Development of a Value Maintenance Management Model for Malaysian University Campuses

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Abstract

The purpose of building maintenance is to increase building’s life expectancy through delaying deterioration, decay and failure. Maintenance preserves, and improves building functional performance. However, a building is procured because of its value to the users. Thus the purpose of maintenance should stem from the value the building contributes to users’ functional needs. It is not the physical condition that users want rather the functional performance. A building allows user to carry out their functions and activities to the best of their satisfactions, therefore it is a source of value creation. Through extensive literature and a case study, this paper revealed there is lack of appropriate management in university building maintenance. This leads to poor service delivery, poor user satisfaction and unnecessary increase in maintenance cost. This is to also responsible for increase in maintenance backlogs. The purpose of this paper is to create awareness on university building maintenance management in Malaysia and propose alternative maintenance management model for Malaysian university buildings. While the research focuses specifically on university buildings, many public and private sector institutions face similar maintenance management problems. Therefore, this research has broader applications as the finding of this study is also applicable to other types of buildings and other countries as well.

Keywords: maintenance management, universities, building users
1. Introduction

This paper is part of an ongoing research; where the main research aims to develop a systemic maintenance management model for university building in Malaysia. The present approaches to university buildings maintenance in Malaysia are corrective, cyclical and inspection-based. Simply put, maintenance is not dictated by the need of the users, rather on the availability of funds and physical condition of the buildings. This is harmful to the building fabrics and engineering services, the university organization and the building users. However, there is a lack of effective and efficient maintenance management model that put users’ needs at the centre of maintenance management. Thus to develop such model is significant. The prime purpose of this paper is to review current literature and theories on university building maintenance in Malaysia and to present a summary of case study conducted on a university maintenance management system. Based on the literature review, case study and discussion with university maintenance organisations, a 5 x 5 building maintenance management matrix is formulated. The top hierarchy of the model is divided into five blocks of planning, organisation, directing, implementation and control. Each of the five blocks contains five supporting functions which are essential to value based maintenance management model or VMMM. The paper comes in five segments structure. It begins in segment two, preceded by introduction. The segment reviews issues in university buildings and the maintenance management of educational buildings in Malaysia. The third segment describes a university maintenance management system, followed by the fourth segment that proposes VMMM for university building. Segment five ends the paper with conclusion and the way forward.

2. Background of study and problem identification

Buildings are factors of production. University buildings are procured to create suitable and conducive environment to support learning, teaching and innovation. By size and complexity, universities in Malaysia are akin to a big city (Mat, et. al, 2009) with close to 1.5 million students in an academic section (Government of Malaysia, 2006). Huge sums of funds are invested for the maintenance of educational buildings. For instance, under the stimulus package, according to the then Deputy Prime Minister (Now the Prime Minister), Mohd Najib Tun Abdul Rasak, contracts worth sum of RM 1.3 billion was earmarked for improvement, maintenance and development of 322 schools (The Star, March, 2009 and The New Straits Times, March, 2009). This is besides large sum of money spent for building maintenance under various Malaysian Plans and through other government interventions. Based on available data obtained from the Ministry of Higher Education, maintenance spending had expanded by nearly 85% from 2004 to 2008. For instance, spending for maintenance of public universities stood at 340 million in 2004 while it increased to more than 600 million in 2008. However, comparing these amounts with spending for education, government is investing only 1 % for buildings maintenance. This amount is however inadequate to cater for the maintenance backlogs. Conversely, different studies have been conducted on the university buildings in Malaysia. From the studies different approaches to buildings maintenance were identified. Table 1, summarizes the different approaches to the maintenance of university buildings in Malaysia.
Table 1: Approach to University Buildings Maintenance

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<tbody>
<tr>
<td>Corrective</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Planned</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Contingency</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Inspection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Service</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cyclical</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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These findings have led to the conclusion that the management of university buildings maintenance is corrective, cyclical or inspection based. These current approaches are tactical or operation based. The major premise of this conclusion is that none of these approaches consider the user value system while deciding on maintenance. Rather emphasis is more on availability of fund and the physical condition of the building as the basis for setting up maintenance programme. Corrective maintenance happens after the building has failed and is intended to restore a building to its original condition. In other words, building is maintained on receiving a complaint about defects or if it was discovered by those concerned with the building management the building failed to perform its intended function. This method is, mostly expensive, and usually leaves the users unsatisfied. Corrective maintenance if not properly manage often lead to maintenance backlogs as the available resources are often inadequate to address the maintenance needs. Another major flaw of this approach is that it disrupts and disturbs the activities that are carried out in and around the building.

Inspection based maintenance is conditional-based maintenance. It is initiated because of some knowledge on the condition of the building from inspection survey prior to failure. And as long as the parameters of the building are found to be within specification, it is considered to be in good condition and no action is taken. Maintenance will only be initiated if the physical condition of the building is worsening, decaying or failing. Condition-based maintenance is sometimes based on a timescale. That is, maintenance is initiated on the agreed time period regardless of whether there is a problem with the building or its element or not. The other names to this approach are cyclical or planned maintenance. However, users are not particular about the physical condition of the building intrinsically rather about their abilities to put the building into optimum use (Jones and Sharp, 2007).

The advancement in technology and communication breakthrough concurrent with the failing in the corrective, cyclical and condition based strategy, the application of performance based maintenance has been advocated. In the performance based strategy equipments are used to monitor the performance of building elements and the associated services. Cheng, Lien, Tsai and Chen (2007) have embedded tag in into open building component to monitor the performance of the components. However, this practice is more suitable for the manufacturing industry compared with the construction industry. Although it is also suitable for some specialized building elements (Edwards, Holt and Harris, 1998) and engineering services. For instance it is possible to embed sensors that incorporate wireless technology into building components. However, this has great limitation especially in building fabrics where the applications of mathematical models prove unable to cope with the complexity of a real life situation (Umeadi and Jones, 2003). It is expensive to install most of the sophisticated tools on most typical buildings components and systems. In most non-
manufacturing industries, like the building industry their use is often limited to the high-tech electrical fittings, appliances and mechanical components. Summarily, the corrective, inspection and cyclical based maintenance are based on culture of fragmentation, scatter and “sickness before cure syndrome”. Therefore, to increase value of service delivery and productivity, consideration of other management philosophy is useful. However, users are not satisfied with the way the building are maintained. Quotes from dissatisfied building users (students) are indicative: “please change the maintenance department, the maintenance is too lousy, our buildings are not well maintained, the toilets in the building is always dirty, repair the defects without delay, improve the condition of toilets, staircases, classrooms and lecture halls, be alert with complaint, late to repair buildings, have competent and enough staff, be more efficient, staff are ill-mannered, be effective and quick maintenance service is important”

While there is a need to increase funding for university building maintenance, it is unclear, whether increase of the maintenance budgets can ever improve the situation. Because even if there is increased in allocation maintenance could only be given tactical attention rather proactive and systematic consideration. This paper argues the maintenance management of university buildings will be more effectively and efficiently initiated and implemented compared to how it is currently executed. This will happen if information on the criteria that influence maintenance of university buildings, the characteristics of defects in university buildings and criteria within the users’ value system are considered. Maintenance intrinsically cannot be blamed if things went wrong rather it is the management that needs some step changes. However, the flaws of the current maintenance management processes have been well documented. Therefore, a standard solution to these failings and flaws is to have a framework (i.e. model) capable of easing decision making process. A model provides reference points to ensure that every time maintenance is initiated and implemented, it is consistent, systematic, proactive and holistic. In this way, it provides a supporting arrangement in defining the scope, quality, and expectations of the maintenance services as well as identifying the procedures to apply. Maintenance management model underlay any systemic decision making processes. The model is required to align maintenance resource to users’ satisfactions and to also align performance with university corporate strategy.

3. Case study on university buildings maintenance

This section explains how a university organization manages its buildings and engineering services maintenance. The Property and Maintenance Management Department or PMMD is headed by a general manager. For purposes of confidentiality, the identity of the university is not given while other information provided is factual. Other information that could reveal the identity of the university is concealed. Before the commencement of the interviews, the respondents requested the data obtained be made confidential. The department is responsible for the management of all the university’s total physical assets and resources. Altogether there are 18 full-time staffs in the department. There are 111 buildings on the campus covering about 40,000m2 of floor area. There are 34 lifts in the university that are concentrated in the academic, laboratory and administrative buildings and there are 149 air-handling units besides about 700 split air-conditioning units. Maintenance works are broadly categorised into electrical, mechanical and civil engineering works. Maintenance work is classified into major jobs and minor jobs. Small contractors operate on a price agreement basis (i.e. electrical maintenance price agreement, civil maintenance price agreement and mechanical maintenance price agreement). On average, for the last five years, the university has spent RM15 million on the maintenance of constructed facilities each year.
The official working hours are 8.00am to 5.00pm daily, Mondays to Fridays. The department does not open for business on Saturdays and Sundays. All maintenance complaints reported on Saturdays and Sundays are attended to on the next working day. Complaints on maintenance are lodged through the warden of each of the hostels while complaints concerning the other buildings are lodged through the technicians in the control room by the person concerned (i.e. lecturers and laboratory attendants). The control room is located in the administrative buildings. If, say, there is a problem in a classroom, the lecturer or whoever is in charge of the classroom will call the control room. Depending on the type of complaint, a technician will visit the place and issue a docket. If it is an electrical failure, an electrician will inspect and issue a docket that will be passed on to the Head Office for necessary action. Students are not allowed to make complaints directly to the maintenance Unit. Instead, students lodge complaints through the warden and the warden, in turn, lodges the complaint to the respective executive at the Head Office. Whenever there is a complaint, the warden will fill in the docket and send it to the maintenance department. A booklet of docket contains 100 complaint sheets. The maintenance department, in turn, send it to a contractor to submit a quotation. The docket contains the complainant’s name and a description of the complaint. Complaints received after 5:00pm are directed to the assistant engineers at control and will be treated on the following working day. More than 90% of the maintenance works are outsources. The clerk receives all dockets daily and sends them to the respective executive. There is no any dedicated maintenance management software like computerised maintenance management systems (CMMS). Rather, works including filing and sorting are done using traditional computer programmes like Microsoft Word and Excel.

4. Proposed value based maintenance management model

The traditional approaches to maintenance are inadequate to cater for the satisfaction of modern forward thinking building users. The classical approaches to maintenance management, are based on culture of fragmentation, disperse and reactive. However, in reality maintenance is not essentially about building itself per se but about the users. It is the performance not the physical condition of building that building users desire (Jones and Sharp, 2007). To the extent that the building allows its users to comfortably and conveniently meet their needs and wants to their optimum satisfaction, the building is a source of value creation. Building is procured to provide functional services to its users. Thus, this must underpin the object of maintenance. However, in the classical maintenance management, the needs and wants of users are not adequately factored in due to poor management principle and philosophy. This is leading to poor service delivery, poor users’ satisfactions and unnecessary increase in maintenance cost. Factoring in, user performance requirements or criteria of user value system into the maintenance management system are critical. It forms the basis of maintenance budget and control (Kelly, 2006). Formulating maintenance objectives involves active participation of the users that signify their expectations and perception from the buildings.

Maintenance management ought to be value based, value maintenance management stem from the user value system. This is contrary to the classical maintenance management that focused on building condition and availability of funds. Value based maintenance management is based on the philosophy and principle of value management. In value management, the functional performance requirements of users are critical. Value maintenance management model improves building functional performance by integrating perspective and activities which traditionally separated, biased and fragmented. Value maintenance management integrate and combined the providers and recipients.
(users’ performance requirements) interests and requirements when making decision on maintenance demand. Users’ satisfactions and providers’ productivity are significant in maintenance management system. The two perspectives must be combined for meaningful analysis (Parasuraman, 2002 and Enquist, Edvardson and Sebhatu, 2007). When the two perspectives are separated, improvement in one will lead to deterioration in the other. Value-based maintenance management therefore, is maintenance management centred on enhancing building users’ satisfaction and increasing maintenance service provider productivity.

The schematic diagram of the value based maintenance management model consists of 36 blocks. Broadly it consists of five major partitions defined in terms of the four functions of management; planning, control, organization and directing as well as a block on implementation. The elements of the Value based building Maintenance Management Model are shown in Figure 1. The elements must form parts of the university maintenance management processes. The top section of the block provides the name of the major maintenance activities whereas the bottom sections identify the necessary activities associated with each of the major functions. The different maintenance management functions play a significant role within each of the building blocks. This provides a step by step framework for maintenance demand and implementation. This sequential arrangement, strategically and consistently steer maintenance initiation for the organisation. This will facilitate achieving users’ satisfactions at the minimum life cycle cost while still maintaining the building fabrics and services integrity at same time increase provider productivity.

Figure 1 Schematic diagram of the Value Maintenance Management Model
Sequentially the blocks drive maintenance objectives as profit generating function by incorporating maintenance with the university’s corporate mission and vision. By this maintenance will receive the attention it deserves at the top management level. Thus it will not be viewed as mere tactical operations and as a burden as it were used to be. The proposed VbMMM consists of summary of literature review and the outcomes of the primary data collected through the case study survey and interview. The model is the entire series of organizational processes that add “value” at each stop beginning with the process of resources to the finish services.

5. Conclusion

The management of university building maintenance has become more challenging to university administration especially with government on effectiveness and efficiency on assets and facilities maintenance management. This is happening when pressures are mounted by the users demanding for more satisfaction. On the other hand, user performance requirements are not factored in the current maintenance management system. As a result users are not satisfied with the quality of the service they are receiving and the maintenance backlogs are on the increase. Having in place a robust and integrated model is therefore critical to facilitate decision making. VMMM is a composite of criteria that increases service delivery, improves users’ satisfaction and reduce unnecessary maintenance costs. While the VMMM is constructed to provide a snapshot of the proposed model, the development of the main model is ongoing. The final model will be empirically tested. The schematic VMMM is still at the preliminary stage, suggestions and comments received at this - CIB - 2010 conference will be incorporated into the final model. Your criticisms and comments are very much welcomed!

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