

# Systemic building maintenance management for Malaysian University Campuses: An Analytical Analysis

Olanrewaju Abdul Lateef, A

*Department of Civil Engineering, Universiti Teknologi PETRONAS, Malaysia*

Mohd Faris Khamidi

*Department of Civil Engineering, Universiti Teknologi PETRONAS, Malaysia*

Arazi Idrus

*Department of Civil Engineering, Universiti Teknologi PETRONAS, Malaysia*

**ABSTRACT:** The value of buildings depends on the quality of maintenance invested in them. University buildings require maintenance to create suitable environment that support and stimulate learning, teaching, innovation, and research activities. This paper emerged based on the premises that if there is information on the criteria that influence maintenance of university buildings, characteristics of defects in university buildings and criteria within the users' value system, the maintenance management of university buildings will be effective and efficient compared to how it is currently executed. The paper is part of an ongoing research. This paper seeks to provide an overview on university building maintenance in Malaysia and to report part of an ongoing research. The paper reviewed related literature and present the outcome of a questionnaire survey. Questionnaires were administered on 50 university maintenance organizations. With a 66% response rate, the findings suggest that though the expenditure on maintenance is inadequate but poor management of the resource and maintenance services is also contributing greatly to the poor service delivery. The empirical survey also suggests that current maintenance management practices were not very good and most of the buildings users were not very satisfied with the services they receive.

## 1 INTRODUCTION

The overall vision of Malaysia is to achieve developed national status by year 2020. In order to achieve this status, higher education is to play a significant role. University buildings are part of the university's assets and resources; they are factors of production. However, once a building is completed maintenance commences. More and more stakeholders in the university management are becoming involved in one way or the other with university building maintenance. However, there is a lack of comprehensive frameworks containing established guidelines to address maintenance; effectively and efficiently. Therefore it is the aim of the research which this paper form part off to develop a model of reference points to ensure that every time maintenance is initiated and implemented, it is consistent, systematic, proactive and holistic. In this way, it will guide in defining the scope, quality, and expectations of the maintenance services as well as identifying the procedures to apply. The word "model" in the research is synonymous with decision-making framework or guideline for managing university building maintenance. Thus university building maintenance management model mean decision-making framework for the maintenance of university buildings. In this context, model consists of personnel, procedures, activities, requirements, tasks and guidelines. This paper is based on literature reviews and questionnaire survey. Based on extensive literature review, three fundamentals questions were developed to guide this paper. These questions are: what are the present university building maintenance practices in Malaysia? (1), are there any problem (s) with the current system? (2) if yes, what is / are the problem with the current systems? (3) The answers to those ques-

tions will produce a realistic and comprehensive understanding of the conditions and possible solutions to the problems of university building maintenance in Malaysia. The objectives of this paper are (1) to provide an overview on kind, size and nature university building maintenance in Malaysia and (2) to report part of an ongoing research on the development of maintenance management model for Malaysian university buildings.

## 2 THEORETICAL FRAMEWORK

Education is very significant and integral part of the Malaysian Strategic Thrust. The economy of Malaysia has since the independence been planned on five years strategic plans. For each of the plans, education sector feature prominently in terms of value and policy implementations. There is an increment of more than 420% on allocation to the education sector for the last 20 years. See Table 1 for the federal development allocations to education sector from 1990 to 2010. The increase in the allocations is a proof of the Government's commitments to improve the performance of the education system in order to produce human capital with high quality capable of competing locally and internationally (Ministry of Higher Education, 2006). Allocation to higher institutions of learning constitute 2.1% of the GDP (Ministry of Higher Education, 2006)

Table 1: Development allocations for the educational and training sectors (RM Million)

Sectors	6MP	7MP	8MP	9MP
Education	7,469.8	17,948.5	18,660	40,356.5
Training	615.4	2,237.3	4,000	4,792.6
Total	8,625.2	20,185.8	22,660	45,149.1

(Government of Malaysia, 1996, 2001 and 2006)

The increase in the allocations to the education sector is at all levels. For instance, under the Eighth Malaysian Plan, the sum of RM8, 900 million was allocated to institutions of higher learning out of the RM18, 660 million allocated to the education sector (Government of Malaysia, 2001) while under the Ninth Malaysian Plan, allocation to institutions of higher learning was increased to RM16, 069 million (Government of Malaysia, 2006). This represents an increment of more than 80%. As a percentage of total public expenditure, 4.4% was attributable to higher education. See Table 2 for the distributions of government expenditure to higher education over a period of five years.

Table 2: Public higher education institutions expenditures (2001-2005) (million)

Year	2001	2002	2003	2004	2005
Operating expenditure	2,748.0	3,811.5	4,001.9	4,398.9	4,773.2
Development expenditure	1,616.8	1,968.9	2,052.2	870,177	1,316.2

(MOHE, 2006)

Malaysia is now an educational destination to nationals from different countries particularly those from Africa, Pacific and Middle East. Malaysia's quest to transform into knowledge based economy (K-economy) where science, technology, and engineering are integrated into the production process and where creativity, imagination, and design capability are embodied in well-educated skilled workers are the main source of national prosperity and wealth is not compromise-able (Government of Malaysia, 2006). In order to achieve this objective however, the assets of the universities must be adequate. This involves improving the performance of the university systems, in terms of methods of teaching, learning, researching and the physical infrastructures (buildings and engineering services). Recent studies (Housley, 1997; Fleming and

Storr, 1999; Amaratunga and Baldry, 2000; Price, Matzdorf, Smith and Agahi, 2003; Green and Turrell, 2005; Leung and Fung, 2005; Wong, Fellows and Liu, 2007; Fianchini, 2007 and Lavy and Bilbo, 2009) have affirmed the positive correlations between performance of educational buildings and quality of education.

Buildings like other capital assets of university organization require effective and efficient maintenance. University buildings are factors of production. University buildings are procured to create suitable, conducive, and adequate environment that can support, stimulate and encourage learning, teaching, innovation and research activities. A failure in the supply of these essential services is a loss in value to the university institution, the community, the students, staffs and other stakeholders. Construction of new university buildings help to upgrading educational facilities and providing better quality of education, but it is utmost necessary to maintain the existing building to acceptable performance standard that is capable of facilitating the transfer for knowledge and carry out other academic activities. The cost of the property function in comparison with turnover of university institution ranged from 8% to 11% (Housley, 1997). Solutions to nation's economic, social, scientific and technological woes live within the walls of functional classrooms, workshop, theatres and laboratories. As a result, universities these days use the nature, design and condition of their buildings to woo students. In Malaysia, universities that in the past relied on the application sent to them through the Ministry of Education, now used their buildings as a variable to attract students (Rohaizat, 2002 and Yosuf, Ahmad, Tajudin and Ravindran, 2008). Arguably, this is also the case elsewhere. To provide quality education, university buildings have to be well maintained to ensure optimum operable performance of the buildings. Therefore, a well maintained building is critical to delivering university core business objectives.

Maintenance means different things to different people. The term has been defined and redefined by different authors. However, clearly, the various definitions suggest that maintenance revolve around building care. Nevertheless, as a working definition, maintenance is defined as the required processes and services taken to preserve, repair, protect and care for building's fabric and engineering services after completion, repair, refurbishment or replacement to current standards to enable it to serves its intended functions throughout its entire life span without drastically upsetting its basic features and use (Olanrewaju, 2010). From this definition, maintenance does not includes activities like refurbishment, alteration, conversion, extension, and reconstruction, but it does includes repairs, rehabilitation, renovation, renewal, restoration, reformation, redecoration and the general cleaning and services. Maintenance is however, unique in the building life cycle as compared to initiatives like refurbishment, conversion and extension. For instance, as soon as building is refurbished, converted, altered, extended or reconstructed, maintenance set in, if not earlier. While maintenance is a must in a building life cycle, other initiatives are usually one off if it all they are required. Clients can decide not to refurbish or convert their buildings throughout the building's economic or and functional life span.

But, this is not possible with maintenance since building components, materials or even design is not maintenance free (see Seeley, 1987). Whereas only about 5% of a nation's building stocks are refurbished, converted, replaced or altered, more that 95% of any nation's building stocks must be maintained in a year (Shah, 2007). Value based management, on the other hand, emphasis on the collaborative approach towards the creation of value to the stakeholders (Knight, 1997; Martin and Petty 2000 and Ashworth and James, 2001). Thus the emphasis here is on user value management. Therefore by extension and combination, value-based maintenance management involves the attainment of maintenance needs effectively (sustain user satisfaction) and efficiently (with optimum materials, labour and costs). Unlike with the traditional management principle that is fixated on cost and on the investor interests only, the value-based management contains both financial and non-financial measure to measure strategic performance and does not laid ultimate emphasis on the investors' interests rather to the consumers of the services or and products.

Based on the data obtained from the Ministry of Higher Education, it suggests that maintenance expenditure had expanded by nearly 85% from 2004 to 2008. For instance, expenditure on maintenance was nearly 340 million in 2004 while it increased to more than 600 million in 2008 even though the figure for 2008 was at July 2008. Therefore the size and scope of university buildings maintenance is huge and at same time is on the increase. However, comparing these amounts with the total expenditure on education it implied the government is investing

roughly 1 % on university buildings maintenance. This is however inadequate, to meet the maintenance. Studies elsewhere have shown that organizations will require between 3 and five expenditure of the monetary value of their capital for maintenance (Vanier 2001)

Intensive, literature review (Ishak, 2006; Zakaria, et al., 2006 and Ruslan, 2007) have lead to the conclusion that the maintenance practices of the university buildings are corrective, cyclical and condition based. Ruslan (2007) also affirmed that the maintenance management of university campuses is still traditional. Corrective maintenance is failure based, it is initiated after the building as failed and is intended to restore the building to it original condition. This method is in most cases very expensive, and usually leaves the users less satisfies. Conditional based maintenance is a preventive maintenance initiated as a result of some knowledge on the condition of the building on the basis of inspection prior to failure. As long as the parameter of the building where found to be within specification, it will be considered to be fine and no action will be taken. Stock condition at best provides only a snap shot of the condition of building during the inspection period. It is difficult to assess the amount of risk posed by an identified non-critical problem to future operations and productivity (Reffat, Gero and Peng, 2004). A non-critical problem during inspection might deteriorate further or becomes more serious during the actual implementation due to time lapse and error of measurement as a result of the inspections.

However, as a result of the advancement in technology and communication breakthrough concurrent with the failing in the corrective, cyclical and condition based strategies, the application of performance based maintenance has been advocated. In the performance based strategy modern equipments are used to monitor the performance of building elements and the associated services. However, this practice is more suitable for the manufacturing industry as compare to 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 embedded sensors that incorporate wireless technology into a range of 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 also very expensive to install most of the sophisticated tools on most buildings components and systems.

Therefore, in most non-manufacturing industries, like the building industry it uses is often limited to the high-tech electrical fittings, appliances and mechanical components. From the foregoing, it is concluded that none of the current maintenance management practices is without flaws and merits. Corroborating, this view, Lofsten (2000), highlighted that even the corrective maintenance cannot be entirely avoided in any organization's maintenance policy. However, it is almost unlikely that a complete solution can be identified without an increase in allocation to the maintenance sector, but it is very much possible to improve the situation by ensuring that the best solution in the maintenance programme is introduced though the development of decision making model. This is probably the only practical means of achieving best maintenance practices (Sherwin, 2002). This is because; problem of inadequate expenditure is not peculiar to Malaysia (Seeley, 1987 and Shen, Lo and Wang, 1998). It is contended that active pursuit of the development of initiatives on maintenance management practices will keep us nearer the moving target. Therefore, a good solution to this is the development Maintenance management model is essential to ensure control, gain knowledge and improve decision making. Model trigger proactive decision making processes. Framework is required in order to align maintenance resource to users' satisfactions and to also align performance with university corporate strategy.

However, university building maintenance in Malaysia lack logical, holistic and consistent framework as the key reference point for maintenance management decisions making and actions. In part, this conclusion is drawn based on the fact that across the whole building maintenance in Malaysia lack consistency and systematicness (see also Myeda, Kamaruzzaman, Abdul Samad and Zawawi, 2009 and Marinie and Zawawi, 2009). The shortcomings and even the failings of the current maintenance management processes have been well documented but the building maintenance management system can only be improved with the availability of efficient maintenance management framework that guide the decision making processes. Maintenance per se cannot be blamed if things went wrong rather it is the management that is requiring some step changes. The value-based maintenance management model comprises of five interconnected phases:

- a. Criteria that influence university building maintenance management
- b. Criteria that influence users' satisfactions in university buildings maintenance services
- c. Maintenance reporting system
- d. Defects in university buildings
- e. Building maintenance performance management for university organization

### 3 RESULT OF PRELIMINARY SURVEY

The survey involves 50 established universities in Malaysia. The analysis of thirty two returned questionnaires were reported in this paper. The survey was directed towards the senior management staff (i.e. those concerns with university building maintenance management. The survey revealed that most of the respondents hold strategic position. Nearly, 32% of the respondents were actually maintenance managers while about 19% were facilities managers (Table 3). Substantial parts of the "other" are director of development or and maintenance "executive" (this is another title / term for maintenance manager). These backgrounds provide the respondents with wide experience capable of providing independent opinion on information that were addressed to them. From the analysis of the survey, 52% of the universities spent less than 10 million each on maintenance annually while about 10% spent about 30 million each on maintenance per annum. Similarly, about 22% of the survey universities occupied less than 280, 000 m<sup>2</sup> built up area while more than 40% occupied more than 1, 400, 000 m<sup>2</sup> built up area. Majority (42%) of the buildings were about 15 years old while only about 10% were between 30 to 50 years old. From, this it could be inferred that most of the university buildings were not that old per se yet considerable amount of money is invested for the maintenance albeit there are considerable complaints about university maintenance practices. Thus the issue then is with the maintenance practice.

In relation to the maintenance practice in the United Kingdom, Seeley (1987) also pointed out that, though available money that is usually allocated for maintenance might not be enough, but with effective maintenance practices much can be done to improve the building performance. In fact, it is obvious that with ever increase maintenance need, the money that will be allocated to maintenance will not be adequate to cater for the maintenance need. From the survey, 4.5% of the maintenance organizations believe that their customers (users) are extremely satisfied with the services provided. About 5% do not know how satisfied were their customers even though majority (77.3%) believe that their customers were only satisfied with the service been provided with (Table 4). However, this needs to be investigated through questioning the users' opinions, this will involve conducting a study whereby questions will be addressed to the users themselves (currently, a survey is ongoing to achieve this objective; the result of which will also be published elsewhere). Information receives, will be compared with the opinion of the maintenance organizations. However, available literature point to that fact, that users were not very satisfied with the performance and condition of the buildings and in fact, with the maintenance organizations.

Table3 Respondent's current position

Position	Frequency	Percentage
Facility manager	6	18.8
Maintenance manager	10	31.2
General manager	2	6.2
Administration manager	1	3.1
Other	13	40.6
Total	32	100

Source: (Primary survey, 2009)

Table 4 Level of users' satisfactions with service delivery

Level Of Satisfactions	Frequency	Percentage
Extremely satisfied	1	4.5
Very satisfied	3	13.6
Satisfied	17	77.3
Do not know	1	4.5
Total	22	100

Source: (Primary survey, 2009)

Most of the universities employed less than 30 employees each on full time basis. Only 16% of them actually employed 140-170 full time employees even though 6.2% of the organization has 60 – 90 and 110m - 140 on their full time pay rolls each. This finding can be interpreted to mean, that most were in favour of outsourcing their maintenance services. Nevertheless, another part of the survey revealed that 66% prefer to combine outsourcing with in sourcing. Majority (46.9%) of the organization rate their current maintenance practices as good while 44% rated their as fairly good. Minimum of 6.2% rated their as very good (Table 5). There is discrepancy with this finding when compare with the fact that 77% of the maintenance organization claimed that their users were satisfied with the services quality. About 53% of the organizations have conducted users' satisfactions before while 40% have not but the remainders do not know. In case, the maintenance organization ran into deficit, 61.3% apply for more money from their respective university management while 32. 3% cut from money allocated for other purpose. It is only through user satisfaction evaluation that can be made. Users need to be questioned on the services they are provided with. The findings of the evaluation or survey should the basis of any meaningful organization maintenance performance measurement benchmark.

Table 5 How organization rate their current practice

Rate	Frequency	Percent
Very good	2	6.2
Good	15	46.9
Fairly good	14	43.8
Do not know	1	3.1
Total	32	100

Source: (Primary survey, 2009)

While most (66%) of the organizations prefer to combine in-sourcing and outsourcing, considerable amount (22%) prefer to outsource their service to external specialist. Fewer than 10% prefer to in-source their maintenance services. This finding is in tandem, with the outcome on the number of their full time employees. These two findings only pointed to the fact the, university organizations in Malaysia prefer to outsource their maintenance services. Often, university organizations have failed to realize that maintenance is also part of their core services. Building maintenance is very critical to the survival of university organizations. Students and faculty members spend most if not all of their productive time in or around the classrooms, laboratories, or theatres or and tutorial rooms. Outsourcing maintenance function reduces maintenance to corrective maintenance. There are also some organizational political-proprietary data that the university would not like to expose to external parties. Tsang (2002) warned against organizations outsourcing facilitating function like maintenance. He also cautioned organizations not to consider outsourcing activities that are critical to their core activities. No doubt building maintenance is very critical to the continuous existence of a university. However, decisions on what to outsource should be based on objective and quantitative facts even though a situation where a university outsources substantial parts of it service may not be entirely healthy for any organization. According to Sherwin (2002), it is still too early to say outsourcing maintenance services is an alternative approach to maintenance service delivery.

However, times have changed. It is high time, university organizations accept and take care of their buildings (vis-à-vis the maintenance practices) efficiently. It is no longer acceptable for university to invest only on improving methods of teaching and learning without improving other assets. They should also invest on training their maintenance staffers as they would for academic staffs. Substantial commitment is required for continuous professional programmes for the maintenance operatives. After all enormous resources are committed to procure their buildings. In fact, it is failing on the part of the university management to consider the management of their buildings as non-core activities. Maintenance is also core activity of the university organizations, since without it the university would not survive. University must take care of their interrelated assets namely; buildings, technology and human resource. Outsourcing if not properly managed often led to maintenance backlogs, unnecessary increase on maintenance cost. It is argued here in that university organization should not outsource the management of their maintenance service, albeit part of the maintenance implementation could be outsourced where extremely necessary. However, it will be more profitable if university could in-house most of their maintenance services. External maintenance organization could hold their clients to ransom. It also leaves the in-house maintenance organization staff less competent and inactive due to redundancy.

#### 4 CONCLUSIONS

Buildings only have value if they continue to provide the intended services adequately, failure of which will render the existence of the building insignificant if not even useless. The corporate objectives of a university place building performance in a strategic position. Therefore, maintenance is inevitable, and in order to improve and sustain productivities, service delivery and satisfaction of the users, maintenance must be positively managed. The analysis of the survey supports the major themes of the paper; that university buildings were not receiving the required attention. The paper only reports the opinion of the maintenance organizations, but the findings revealed that the maintenance organizations feel the users are only satisfied it is very possible that the users will rate them low and only 2% of the maintenance organization feel that their current practice is very good. All this is leading to the fact that maintenance management of the university buildings are not effective and efficiency thus leading to poor service delivery, poor user satisfaction, increase in maintenance backlogs and increase in maintenance cost. University must be very critical of their procurement systems. What to out-source or in-house needs to be looked at critically before making decision on the delivery method to apply and on what and what not to outsource and to what extent to out-source. In any case, organization must not outsource facilitating functions to their core business objectives.

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