns without taking into account other related factors such as increments of prices of materials, location factors and nature of building condition (Bahr & Lennerts, 2010; Lateef Olanrewaju, Idrus, & Faris Khamidi, 2011). Thus, these differences will influence the decision-making for maintenance cost (Bahr & Lennerts, 2010; Flores-Colen & de Brito, 2010; Lai & Yik, 2006; Small & Gomez-Ibanez, 2008).

Lack of knowledge of maintenance manager and unskilled personnel also among the factors that contribute to the inefficiencies of maintenance cost as they could not well-performed in their tasks (Banister, 2008; Sani et al., 2012; Simões et al., 2011). Inabilities to plan and conduct the efficient maintenance works indirectly affect the performance and quality of the buildings. Also, the unskilled personnel that lack of training and education will not

provide any helps towards reducing the risks of building failures, instead of giving more burdens to the organizations.

Each task of maintenance requires spare parts and materials to replace the defective parts of the building. The worst part happens when most of the current building design is too up-to-date which cause the high cost of the components which need to be imported from foreign countries such as the United Kingdom, German and Japan, and most of the imported parts require a long time to get in. The sequence of this problem has led to building maintenance management to take a short cut by using non-original parts are cheaper and readily available in Malaysia; the quality of the spare parts is not guaranteed (Au-Yong, Ali, & Ahmad, 2016; Banister, 2008).

## 3. Budgeting and cost management

Budgeting and cost management are linked to summarizing the total cost of the maintenance that needs to be carried out. Maintenance budgeting is the justification of the cost acquired; what kinds of maintenance, when the maintenance to be executed, why the maintenance needs to be done and will be implemented by the routine activities that have been planned (Khan, Anuar, & Malik, 2014). Cost management demarcated as the expenses that have been brought about by the specific planned activities. It is not only a straightforward regulatory observing errand, as cost management includes securing that the totals spent and invoiced are as per the financial plan. The planning of every exchange is suitable and making a radical move to guarantee that any restorative venture moves are made as and when required (Khan et al., 2014; Yusuf, Mohamed, Yusof, & Misnan, 2013).

Deficiencies in the current ways to deal with building maintenance cost are prompting poor administration delivery, a pointless increment in maintenance and poor users' satisfaction. The current methodologies are retrogressive to the building textures, the engineering departments, the support organizations and the building users (Hamzah & Kobayashi, 2013; Hon Yin Lee & Scott, 2009; O. A. Adenuga, 2010). With a specific end goal to support the corporate destinations of association, an integrated and element maintenance administration framework is required. Sudden catastrophes can lessen output—particularly if the disappointment influences the procedure bottleneck. Moreover, when a disappointment happens, it, as a rule, takes more time to adjust than a planned support action would, bringing about the fundamentally higher expense (Hopland & Kvamsdal, 2016; Koussaimi et al., 2016; Parida & Chattopadhyay, 2007).

In any case, the increment in resource allotment without enhancing the management system is not the relevant answer for advance the distribution since it could reduce the support overabundances. However, it would not improve the profitability, client fulfilment and administration conveyance. Despite the significant properties for building upkeep, there is no rule or standard working method as the diagram to allude and utilized by the building proprietors and open all in all. Subsequently, the management regularly battled with the absence of learning to actualize a compelling maintenance management (Au-Yong, Ali, Ahmad, & Chua, 2017; Mohd-Noor, Hamid, Abdul-Ghani, & Haron, 2011).

## 4. Methodology

This paper is grounded on the part discoveries of a much wider study that engaged a balanced, rational viewpoint regarding the study approach and data collection methods. The interpretivist and positivism approaches were implemented which include literature review, online questionnaire survey and followed by interviews

and in depth comparative analysis. The positivism allows the researcher to study the cause and effects of the cost overruns in building maintenance management. The researcher might explore more into the questions of 'what', 'why' and 'how' the cost of maintenance from the questionnaire survey can improve the building maintenance performance through the adaptation of interpretivist. It provides the researcher with the chance to interrelate with the stakeholders hence consider the organization's problem: the nature of the relationship among the stakeholders of the organization during the decision making of maintenance cost. Therefore, by integrating the positivism and interpretivist, a solid desire to improve the issues of cost uncertainties and overruns by providing the key strategies to improve the performance of building maintenance management.

Moreover, this paper provided the basis for the formulation of the preliminary questionnaire and interviews which will be taken shortly. These findings are important as they cover the cost, time and quality measurement to explore the importance of budget in building maintenance management. The research method employed in this study was to review the literature on the issues of maintenance cost uncertainties, and overruns and the factors contribute to the problems. The selection of the literature ranging from the latest research since 2007 to 2017 which was based on articles published from various recognized journal such as Journal of Quality in Maintenance Engineering, Journal of Building Maintenance, World Journal of Engineering and Technology, Journal of Facilities Management, Property Management, Construction and Building Materials, Procedia Environmental Sciences, Journal of Retail and Leisure Property, Procedia Engineering, Facilities, Journal of Building Appraisal, Journal of Performance of Constructed Facilities and Construction Management and Economics. The review will be on the factors influence the decision making for maintenance cost. The peer-reviewed literature will be the primary basis of information for the author to justify the key strategies to overcome the maintenance cost uncertainties and provide the sustainable building maintenance management

## 5. Findings and discussion

As discussed in the previous section, the main causes that influence matters of the maintenance cost have been identified which are the human resources, spare parts and materials, fund allocations, information and tools and equipment. The main elements of the proposed cost model of strategies are highlighted regarding push and pull factors, and these will be discussed in this section in the light of recent and current research.

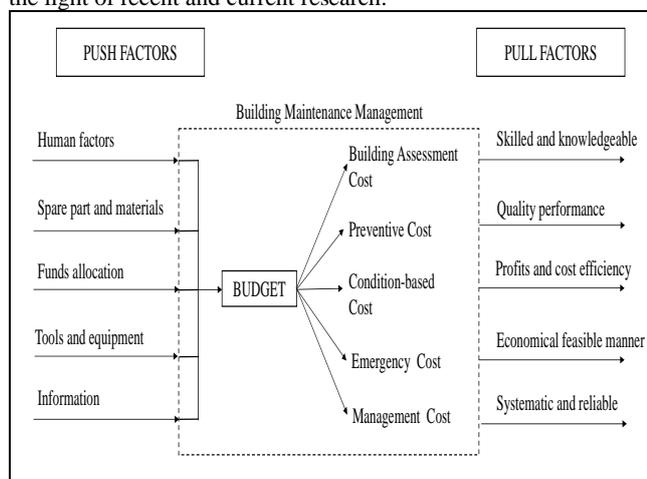


Fig 1. Proposed cost model of building maintenance strategies

### 5.1 Human Factor

The dedication, unique capacities and coordination of every key partner as principal components in enhancing the effectiveness of

maintenance management. The inclusion ought to concentrate on data, information and expertise sharing, correspondence, and preparing for the stakeholders. The addition of key partners enhances communication stream and input frameworks (rahmat & shah ali, 2010). Accordingly, it prompts a superior cooperation and employment fulfilment. The association among administration and maintenance activities require essential as it would impact the consequence of building bolster operation frames. For example, it is basic to empower key accomplices to apply the effect on critical initiative practices, so that the experience, capacities, data and wellness can be shared among the key accomplices (lee & scott, 2009; sheikhalishahi, pintelon, & azadeh, 2016). The readiness of adequate human resources to execute the works related to the maintenance of the building is entirely the responsibility of facility management organizations. Human resources should be consisting of skilled and semi-skilled workers that ensure that every service in the building efficiently maintained. Besides, to achieve the effective and efficient building maintenance cost, the top management needs to provide support and give full commitment during the planning stage and decision making for maintenance (ding & kamaruddin, 2014).

the decision to outsource maintenance labors or in-house staff obviously depending on the maintenance department strategy. When desiring to entirely or partially outsource maintenance, the evaluation cannot be initiated on monetary estimations only, as they have constrained utilize while evaluating the risks required in deciding to outsource (newman, 2006). It is important to consider the classification of tools and equipment and to contrast the benefits of outsourcing and the benefits of creating and utilizing an in-house staff. Regarding the equipment, in-house staff should fully be employed for maintenance. On the other hand, potential troubles from the ill-advised execution of support works can radically expand the points of interest of outsourcing (kurdia et al., 2011).

### 5.2 Funds Allocation

The scarcity of resources allocation and building are of the poor condition has caused the maintenance turns out to be always imperative particularly for authorities. The acknowledgement of significant repairs should be made accessible at the perfect time through financial means. Lately, the budget for maintenance plans was regularly not decided efficiently, and a few different planning techniques are being used (Gupta et al., 2014; Yusuf et al., 2013). Therefore, the management needs to select the best budgeting method to equalize the needs of maintenance with the fund's allocation. Notwithstanding what finance department may think, characterizing maintenance expenditures is greatly indistinct. Dividing the maintenance into the different classifications enables the total cost for maintenance to be controlled (Limited, 2015). Allocation of funds for maintaining the building should be balanced with the established maintenance plans and annual work schedules. Hence, the appropriate budget should be delivered and considered based on the estimated cost of the maintenance work that is predetermined according to the needs and the legal procedure or equipment (Banister, 2008; Modgil & Sharma, 2016)

### 5.3 Tools and Equipments

The essential element of a maintenance management system is differentiating equipment according to technical condition and impact on financial results. Equipment differentiation is needed for prioritizing funds and taking the appropriate maintenance and repair steps for each item of equipment according to its nature (au-

yong et al., 2014a; gupta et al., 2014; koussaimi et al., 2016). Prioritizing funds can only be done effectively when equipment units are correctly ranked regarding value to the company. When equipment is classified and assessed, the main challenge is to consider the needs of the whole group: what might be critical to one department might not be critical to the company (limited, 2015).

#### 5.4 Spare parts and materials

Upgrading the inventory is vital for an organization's working capital administration, and it can frequently be progressed. Moreover, receiving an arrangement of cheap spare part stocks risks generation being suspended for a drawn out stretch of time. To decide the ideal quantities of things required for a stock, a distinct way to deal with overseeing spare parts is necessary. Spare parts ought to be classified by their significance to an organization's generation forms (au-yong et al., 2016; salleh, rahmat, & ismail, 2015). Such arrangement depends on the gear separation completed while executing the essential components of the model. Working out an appropriate system for obtaining and keeping up stock assets relies on upon how necessary a stock thing is and to what extent it takes to convey that thing. For instance, there ought to be a constant supply of spare parts for hardware that is fundamental to generate forms and of poor condition to limit downtime (salleh et al., 2015).

Moreover, spare parts are significantly required for planned maintenance contrasted with other maintenance approaches. A few sections of the building should be replaced with another one in settled interim as decided in the calendar upkeep program, regardless of such things are harmed or not. What's more, the nature of spare part and material dependable effects maintenance cost. Therefore, the determination of spare parts and materials need to be considered not only on the cost saving but also the quality (au-yong et al., 2014b; engkasan, ehsan, & chung, 2011).

#### 5.5 Information

These days computerized maintenance management system (cmms) turned out to be extremely well-known among building maintenance management in maintenance implementations. Cmms is intended to store data and finish information for every action, framework or mechanism, for example, facilities maintenance; work orders; planned or unplanned maintenance; maintenance history, spare parts providers; purchase orders and cash flows. Furthermore, the recorded information will be utilized as a part of the checking and control of maintenance work; budget preparation and financial reporting and maintenance of all the data place in the cmms simple to allude to when required (lind & muyingo, 2012)

Moreover, information speaks to a necessary incentive for maintenance management, since it is fundamental for the proficiency and viability of the administration, the nature of the benefits and the procedures, and the development of the hierarchical models (browne, 2005). In the meantime, data is a cost. Data costs for gathering, preparing, sharing, and refreshing. On the off chance that we consider what number of information is associated with the great measure of elements constituting a land and to the high number of administrators and procedures in the long-life cycle of the structures. It is straightforward that data speaks to the fundamental condition for the advancement of the administration, however, in the meantime a high danger of wastefulness and run away uses. Stable wasteful aspects are conceivable if, as it might happen,

the exercises that require the data gathering are completed without a sufficient arranging stage and proper coordination. The instances of negative encounters in building stock exercises are not uncommon: they may come about too much costly and hard to be finished since they gather over the top measures of information or since they are not arranged to an information finding.

## 6 Conclusion

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