

Exploring Maintenance Management in Service Sector: a Case Study

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Abstract

It has been acknowledged that effective maintenance management can help organizations achieve effectiveness and efficiency in service businesses. Yet, there is not many organizations view maintenance management as a business function which offers business profit and competitive advantage. Indeed innovative and responsive maintenance approaches in the service sector are not being seen. This paper identifies the maintenance management practices in a case of academic institution in Malaysia – to explore maintenance management in service organizations. The current maintenance management and major issues on maintenance are investigated by using in-depth interview and semi-structure interview. The case study reveals that the maintenance management is basis processes in enhancing its assets are available to support business operations. Inspection and assessment; and repair are more likely to be practiced, while cleaning, landscaping and security services are outsourced. However the institution has no maintenance policy and lack of resource allocations on preventive and corrective maintenance. This study provides constructive recommendations for property managers or owners in the initiated and implemented maintenance management.

Keywords

Maintenance management, performance, service sector, operations management, case study

1. Introduction

The issue of effective maintenance management was not paid much attention in service industry. Many organizations; private or public sectors still do not realize the importance of maintenance management. It is essential to start maintenance immediately after the building is completed as building deterioration start from the moment erected (Arditi and Nawakorawit 1999). Despite building deterioration, damages and failures (or perform below expectation) are increasing, not many firms view effective maintenance management as the strategic importance to maximize the business profit (Swanson 2001; Alsyouf, 2007, 2009) and offer competitive advantage (Pinjala et al. 2006; Asyof 2009). Thus it is an imperative task to research maintenance management in service businesses.

The service sector has become the most contributors in Malaysian economy. Service can be defined as the application of competences for the benefits of service clients. It depends on client participation and input such as man power, machines, method, materials, property or knowledge for the service functions and businesses. In service organizations like educational services, functional buildings are the most significant input to be invested effectively and efficiently to create service innovations. Others contend that the pervasiveness of service input, such as office,

lounges, reception areas, conference/seminar rooms, storage, treatment rooms, workrooms for equipment (photocopiers, fax machines, printers), mailbox, classrooms, teaching and research laboratories, libraries, residence halls, cafeteria, places of worship (e.g. mosque), tea rooms and athletic facilities (Miller 2007; Olanrewaju et al. 2011), create a need for more effective maintenance management.

2. Literature Review

Maintenance management is essentially a preventive management philosophy and it should be considered as a business function which provides opportunities to retain quality, life and value of assets and improve cost, risk and productivity concern in organizations. The maintenance organization (e.g. maintenance department, property division, facilities department, administration department, logistic and building department or asset management department) is responsible for managing the operations and maintenance of all the physical facilities or assets of the organizations. In theory effective maintenance management offers positive effects on organizations by improving their operations cost and productivity. The studies on effective maintenance strategies like productive maintenance have typically, been conducted within the domain of the manufacturing industries (Cholasuke et al. 2004; Pinjala et al. 2006; Alsyof 2007, 2009) but it has been less studied in service industries (Lind and Muyingo 2012). Hence, these maintenance strategies perhaps would be effective in services; when fully implemented, maintenance management could also bring benefits to service organizations.

The concept of maintenance is regarded as “Work carried out to keep or restore every facility, i.e. every part of a site, building and contents, to an acceptable standard” (British Standards Institution 1964). Meanwhile, the general concept of building maintenance policies includes cleaning, inspections, repair and replacement; and equipment maintenance includes repairs and replacement of parts or just to fix malfunctioning equipment. Furthermore maintenance management involves the combinations of all technical and administrative action, including supervision actions, intended to keep an item in, or restore it to, a state in which it can perform a required function” (British Standards Institution 1991). This implies that maintenance management requires people with a variety of skills, technical knowledge and site experience. The more we need people, the more expensive human resources become because training and educating people with those professional skills takes times and requires educational investment.

2.1 Maintenance Approach

Various terminologies have been used to describe the maintenance strategies (Lind and Muyingo 2012). Table 1 summarized maintenance strategies that demonstrate such professionalism in organizations. However, whatever terminology is used the two fundamental ingredients of maintenance are constant:

- (1) Corrective maintenance; and
- (2) Preventive maintenance.

Corrective maintenance known as classical maintenance policies focuses on repair and serving of parts activities. It can be done immediately or deferred to a later date and might be planned in long term maintenance plan. In contrast, preventive maintenance is a planned activity (repair/replacement) to prevent failures. Repairs and replacement take place without the incident of any specific fault.

Table 1: Summary of maintenance strategy

Preventive Maintenance	Corrective Maintenance
Planned Maintenance - Carry out before a detected fault <ul style="list-style-type: none"> ➤ Maintenance that planned in time, nature and scale ➤ Condition based – schedule, continuous or request ➤ Time based -predetermined schedule e.g. to detect any equipment abnormalities and avoid breakdowns and failures	Corrective Maintenance - Carried out after a detected fault <ul style="list-style-type: none"> ➤ Immediate maintenance <ul style="list-style-type: none"> - Needs to be carried out as soon as possible - To avoid unacceptable consequences ➤ Deferred – to delay e.g. knowledge about the deterioration of components through inspection by staff or customers complaints by users

In addition, the maintenance planning program will depend on the requirements and objectives of the maintenance strategy which in turn depends on the firm's policy (Hallberg 2009). According to Ardit and Nawakorawit (1999), it will improve the performance of buildings facilities when serviceability condition for the building is established. The organizations may plan maintenance works in-house, or by contract or outsourcing service. It is common practices in building maintenance that part of maintenance works are outsourced (Dubbs 1992; Blumberg 1998) to maintenance providers who have special equipment, knowledge and skills. Besides that, the key success factors of building maintenances also depends on size, type and age of building, design and condition of facilities provided (Encon 2005).

The aim of maintenance is to increase the value (reliability, safety, availability and quality) of a building or equipment hence reducing the need for further capital investment, however increasing the need for further capital investment in human resources. Hence, maintenance strategies require increased commitments to training, resources and integration. These investment efforts can further result in better hardware utilization, higher service/product quality and reduce labor costs. In other words maintenance function has high impact on services; increase user satisfaction (achieve effectiveness) and resource utilization (achieve efficiency) in service. The study of Swanson (2001) confirms that proactive and aggressive maintenance strategies have positive impact on performance. The survey conducted by Cholasuke et al. (2004) on 18 manufacturing organizations in UK reports that maintenance approach and continuous improvement significantly contribute to an effective maintenance management. Indeed, those firms that more pro-active maintenance policies, better planning and control system and decentralized maintenance organization structures have obtained more competitive advantage (Pinjala et al. 2006).

2.2 Theoretical Framework

This study thus provides insight into the effective maintenance management in service context. Cholasuke et al. (2004) summarized the nine areas of effective maintenance management; they are policy deployment and organization, maintenance approach, task planning and scheduling, information management, spare part management, human resource management, contracting out maintenance, financial aspect and continuous improvement. Recent study by Sharma (2013) suggests five components of maintenance management: goals and strategy, human aspects, support mechanism, tools and techniques and organization that makes the maintenance system more effective, efficient and powerful. The theoretical framework present the maintenance management and performance criteria identified from reported literature (Figure 1). In order to generate high impact on performance, maintenance management should be positively planned, strategically organized and innovatively implemented. However, to create sustained competitive advantage, organizations need to focus on customers need and accountability of result to deliver services.

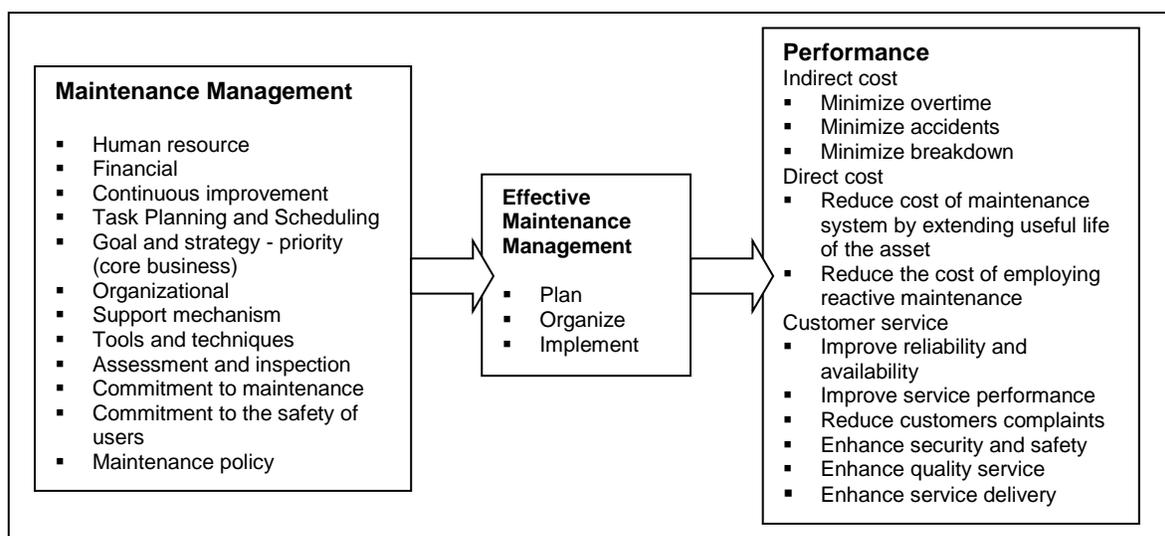


Figure 1: Maintenance management framework

3. Methodology

This study aimed to investigate current maintenance management practices and its issues in service organizations. This study combined a literature review and a case study to answer its research objectives. The academic institution in Malaysia was used as a case study, located in Kuala Lumpur; consist of thirteen building blocks that occupied with 700 students, 281 academic staff, 23 non technical staff and 93 support staff. There is a formal maintenance department in the institution, with a limited workforce: one assistant engineer, six technicians, one electrical operator, two general workers and three assistant administrations.

The approach to data collection for interview involves two stages: (1) Seven in-depth interviews with 5 technical and 2 non technical staff were conducted to have the preliminary information on maintenance management and further would be used for developing semi-structure interviews and, (2) The semi-structure interview conducted on 23 respondents involving fifteen non technical staff and eight technical staff was able to gather information about the backgrounds, current problems, the extent of maintenance management and satisfaction of the institution. The interview findings lead to a depth scenario of maintenance issues; thus, provided more understanding on the policy used. These data will be the guidelines in preparing the survey questionnaire to all service organizations for future research.

Prior to conducting the interviews, the researcher sets an appointment with head of technical and administration department. The purpose of it was to brief the objective of research and the research events. For reason of ethical consideration, the researcher explained the issue of confidentiality and informed consent. The respondents were fully informed about the interview schedule.

The analysis of the semi-structured interview conducted based on the feedbacks received. Data and information have been analyzed and presented in tables and graphs for a clear understanding of the analysis. This is followed by descriptive statistics e.g. radar chart, pie chart and histogram to describe the phenomenon of this research interest.

4. Results and Empirical Analysis

4.1 In-depth interview findings

The following presents the interview findings from research exploring the kinds of maintenance management practiced by the case study (Table 2). Overall, the interview point in the transcript is highlighted with the indicators based upon the literature review established in theoretical framework section. It captures an important element in relation to maintenance management by providing example from interviews. The interview findings reveal which maintenance management practices are implemented. Despite being committed to maintenance practices, the top management did not have any maintenance policy. As a result, resource allocations are neglected for maintenance management. The interviews highlight that resource allocation is crucial for technical and administrative staffs; and corrective and preventive maintenances. These suggest that the institution has not implemented any maintenance strategies since there is no maintenance policy. Due to that, the institution never have any planning and scheduling for maintenance work as emphasized in the interviews, “we don’t have schedule or periodical maintenance program”. The interview findings consistent with previous literature, that maintenance policy (Cholasuke et al. 2004; Pinjala et al. 2006) enables the institution to undertake maintenance strategy (Swanson 2001; Sharma 2013) which in turn, may create the maintenance planning program (Pinjala et al. 2006; Hallberg 2009).

Table 2: Maintenance management practices

Indicator	Pre-defined	Example from interviews
Policy	Established procedure, routine or policy	'We don't have any policy due to building maintenance and we repair when it is broken'. (Asst.Registrar)
Budget	Financial allocation	'We have bursary procedure which is sometimes ridiculous argument'. (Technician and Administration Staff) 'We do not consider increasing in maintenance allocation yearly...'. (Bursary Staff) We don't have an allocation for engineer, quantity surveyor, or accountant but we need this people to guide us'. (Bursary 1 and Technician 1)
Planning and Scheduling	Predetermine schedule Maintenance Plan	'We don't have schedule or periodical maintenance program'. (Technician 2) 'We have unexpected event. Event was held on weekday, weekend and until late night'. (Administration Staff 1)
Human Resource	Have variety of skills, technical knowledge and site experience	We don't have an allocation for engineer, quantity surveyor, or accountant but we need this people to guide us'. (Bursary 1 and Technician 1) 'We have a jammed pack of event, most of us doing civil, electrical, sound and acoustic and everything'. (Technician 1)
Commitment to maintenance	Do replacement and repair in-house after receiving clients' complaints <ul style="list-style-type: none"> ▪ Response time ▪ Repair and replacement ▪ Inspection and assessment ▪ Cleaning ▪ Reporting maintenance problems (repairing, replacement) 	We repair when it is broken'. (Asst.Registrar)
Goal and Strategy	Aims to be achieved	'The faculty has been relocated 3 times within 3 years; whatever it is we have to survive'. (Academician)

4.2 Semi-structure interview findings

Figure 2 describes the response time from both technical and non technical staff for maintenance works after receiving complaints from service clients. From non technical staff, there is more than half (60%) of the maintenance complaints took one week to be lodged. This shows not well practice and implies lack of urgency. However from technical staff, there is less than half (40%) of the complaints could be solved within one day followed by three days (20%) and more than one week (20%). Although the response time to maintenance complaints varies, most of the respondents have similar thought on their commitment to maintenance and the safety of the users. Hence, it is fair to say that most of maintenance complaints take response time at least three day or less (60%). These reflect the level of commitment to maintenance and the safety of the users in the institution.

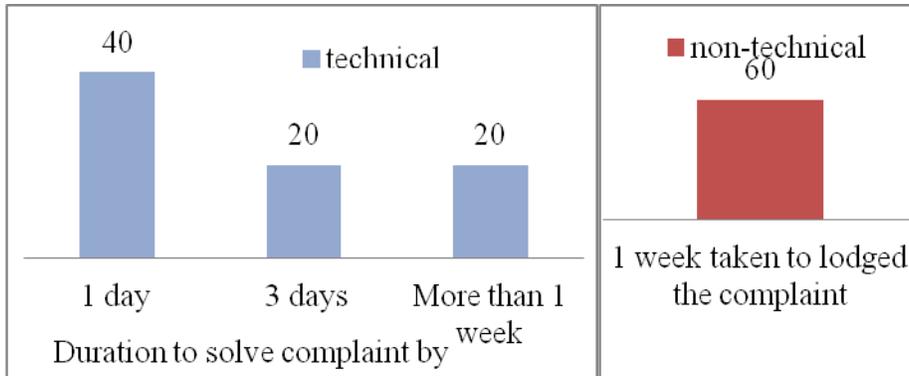


Figure 2: Time taken by technical and non-technical

Figure 3 describes the scope in planning process. At 60 percent more than half of the technicians are not given work briefing on the routine basis; however 80 percent of them have understood the job task and prepared checklist before start working. Most of technicians highlighted that they have the knowledge and skills for the job tasks. When it comes to the planning and scheduling, most of them agreed that they did not have any schedule or periodical maintenance program as emphasized in interviews.

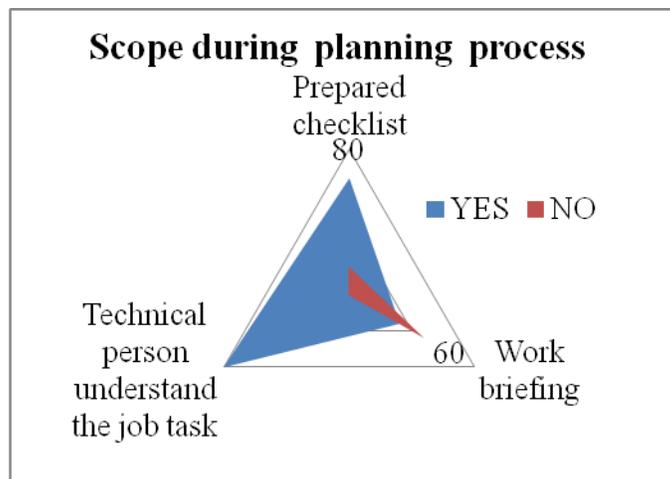


Figure 3: Scope during planning process in technical department

Figure 4 describes the maintenance scope in the maintenance department. There is less than half (40%) of the maintenance works involve inspection and assessment followed by repair (20%) activities. At 40 percent of the maintenance works involve both inspection and repair activities. All of respondents agreed that inspection, assessment and repair tasks have been carried out by their department. Hence, it is fair to say that the main elements in maintenance practices include inspection and repair; and inspection and assessment.

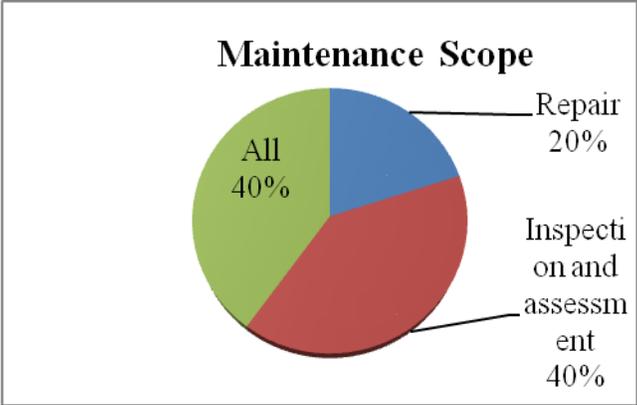


Figure 4: Maintenance scope

Figure 5 shows the results of maintenance works that are outsourced. About 60 percent of maintenance works is the selective outsourcing followed by contract outsourcing (20%) and the rest is conducted in-house service (20%). It shows that, instead of conducting maintenance works, institution can focus on its core business. Most of the maintenance works are outsourced to the selective outsourcing and contract outsourcing.

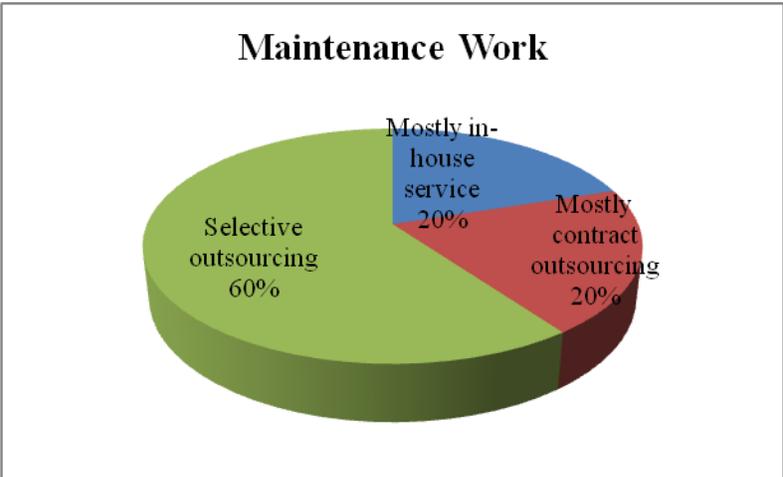


Figure 5: Maintenance work

Figure 6 shows the results for the building component replacement. Slightly, all (80%) of the technical staff and more than half (60%) of non-technical staff have indicated that building components are replaced after they are broken. About 20% of building components are replaced according to manufacturer recommendation. Both the technical and non-technical staffs have similar thought on the building component replacement as maintenance works in the institution.

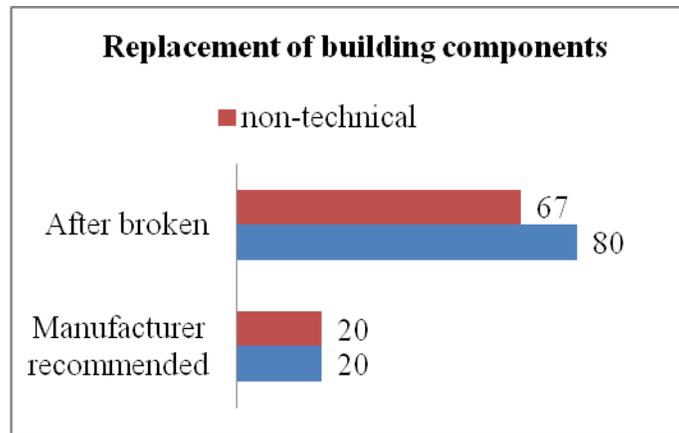


Figure 6: Replacement of building components

5. Discussion

The above findings show that the maintenance department has implemented maintenance practices by reporting maintenance complaints; and responding immediately to clients' complaints. This implies that the institution has committed to maintenance and shown high concern on the safety of the users. Specifically maintenance works involve inspection and assessment; and repair and replacement as acknowledged in buildings maintenance policy. However, most of the maintenance works are outsourced to the selective outsourcing; e.g. cleaning, landscaping and security services. As emphasized in interviews, a special task, equipment or maintenance are managed by other parties having expertise. The results show that it is a common practice for the maintenance department to ask outsourcing for buildings maintenance and maintenance works (Dubbs, 1992; Blumberg, 1998). Although institution has no maintenance policy as emphasized in interviews, the findings reveal that maintenance management is basis processes in enhancing existing assets are available to support service operations. The results also suggest that the top management should have maintenance policy if they realize the importance of effective maintenance management.

Maintenance policy is crucial for the institution to establish maintenance strategy and make decisions on maintenance planning such as resource allocation for technical and administrative staffs, materials and equipment and budget (Hallberg, 2009). Resource allocation is another factor the effective maintenance management. Resources for the building maintenance including staffing (both managerial and operations), materials, equipment, budgets and time play an important role in performance of maintenance management. An efficient allocation depends on the cost expended and maintenance's objective. Such resources should be considered for both short and long term planning. It is believed that preventive of buildings deterioration is better rather than corrective as it reduce maintenance cost and increase productivity. Thus resource-based allocation for preventive maintenance and reactive maintenance is urgent for the effective maintenance management.

In addition, human factor is the most important for the effective maintenance management (Cholasuke et al., 2004; Sharma, 2013). The aim to increase the value of a building or equipment increases the need for further investment in human resources. Staff of maintenance operations, both technical and administration is responsible for planning and executing maintenance policies. Top management commitment and support empower employee or person in charge to act and responsible for enhancing maintenance management effectiveness. Hence, it is essential to provide specialized training to workers, supervisors and managers (Sharma, 2013). Besides that, organization should also consider consultant or contractor for maintenance inspection and assessment; and innovative standard procedure.

6. Conclusion

Novel features of this study include the conceptual development of effective maintenance management in relation to performance in the service context. It provides a better understanding on what component of maintenance management that may have impact on performance. In service organization, buildings and physical facilities are

vital assets; and they are the most expensive and important input for transforming the process of operations into output. Therefore the needs for effective maintenance are necessary to sustain building value rather than rebuild a new one or reconstruct existing ones and further help organizations to obtain business profit and competitive advantage. In order to generate high impact on performance, maintenance management should be positively planned, strategically organized, and innovatively implemented. Organizations also need to focus on customers need and accountability of result to deliver services; and to create sustained competitive advantage. However, it will be more interesting to test and justify if and how the effective maintenance would impact performance. A survey study would be performed to examine the causal relationship between effective maintenance and performance.

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Biography

Noorliza Karia is a senior lecturer of Logistics and Operations Management at the Universiti Sains Malaysia (USM). She received her PhD in Logistics from University of Hull, UK, MBA from USM and Bachelor of Science in Production and Operations Management from University of Denver, USA. She has gained industrial experiences in production planning, supply management, assembly and mass production in manufacturing industry. She is the Chartered Member of the Chartered Institute of Logistics and Transport, United Kingdom. She has involved in numerous consultancy projects in the areas of logistics service providers, entrepreneurship, service and operations competency, and Halal logistics. Dr. Noorliza has published her works in high quality journals and conferences. She teaches logistics, supply chain and operations management at undergraduate, post graduate and executive levels. Her

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Hayati Saleh is a Research Officer at the School of Management in Universiti Sains Malaysia (USM). She earned Bachelor Engineering in Civil Engineering from Universiti Teknologi Mara Selangor, Malaysia and Masters in Building Technology from USM. She has been working for almost 10 years in building industry from 2001-2010. She started her career by holding site engineer position in WCT Berhad, Shah Alam. Then, she transferred to C&S consultant firm-Skaz Consultancy, KL and worked as a project engineer until 2003. From 2003-2010, she become a project co-coordinator in FA Nexus Sdn Bhd, Shah Alam. Currently, she is doing her research project. Her research interests include green technology, green building, energy management, building maintenance and building management. She is a member of IEM and Board of Engineer (BEM).