BUILDING MAINTENANCE MANAGEMENT IN PUBLIC SCHOOL OF MALAYSIA

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BUILDING MAINTENANCE MANAGEMENT IN PUBLIC SCHOOL OF MALAYSIA

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ABSTRAK

Pelan yang berkesan untuk sistem pengurusan penyelenggaraan adalah penting kerana cabaran dalam mengekalkan kemudahan pendidikan negara telah berkembang meluas disebabkan faktor penuaan bangunan-bangunan sekolah di Malaysia. Selain itu, implikasi daripada kemudahan yang terabai boleh mengakibatkan bahaya yang sebenar. Keberkesanan penyelenggaraan sekolah melindungi pelaburan modal dan lebih penting lagi ia melindungi kesihatan dan keselamatan kanak-kanak serta menyokong pencapaian pendidikan. Kajian ini dijalankan untuk mengenal pasti masalah utama dalam melaksanakan sistem penyelenggaraan bangunan yang berkesan di sekolah-sekolah di Malaysia. Dalam proses untuk mencapai matlamat yang ditubuhkan, kajian ini telah diasusun dalam kombinasi kajian literatur, pengumpulan data dan analisis data yang telah dijalankan menggunakan kaedah analisis purata indeks. Pengumpulan data primer telah dijalankan di 6 buah sekolah yang melibatkan pengedaran boring soal selidik kepada 62 responden dengan jawatan yang berlainan. Hasilnya, penemuan kajian telah membuktikan bahawa prestasi sistem pengurusan penyelenggaraan di sekolah-sekolah masih rendah daripada jangkaan keperluan dan disebabkan oleh amalan penyelenggaraan yang tidak wajar, masih banyak aspek yang perlu diperbaiki. Oleh itu, dalam usaha untuk mewujudkan pengurusan penyelenggaraan yang berkesan, perancangan strategik telah disyorkan untuk mencapai keberkesanan kualiti dan kos yang maksimum serta mengoptimumkan tahap penyelenggaraan sekolah mereka.

ABSTRACT

An effective plan for maintenance management system is crucial as the challenges in maintaining the nation's educational facilities has grown wider because of the aging factor of schools' buildings in Malaysia. Moreover, the implications of negligent facilities could be the real danger. The effectiveness of school maintenance protects capital investment and significantly it ensures the health and safety of the children and supports educational performance. This research is conducted to identify the major problems of building maintenance management system within public schools in Malaysia. In the process to achieve the objectives established, this research has been organized in combination of literature review, data collection and data analysis which has been conducted using average index analysis method. Primary data collection has been carried on 6 schools which involving questionnaire distribution to 62 respondents from different positions. As the results, the findings had proven that the performance of maintenance management system in public school still minor of requirement expectation and due to improper maintenance practice, many aspects should be improved. Therefore, in the effort to establish an effective maintenance management, strategic planning has been recommended to achieve high quality and cost effectiveness as well as to optimize the maintenance performance of their school.

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LIST OF SYMBOLS

ICT	Information and Communication Technology
PPD	"Pejabat Pelajaran Daerah"
MOE	Ministry of Education
SIRIM	Standards and Industrial Research Institute of Malaysia
IDEF0	Integration Definition for Function Modelling
JKR	Jabatan Kerja Raya

LIST OF ABBREVIATIONS

ICT	Information and Communication Technology
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CHAPTER 1

INTRODUCTION

1.1 Research Background

Maintenance of a building can be defined as a process of reservation and restoration activity of the structures and the components in the building. This process should cover the whole building structures including toilets, rooms, walls, roofs, drains, doors, windows, floors and the fix furniture. The progress of a building maintenance is a universal issue and usually it is highly considered from the early process of the project construction or in the design phase to assure the quality of the building .

To be specific, school buildings are one of the most important facilities in our residence which functioning as the centre of excellence for getting basic knowledge in everyday life. The process of maintaining the school buildings also necessitate in serving staffs and all students well-being. The effectiveness of school maintenance protects capital investment and significantly it ensures the health and safety of the children and supports educational performance.

Nevertheless, in the year of 2007, there are many cases reported which involved the failures of the building components of Malaysian school. Furthermore, there is another case reported on 14 April 2008 where there was some roofs collapsed at Wakaf Tapai Secondary School in Kuala Terengganu. Unfortunately, on November 2008, the same case occur in SRJK (C) Han Ming, Puchong, Selangor due to the failure of roof trusses which was attacked by termites.

Leads to the efforts to sustain the effective implementation of property management in Malaysia, the need to study the problems that hinder the execution

should be considered as of paramount importance. Some of the problems previously identified which involve the lack of information (Zailan, 2001), human resource (Gibler and Black, 2004) and unclear objectives (Shahir, 2007). Therefore, as to complete a brief description with new findings and solutions, the study on the effectiveness of the public schools' maintenance process should be conducted comprehensively.

The paper begins with a literature review that focusing on public property management techniques and experiences in other countries and from other research. It is then followed by a section detailing the methodology selected for the study. Pursuing this further, a discussion of the findings will be presented before the paper provides a conclusion which is derived from the research.

1.2 Problem Statement

Discovered from the literature review of some research, many problems had occurred at the implementation stage especially in public schools building. In our country, Malaysia, the management of government property and assets including buildings and the land management is considered as fairly low and under-performed (Syamilah, 2005). Compared to more developed countries like Australia, Japan and America, Malaysia can be categorized as less competent. In addition, the management aspects specifically for public school buildings in Malaysia, were virtually unattended to and almost ignored completely according to Syamilah (2005).

Leads to the serious effects, media reports have also highlighted a lot of issues caused by the poor management of government buildings maintenance. Some cases have led to the collapsed of ceilings, vacant buildings and surprisingly there are incidences of fire in school buildings. Results from those media reports, it can be seen obviously that there are barriers and a lot of difficulties faced by Malaysian government agencies to effectively implementing property asset management practices. In view of these serious problems, 'National Facility and Asset Management' conference have been conducted by the government as an optimistic step towards improving this poor management of government buildings as well as to adopt and integrate the effective

management practices specifically in managing, operating and maintaining a good performance of services.

According to Mohd et al. (2009), it is found that one of the main problems that cause default in the implementation of an effective property asset management is the absence of competent staff within specific knowledge areas and work units. Indeed, the finding of this problem statement was first to be found by Gibler and Black (2004) and specifically in public school administration as noted by Syamilah (2005). Results in other consequential problems, this issue also affect by the failure to employ the staffs equipped with special expertise within the property asset management field at public schools (Mohd et al., 2009). Moreover, this issue is comparable to the notion put forth by Syamilah (2005) who point up that the responsibility to manage the property assets in public schools including all buildings maintenance works definitely should be carried out by personnel or staffs equipped with relevant and related academic qualifications.

Other than that, Shahril (2004) states that another major problem faced in managing the property assets especially at the public school level are insufficient financial resources. To emphasize, this challenge becomes a critical impact in the efforts to manage the property assets effectively as Abdul Hamid (2002) figured out that financial resources act as one of significant keys in determining the success of an operation. According to Martindale (1999) who shared the same idea, he continued that the factor which lack of financial resources creates unwanted pressure within organisations as they strive in order to develop a better maintenance management using that scarce resource. As a prove to this issue, it have been reported on the news by "Berita Harian" on 5 August 2016, which entitled " Syor sekolah cari dana sendiri disokong " , refer to the appendix 1. It is stated that the recommendation of schools finding its own funds were supported.

In addition, the other problem which negatively affects the implementation of property asset management in the academic institutions specifically in the schools' buildings is the lack of effective communication. It has been discovered by Mohd et al. (2009) that the communication failure exists in Malaysia mainly due to the very structure of our public governance as there are a lot of departments and ministries

involved in the decision making process. Negatively, the presence of a fragmented governance structure has been figured to lead to an apparent communication gap among those agencies and public sectors. Based on Shahir (2007) finding, he confirmed that this multitude of departments and ministries had negatively causing the decision making process to be more complicated.

Pursuing this further, EPA (2001) discovered that the problem of communication even has begun from the lower level of management hierarchy of public schools. To be specific, the communication problem commonly involving the teachers and the personnel in charge of the property management especially for maintenance works. Furthermore, Rahmad and Mohd Subhi (2001) recognized another additional factor of implementation failure of efficient maintenance management which involving the application of information and communications technology or (ICT). This viewpoint is supported by Carolyn (2003) that (ICT) development has not been employed widely in public schools. She also found that most of the organisations are unable to utilise the advantages of communication technology fully. To emphasize this issue, Noor Khairunisa (2009) proved with this finding that the present system still utilizes the manual approaches. For instance, information stored only through manual filing methods instead of using and engaging ICT in managing information data. Through this revelation, it proved that information and communications technology or (ICT) as accessibility and traceability of data is vital in implementing an effective and efficient property management practice.

In brief, from all discussion and clear explanation about major problems in property asset management as gleaned from the literature review, it can be concluded that there are a few acute problems that must be solved in order to improve the level of effectiveness in property asset management especially for maintenance the buildings of public schools. A discovery found that most of schools' buildings in Malaysia aged about 15 years and above Noor Hidayah (2008). Therefore, this factor shows one of the reasons why they need more attention in doing maintenance activities. On the other hand, many problems are faced particularly in maintenance policy and the procedures which issued by the Malaysian Department of Education. With attention to the process in getting maintenance funding, it is difficult to be solved besides it takes quite a long

time to get an approval. Alternatively, 70% of the school community in Malaysia conduct the maintenance activity by themselves using their own sources. Furthermore, the school community agreed that the department of education takes a long time to solve the maintenance problems and damages.

1.3 The Aim and Objectives

Contributes in the efforts to study the effective maintenance management practice in Malaysia specifically within public schools, the aim and the objectives of the study must be clearly stated. In order to accomplish and sustain an effective maintenance process, the purpose of this research including:

1. To study on the common practice of building maintenance management in public schools' of Malaysia.

2. To obtain the information about the problems of building maintenance management faced by the schools' organizations in Malaysia through questionnaire design.

3. To analyse the problems of building maintenance management system applied in public schools' of Malaysia.

1.4 Scopes of Research

Generally, there are some outlines for the limitations of the research which are also act as a guide for the specific data and the theories used to interpret the data in the research. These scopes and limitations are important to determine the parameters of the study. In the first place, the scope of this research will focus only on the management of building maintenance. To be specific, this study will generally focus on the maintenance of building which including components consisting of civil engineering services, equipment service mechanical, electrical and telecommunications.

In addition, the scope of the maintenance works in this research will be targeted on the buildings of educational institute especially for schools' buildings in Malaysia. Given the position of distribution for school buildings in Malaysia are numerous and spread evenly in the country, it is a trouble for the author to find data in limited time. Related to this issue, the authors of this study will focus specifically on the schools located in peninsular of Malaysia only. Although this study was made only in a part of the country, it is expected that the findings that have been achieved from this study will be used as a model to the effective management of public schools' maintenance building in the public sector in Malaysia.

1.5 Significance of research

According to (Scarret, 1983) , the general definition of property management is a control or monitoring activity over property interests while considering the owner's ascertained objectives. On the other hand, the idea stated and supported by Sejas (2010), there are also other activities that can be considered to explain the true definition of property management. These activities including the decision making explained by (Kaganova et al., 2006; Micheal, 2007), application and utilization by (Kaganova et al., 2006), procurement by (Kaganova et al., 2006; Sejas, 2010), maintenance and upgrading by (Sejas, 2010), investment by (Becker, 2011), as well as disposal activities also by (Kaganova et al., 2006; Sejas, 2010).

In the same way, these various activities within property management are seen to be the exact representation of the true aim and the reason why an effective management must be practiced. Additionally, this statement comply with the previous studies which have indicated that the practice of property management was developed to suit numerous of main purposes. To explain more, Arnold and John (1989) suggest that the leading purpose of property management is to increase the value of the property itself. Strengthened by the statement posed by Scarrett (1983), property management is a management process which is important to maximize the income and capital assets. Therefore, from the views presented by the parties, it is concluded that there is a need for vital property management practices to be implemented effectively to ensure that the

values of a property are able to be upgraded to meet a particular target which have been determined by the investors and the owners of the asset involved.

Moreover, this idea is compatible with the views according to Epley and Rabianski (1981), who state that the implementation of the management practices within the professionalism help property owners to achieve the respective purposes of their investment. In the meantime, for the best implementation, the property management practices should be applied in managing properties for an organization Ching (1994). In this concept, the best performance can be determined by covering various aspects which involving the achievement in the form of financial or economic gains, social benefits, user satisfaction, optimization and other functions. To be specific for the public schools' case, the buildings and structures constructed by the government are not intended primarily to fulfil the target of investment or financial gains. However, the focus is more towards the efforts to meet the needs of social welfare. This is because school buildings are particularly used only for education itself. Besides, these types of buildings which serve a certain specific purpose are often referred as operational buildings.

To summarize, by the year of 2017 most of the schools' buildings in Malaysia are aging. In this manner, the challenges of maintaining the nation's educational facilities have grown wider. To explain more, this issue has been spreading since routine and unexpected maintenance demands are bound to arise. Therefore, every educational organization must proactively develop and implement an effective management plan for dealing with these inevitabilities. A plan of an efficient facilities maintenance system is crucial to ensure that the school facilities are appropriately cared for. Furthermore, the consequences of real problems can be result from negligent facilities. Besides, it can negatively affect some capital investments when those buildings and equipment deteriorate or their warranties are invalidated. Other than that, if school facilities are failed to be maintained adequately this problem can lead to the most critical issue which are the possibility to discourage our future investment in the public educational system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Specifically in the property management sector, the process of assessing the total costs of owning, designing, constructing, operating and managing buildings and its structures is being realized throughout the evolved world. In addition, focusing on the face of current shrinking maintenance budget, it has been a significant concern to the building owners, developers and facility managers on the increasing of customers' expectations and demands for better total building performance and facade maintainability management in the industry.

For instance, the process of reducing the rising total facility related to cost-in-use is one of an impending task of a building delivery process (Chew, et al, 2004). Moreover, building maintenance management is a universal issue which involving the consideration from the design stage because it is importance for the future performance attributes and its life cycle cost (LCC). In order to meet high building standards as modern buildings and structures design, the decisions made during the design stage would have a far reaching effect and important impact on the future maintainability of a building (Briffett, 1990). Besides, the demands for higher qualities of the building maintenance have increased due to the continuous developments of high rise buildings. Significantly, the availability and reliability of an analytical engineering model which is designed to predict the life cycle and deterioration patterns of building systems, subsystems, components and assembly of components are the major issues of a quality maintenance program (Shohet, 2003).

In the same way, Abd. Rahman (2004) has claimed that the implementation of property management practices has been associated with an efficient control management system. Significantly, it is not only expected for returns from a property but also ensures a maximum protection to the structures from quickly becoming inoperative. Furthermore, Abd. Rahman (2004) himself also stressed out that the implementation of an effective property management practices is capable to avoid loss through the systematic management and maintenance system. In the same way, it is beneficial to establish a competent management system for the school buildings particularly through the organization and implementation of an effective and efficient maintenance which is planned and regulated. Besides that, from the point of maintenance process, the existence of a good management practices will guarantee that the maintenance activities are implemented through proper and safe ways.

Another statement is suggested by Zailan (2001) that when a real estate management is implemented efficiently and effectively, it can reduce costs of operations, eliminate excess real estate assets and defer any other related problems from occurring. Meanwhile, according to Lyons (2004), an efficient and effectively operations of a property management will improve the level of service delivery as well as increase the income. From this viewpoint, the importance of an effective property management practices for public schools can also be associated with the need to ensure that schools' buildings must be managed well. This is because, providing the educational services can be fully succeed without any form of waste during the usage of resources such as financial, human, equipment and others.

As the conclusions, in order to effectively extend the lifespan of a building facade, there are some important aspects need to be concentrated. For instance, an improved initial design, good construction workmanship to deliver the design details as originally intended and a comprehensive maintenance program were relevant for the enhancement of façade maintainability (Christian and Pandeya, 1997). This whole life performance approach towards the attainment of facade maintainability was as an innovative process for design and construction development that took into account of its future use and maintenance practices.

2.2 Definition of Maintenance Management

First and foremost, to define the building maintenance through the investigation it can be seen that there are several areas requiring closer attention. Maintenance is defined according to BS3811:1964 as ‘A combination of any actions carried out to retain an item in, or restore it to, an acceptable condition or standard’. Continuing this further, BS3811: 1984 has defined maintenance as ‘The combination of all technical and associated administrative action intended to retain an item in or restore it to a state in which it can perform its required function’. In this manner, maintenance can be summarized as the improvement of any item to make it functional with the co-operation of technical and management parties. In the meantime, based on the definition of Oxford Dictionary, the management means `the people that control and making of decisions in a business or similar organization'. To explain further, both words `maintenance' and `management' are combined together.

Maintenance management can be defined as the organization of maintenance within an agreed policy. It means that the maintenance management is an organization that is considering the facet of management which is important to lead all the work on maintaining a building within the contract. It must have been agreed between the two parties whether by the building owner, contractor and maintenance management department or company. Each party that involved in the maintenance management contract must complete all the works and the maintenance contract must be obey and follow as the guidelines. In addition, maintenance management can be describe in other general terms as the task gets done and carried out efficiently (R.Chudley 1984). Therefore, the typical maintenance tasks included:

1. Planning:

This process involve organizing the department or company and assure all necessary items such as equipment , tools, materials, work instructions and adequate labour are enough and available at the required time. Setting of targets for expected outcome and performances to ensure viability or profitability should be considered as another important aspect.

2. Controlling:

This is a routine process of checking actual performance against planned performance and making any necessary alterations which are important to ensure a satisfactory performance and outcome is achieved. Moreover, for the benefit of future planning, it should also include the feeding back of information gained by experiences.

3. Co-ordinating:

This approach is the balancing and keeping of the team together as a harmonious unit by suitable and fair allocation of works.

4. Motivating:

To ensure the effective and economic outcome is achieved, this management role of leadership involve inspiring loyalty, effectiveness, pride and a sense of moral responsibility to the tasks set within a team or group.

Generally, maintenance management is the major physical aspect of the building management. Besides, Othman (1996) has outlined maintenance management as a management system, or procedure, which is designed to allow buildings owners or managers to look after their buildings and structures in an efficient, well organized and cost effective method. To explain more, in an attempt to maintain the premise at the level of comparable to its initial condition, the maintenance manager combats the effect of physical deterioration. Thus, maintenance management covers most of the buildings operations and maintenance function.

2.3 An Application of IDEF0 Modelling Methodology

According to (Hamisah Hafni, 2003), the major causes of the problem in implementing an effective maintenance management is the lack of the understanding about the maintenance management process among school administrators as such it hinder the schools from designing a good maintenance program for their schools. Mapping process has been discovered as one of the techniques which are able to facilitate individual understandings of a process using suitable mapping or modelling

tool through an analysis and an appropriate representation of the existing process. For instances, the process mapping tools include flow charts, Petri nets, Unified Modelling Language, and the Integration Definition for Function Modelling (IDEF0). Using the IDEF0 modelling system, the development of a process model for the management of school buildings can be explained clearly.

1. IDEF0 Modelling system

Briefly explained by (Wilson et al., 1998), IDEF0 modelling system is a structured design and analysis technique based on graphics syntaxes and semantics. Beneficially, a designer is able to produce a process model that is descriptive as well as comprehensive using this system. Starting in the 1970s, it was used for integrated computer aided manufacturing by the United States air force. The U.S National Institute of Standards Technology (NIST) published the system in the early 1980s in the Federal Information Processing Standard as a manual under the topic of Integration Definition for Function Modelling (IDEF0) (FIPS PUB 183, 1984). The Institute of Electrical and Electronics Engineers (IEEE) established the IDEF0 standards through continuous improvements of the manual (IEEE Std 1320.1-1998). Currently, IDEF0 model has been widely used not only for process modelling but also for the evaluation of current process models.

2. The IDEF0 technique

Two basic elements have been used in IDEF0 as its modelling language such as boxes that represent activity and arrows that represent the interfaces. The input, output, control and mechanism are the example of its interfaces. To explain further, the input element can be anything that will be processed by the activity to produce the output while the output element is whatever that is produced by the activity and the control can be condition, situation or information that controls the activity. Finally, the mechanism is the human resource which are in group or individual or tool that is required by the activity to change an input to an output. The figure below shows the basic of IDEF0 model with ICOM elements.

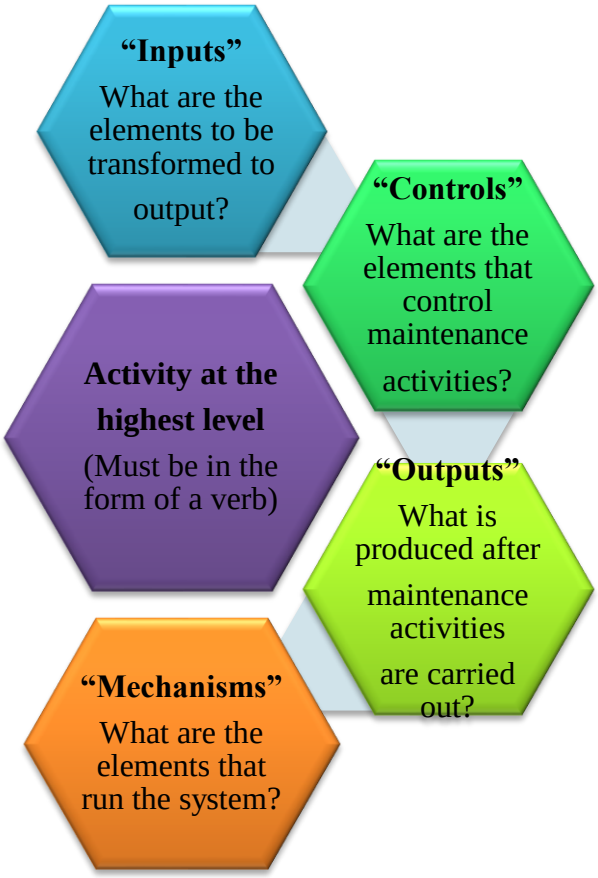

Figure 2.1: Basic IDEF0 model with ICOM elements (A-0 level).

The classification of information using four questions is the basis of the IDEF0 modelling system. These questions are defined as the ICOM questions for Input, Control, Mechanism and Output. After that, the information mapped is presented in the form of graphics and texts and it will be arranged in a hierarchical form.

The examples of ICOM questions for Input, Control, Mechanism and Output as:

(i) What are the activities?

(ii) What is input that needs to be transformed into outputs?

(iii) What are the elements that influence / control / regulate / constraint those activities?

(iv) Who/what will implement those activities?

3. IDEF0 Procedures

There are three main stages of the modelling process in the IDEF0 system:

(i) The construction of a context model (A-0 model).

(ii) Identification of the main activity from the A-0 activity (the first decomposition to obtain A0 model).

(iii) Identification of sub-activity of the main activities in the A0 model (the second decomposition).

The limits of decomposed activity in IDEF0 system are minimum is three and a maximum of six. According to the label of the parent activity, each decomposed activity is labelled with a number. There is no information on timing in the IDEF0 diagram. Figure 2 shows the illustration how a parent activity is decomposed into its sub-activity.

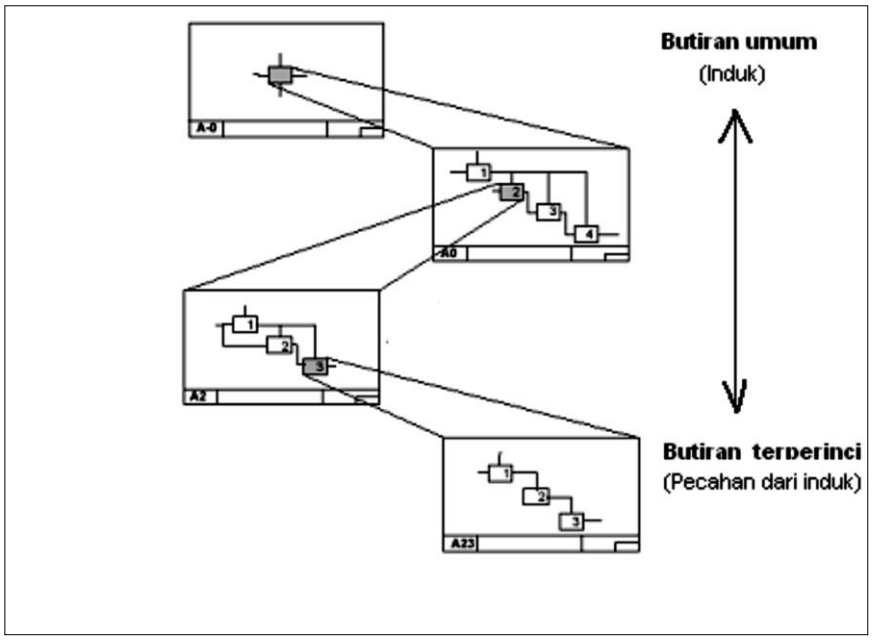

Figure 2.2: Decomposition of a parent activity to its sub-activities

4. Development of Building Maintenance Management Process Model

There are three main stages in developing The School Building Maintenance Management Process Model (SBMM Process Model) as:

Stage I: Information gathering

Stage I involves the process of gathering the information of the existing practices from three levels of sources which are country, states and districts. Document analysis, questionnaires and interviews are the techniques of information gathering used. Analysis of all documents includes the government circulars and maintenance reports. Fifty respondents involving the school heads and education administrators were included in the questionnaire and interview samples respectively.

Stage II – Developing the draft model

The development of the draft model is done through interactive mapping operations of existing maintenance process. Based on the answers from the four ICOM questions, the information is mapped easily. First, through the interactive process, the context model (A-0) is produced followed by the main function model (A0 model) and the sub-function models A1, A2 and so on are followed through.

a) Context model

In the beginning, two input elements were identified based on the first ICOM question:

(i) Type of building

(ii) Equipment/materials

Next, based on the second ICOM question, eight control elements can be identified including:

(i) Building plans
(ii) Equipment specifications/standards
(iii) Types and costs of materials
(iv) Budget allocations
(v) Inventory records/log book
(vi) Ve ndors
(vii) Technical knowledge and skills
(viii) Associated forms

b) Main function model

In addition, the main function model is the second level in the hierarchy of the SBMM Process Model (level A0). Decomposition of the context model has produced the main function model. In the same way to the previous process, by asking the four ICOM questions, the identification of the main functions and its descriptions are obtained. The identification of the main functions is achieved from the existing practices and the development of A0 model is completed by integrating information on existing practices which are based on the results of document analyses, responses to questionnaires, interviews, and best practices. There are six activities which are identified for the main function model which include:

i. (A1) Identify building status.

ii. (A2) Assess and evaluate defects.

iii. (A3) Estimate maintenance costs.

iv. (A4) Plan maintenance activities.

v. (A5) Implement maintenance activities.

vi. (A6) Evaluate and report maintenance.

Table 2.1: Sub-activities to the main activities (Akasah, 2008).

Item	Main activities	Sub-activities
A1	Determine building status	(A11) Identify building that requires maintenance. (A12) Determine the building location. (A13) Visit building site. (A14) Identify and verify maintenance needs for building.
A2	Evaluate and estimate defects	(A21) Refer to criteria for usability of buildings. (A22) Identify techniques for measurement and evaluation of defects. (A23) Identify the usability level of building. (A24) Report building defects and usability status.
A3	Estimate maintenance	(A31) Identify building details that require maintenance. (A32) Gather cost information on labour, materials and related maintenance activities. (A33) Prepare documents on expected cost incurred.
A4	Plan maintenance activities	(A41) Refer to existing circulars on maintenance for guidance. (A42) Prioritise on identify maintenance needs. (A43) Prepare documents for maintenance applications. (A44) Submit application to carry out maintenance activities.
A5	Implement maintenance	(A51) Receive budget approval for maintenance. (A52) Prioritise maintenance activities based on available budget. (A53) Plan maintenance activities. (A54) Choose and appoint suppliers. (A55) Supervise maintenance project.
A6	Evaluate and report maintenance	(A61) Asses work progress. (A62) Prepare progress report. (A63) Submit document for payment approval.

Stage III: Experts verifications

Pursuing this further, the draft model will be evaluated by three technical experts who were serving the Ministry of Education as assistant director (architect), project architect and project engineer who usually have had more than 10 years of experience in the field. According to (Presley et-al, 1993), the evaluation and verification process is an iterative one starting with the submission of the draft model to the experts. All information presented in the model will be reviewed and observed besides they need to put mark as to show their agreements or disagreements with any presented information. Moreover, suggestions will be provided for better improvements. Recommended model is the returned model which will then refine by the author accordingly and the experts' opinion was sought for confirmation where necessary. Three types of feedback were obtained from the experts for instances, the questions on syntaxes, questions on textual information and other recommendations.

Furthermore, the experts should agree to the activities, their sequences and the descriptions needed which must accurately represented. However, the model will not need to be submitted again as the changes were minor and verifications were obtained through phone discussion. Now, the model is recognized as a publication model which is ready to be used by the school heads as the guidance for the maintenance management of school buildings.

2.4 Factor of Effective and Efficient Maintenance Management

Referring the definitions stated in section of 2.2, it can be summarize that the term of maintenance management consists of managing, planning and also controlling. Pursuing this further, in the effort to make sure the maintenance management more effective and efficient when it is executed, there are four supporting factors that should be considered. The four major factors that need to be deliberate are as follows:

1) The organisations structure and general responsibilities of maintenance management.

2) The maintenance policies and standard for maintenance.

3) The maintenance management planning and scheduling.

4) The maintenance management for budgeting and cost controlling.

2.4.1 Organizations Structure System of Maintenance Management

One of the major factors which should be considered in having a better maintenance management system is the set up of the organization structure system. Basically, the organization structure system involve with managing a maintenance team and also controlling the manpower. Significantly, the purpose of this organized system is to let us know how appropriate the maintenance management system are, the sufficient number of the manpower required in maintaining the building, the roles of each member in a team and other related information from the maintenance structure system.

Normally, the organization structure of the maintenance management team consisted of a group of individuals which are selected from various fields in the organization or from the outside based on their special skills, expertise and experience related to the maintenance projects. Otherwise, the employee who works in an area can be a part of the problem solving or project team in order to take advantages of their unique perspective and expertise. This principle is stated in the Total Quality Maintenance (TQM) (Seti Mariam, 2003).

For instance, normally the building manager, engineer for mechanical and electrical, civil and structure engineer, operator and handyman are some of the important crews which are involved in a maintenance team for the building maintenance system. Not forgotten, the most important person in the team is the

building manager. The structure of the organization for the maintenance management is usually in a form of matrix.

2.4.2 Function and General Responsibilities

In this context, the term `maintenance organization' was used to represent the person or their responsible for the planning and control process of maintenance operations. According to the figure below, these are some of the general functions and responsibilities of maintenance management team to the building owner describe by (Ivor H Seeley 1980).

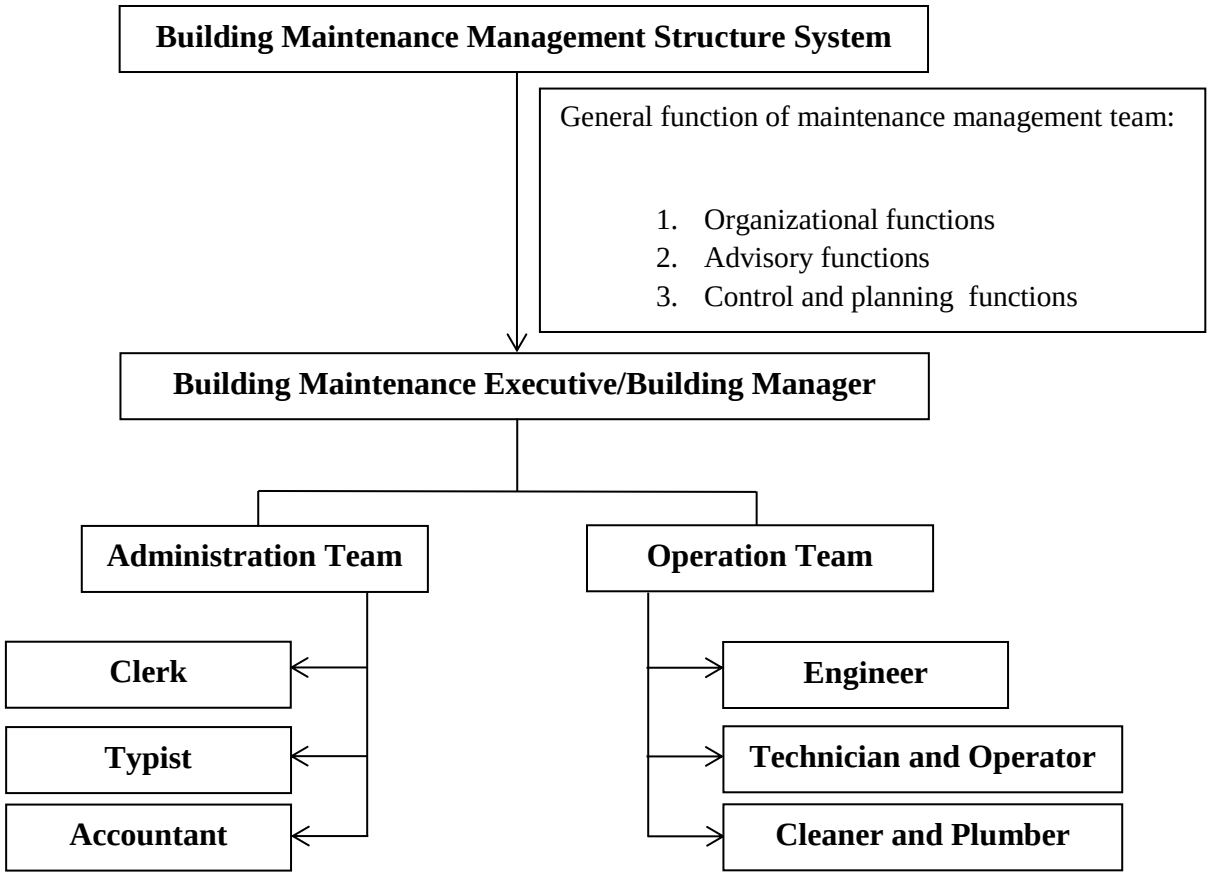

Figure 2.3: Building Maintenance Management Structure Systems

1) Organizational functions

This function normally related to the central administration and supervisory system or to the execution system whether by direct labour or the contractor.

i) Maintenance Department

The functions of maintenance department should be necessary and the associated costs are considered whether the work is ultimately pass to outside contractors or to directly employed maintenance department who would undertake the responsibilities such as:

a) Determine the roles and the responsibilities of the administrators, all supervisors, and their technical and clerical staffs.

b) Establish and support job relationships, the pattern of systematic accountability and clear paths of contractors.

c) Formulating and establish the standard procedures of operations and work instructions.

d) Provide any suitable office accommodation, necessity and equipment.

ii) Direct Labour Force

When an organization of independent contractors undertaken the works, he would accept the responsibilities in this area such as:

a) Foreman selection and their duties and limits of authority or alternatively as well as the functions and the roles of the foreman are defined.

b) Involve in operations including payment, procedures of timekeeping, incentive schemes administration, provision for safety, welfare and training.

c) Materials will be purchased by their organization and the stores control procedures must be comply with.

d) Arrange and organize for the transport of labours, materials and machineries to and from the project site.

e) Maintaining and keep up the good condition of workshop and stores building.

iii) <u>Contract work</u>

a) Tender document preparation and contractor selection.

b) Condition of contract administrative which includes authorizing and valuing variations and certifying for payment and satisfaction.

c) Work supervision based on the standard of procedures in order to ensure compliance with term and contract.

2) Advisory functions

Advisory functions would involve liaison or relation with the owners and users as well as the consultation with upper management on such matter as stated by (Ivor H. Seeley 1980):

a) There are standards to be maintained and the effects on users' activities of deviation from this standard.

b) The relatives merit of alternative maintenance policies and the extent to beneficially employ operatives directly for executing the work.

c) Clarification of any constraints which related to the limits of expenditure, desirable cash flow pattern, acceptable delay times or restriction on time as well as the method of carrying out all works.

d) Maintenance expenditure estimation for both long and short term which including where would be more appropriate, initially bringing up costs to required standards and the possibility of facing any such backlog to repair or renew.

e) Although not directly maintenance, usually the maintenance organization would assume the responsibility for technical requirements for minor work involving alterations or small additions to the building.

f) For proposed a new building, it is most important that the maintenance organization should participate in the briefing session of the designing the building and they also should be given the opportunity to comment on the detailed design as the guidance on the maintenance implications of design.

3) Control and planning functions

This function would involve the process of inspecting and reporting on the necessity for maintenance work to be carried out and it is including the planning and the programming of the works. The work program should both in the short and long term contexts as the effort in preparing costing and budgetary statements. By establishing adequate supervisory system and organizing a system of recording and feeding back information, the quality and the quantity of output could be controlled for future use in planning.

4) Miscellaneous functions

Under the jurisdiction of a maintenance department, other aspects and issues which could arise are including fire pre cautions and safety, general security and safety measures, and the collection and disposal of waste and garbage.

2.5 Policies and Standard for Maintenance

2.5.1 Maintenance Policies

Discussing on the way of proceeding, to build an effective and efficient maintenance management system, the maintenance policies of a building are one of the major component. On the same contrary, it may also be describe as the ground rules for the allocation of resources such as men, materials and money between the alternative types of maintenance actions that are precious to the management. According to (Reginald Lee 1985), the maintenance policies is a strategy within which decision on maintenance are taken.

Otherwise, starting with the identification of the maintenance tasks and the standards to be achieved as well as the limit of the cost, the strategy intended to lay down the operational and cost objective for the maintenance department. Beneficially, this will direct to the policies which concerning the proper balance between preventive and corrective maintenance. This includes the decisions on how far the works need to be programmed rather than relying only on the users request, the priority to be comport depends to different types of work whether the work is better carried out by the direct labour or contract labour, where the properties are dispersed over a wide area, and the extent to which decision making should be decentralized.

Additionally, the maintenance policies also useful in the determination of the maintenance organization structure as well as the roles and responsibilities of the supervisory staff. Before commencing the policy standard that need to be fulfilled, there are several factors that the maintenance manager and his management team have to look at based on the formula :

1) <u>The aims of the parent organization</u>

The understanding on the nature of the end product and how it has been produced will give more information to the management in the process of formulating the policies. The information is important as it includes the necessity of the products in the building and the services.

2) <u>The Standard required</u>

The optimum level of maintenance work required on the fabric should be determined by the maintenance manager to preserve an acceptable environment in the building under his care. Insufficient maintenance could cause the fabric of building first to become less attractive, then unacceptable to the occupants and finally dangerous and may be uninhabitable.

3) Legal Liability

The statutory requirements must be comply by the maintenance manager whether by Standards and Industrial Research Institute of Malaysia (SIRIM), Uniformly Building by Law or other related act.

4) Method of Execution

The type of execution that need to be used when maintaining the building will be determined by the maintenance manager whether the direct labour or contractor should carry out the works.

2.5.2 Standard for Maintenance

The key factor in determining the maintenance workload is the identification of an appropriate building standard. The concept of the acceptable standard is mentioned in the definitions highlighted earlier, but this does not suggest that there is any absolute standard which would satisfactory in every case.

According to the Chartered Institute of Building United Kingdom, there are two types of standards for maintenance programs which are as follows:

1) Quality Standards

The acceptable quality of maintenance work should be control by the supervisor of technical staff. This is because, the complaints can be arising and lead to tenants' frustration because of poor workmanship. Quality control is the most important aspect to staffs at all levels of maintenance. Related to the materials and workmanship, the essential to ensure an acceptable standard of work is carried out by council workmen or contractors, which in this regard, the council standard will be the higher level, middle level or lower level of quality standard, are the management and vigilance at all times.

2) <u>Service standards</u>

As far as building repairs and maintenance is concerned, an acceptable standard should not only be to the satisfaction of the council but must also to the tenants. In order to ensure that the programmes of work can be prepared and performance is measured to achieve the acceptable standard, it is necessary to quantify the service standards in terms of the time periods within which the progress should be carried out. Consequently, a service standard is the essential as the basic for calculating the workload together with labour requirement and the financial resources needed. It was the duties of the maintenance management team to set-up their own maintenance standard which also needs to be acceptable by the client, owner, and the government. This is because, different requirements of different organizations will make a different maintenance standard inescapable.

2.6 Maintenance Management Planning and Scheduling

2.6.1 Preventive Maintenance Plan for the Long Term and Short Term

To begin, school districts need to plan strategically in order to get optimum benefits from the preventive maintenance. In contrast, if maintenance is absence of strategic planning, maintenance tends to lead to the premature equipment failure when the need for repair arises because of high cost of arrangement. Every district need to include preventive maintenance system along with other maintenance projects for long-term and short-term maintenance plans which are tied to the capital improvement programs, capital budgets, reserved accounts, and operating budgets.

Operative planning for preventive maintenance should be implemented at the same time as the planning for other maintenance which is needed both for the long-term for at least a three-year outlook and the short-term for the upcoming year. Long-term planning includes a long-range facility plan and a capital improvement program while short-term planning involve annual work plans and annual budgets.

1. Develop a Long-Term for Ten-Year Facility Plan

Significantly, long-term plans help to achieve goals which are needed to guide maintenance activities and help to allocate resources strategically. Moreover, common objectives for employees can be provided by defining goals for the district toward which individual staff members strive. The future for a district's facilities is chart and building managers can identify the best maintenance projects that meet the overall needs of the district easily.

As a goal-setting document, a ten-year strategic plan will take a much broader view of facilities than an ordinary annual plan. Typically, a ten-year plan should contain four important elements and the contents of the plan usually will differ from district to district. The four important elements include:

1) Full descriptions about the district and how it is organized, including the communities it serves.

2) A detail explanation for the overall missions and objectives of the district. It includes how the facilities fit into fulfilling those purposes.

3) A clear account of the facilities which operated by the district with appraisal of their adequacy for meeting overall goals. This element involves the assessment of a building by building of improvements listing for expected years of completion which ranked projects are completed by need and based on the expected remaining life of building systems. Furthermore, plans for reducing the backlog should be implemented to the districts with deferred maintenance.

4) In order to fund desired improvements, the assessment of the financial resources is required. Projections of operating and capital costs are important to give school boards and other policymaker information to anticipate upcoming financial needs. However, in cases of major improvements, it is advisable to involve a range of project alternatives instead of a single solution, where each option of estimated costs and level of service is list down.

To be more precise, the ten-year plan requires annual review and updating which involved recalculate cost estimates based on updated condition levels and current costs of equipment and labour. Besides, it is necessary to update because projections of deferred maintenance may decrease due to completed projects or increase from on-going deterioration. Building administration also needs to revise costs and building information with their best professional estimates because of the general uncertainty which involved with long-range forecast.

2. Develop a Capital Improvement Program

Information from the long-term plan provides a base for a capital improvement program. Briefly, a capital improvement program is a schedule of capital improvements which listed in priority order over a number of years. As the alternative to the long-range plan, the capital improvement program is a set of proposed actions. Specifically, it proposes a specific project to meet the needs which have been identified in the long-range plan. The capital improvement program will identify a specific course of action the school district intends to take from the alternative options. A typical capital improvement programs usually include remodelling and new construction as well as the major maintenance projects.

Capital improvement programs should be develop especially in all school districts that own facilities to accurately prepare for the future needs and costs of their physical plant. Building managers should base their estimates on building components' remaining useful life when estimating the costs for the capital improvement program. This is mainly because some components that have been neglected will have an older "effective" age which requires earlier replacement than those that have been well maintained. Officials that develop the capital program should update its cost estimates annually to account for inflation and changes that occur to the buildings.

3. Establish a Reserved Account

From year to year, maintenance and planned replacements are differing. Larger expenditures are required for some major projects such as reroofing, tuck pointing brick

exteriors, and replacing a boiler or the cooling tower. Consequently, in order to provide funding for the renewal of building components, districts need to reserve an amount of money for each year. Simply put, reserved accounts spread out over many years for the payment of replacing those building components.

The requirement in establishing reserved funds is to place high priority on renewing building components when setting budgets by the district. Beneficially with reserved funds, districts affirm the significance of an on-going investment in preserving their physical plant. The information of building condition assessments, calculations of components' useful remaining life, and accurate estimates of project costs are some of the important factors to plan for an adequate reserved funds.

4. Develop an Annual Work Plan

Strategic long-term goals and objectives developed for a district's buildings are important to develop an effective annual work plan and budget. All expected maintenance projects for the year which involving preventive maintenance, general maintenance, major and minor repairs, custodial operations, alterations, and construction should be list in the work plan. Besides, projects needed to reduce backlogs of deferred maintenance should also include.

5. Link Work Plan to Annual Budgets

Pursuing this further, the annual work plan should link directly to the yearly maintenance budgets. Only when projects in the work plan are included in operating or capital budgets it can be transform from ideas into reality. Building managers responsible to balance maintenance needs against available funding in the budget.

The annual budget helpful to show how much money is needed for each project in the annual work plan, which also including projects intended to reduce maintenance backlogs for the coming year. The development of the budget requires the preparing of cost estimates for annual operations such as personnel and supplies costs, as well as for capital costs such as making major repairs.

The costs of buildings' identified needs, the extent of deferred maintenance, and the planned period over which the district hopes to reduce building deficiencies are important to decide the amount of spending needed for facility maintenance. Higher spending in any given year will bring the conditions to their desired level faster while lower spending may lengthens the time. However, no single rate of maintenance spending applies to all buildings and its maintenance process.

2.6.2 Structure a Framework for Operating a Preventive Maintenance Program

Preventive maintenance is defined as inspecting, adjusting, lubricating, testing, and replacing on a regular basis. Therefore, building managers need a framework that supports the preventive maintenance program to ensure it is implemented effectively. The responsibility of a building manager should include:

(1) Coordinate preventive maintenance progress with other maintenance projects.
(2) Prepare a checklist and outline of preventive maintenance tasks.
(3) Schedule a timeline for all of the tasks assigned.
(4) Prepare the standard of procedures for managing the program.
(5) Involve preventive maintenance together among activities for controlling the quality of air inside the buildings.

1. Coordinate the Program with Other Maintenance

Usually, in most cases of districts the preventive maintenance projects will be performed among the other maintenance requests. Therefore, in order to ensure all works are assigned to the appropriate personnel and performed when it is supposed to be, the overall maintenance program requires a systematic coordination.

In the other words, this also shows the responsibility of designing the coordination by a specific individual or department. The responsibility to synchronize all maintenance job including preventive, general, and emergency maintenance should be conducted by a coordinator. Positively, this lodges accountability for managing maintenance process with specific staff. Moreover, it is important to ensure that the

maintenance projects of one type do not interfere with any other, such as repainting a wall which is soon to be modified as a part of remodelling project.

2. Develop Checklists of Tasks Including Their Frequency

Every piece of every building system is not necessary to be included in a preventive maintenance program because it is prohibitively expensive. Such effort would take more time plus the outcomes are unlikely to justify the expenses. Equipment that is inexpensive and easy to replace should be exclude from a preventive maintenance program by the building managers.

In advance, building managers have to determine which equipment is critical to the continued safe operation of the building, carries high expenses of repair or replacement cost or is difficult to purchase "off the shelf".A checklist of preventive maintenance tasks should be develop after the items to include in the program have been decided by the building managers. Besides, the checklist should include the details specification for each type of equipment such as what inspections, calibrations , lubrications, or replacements are needed.

To be precise, the checklist should also indicate the frequency of the preventive maintenance task. Whether the task is to be performed weekly, monthly, annually, or at some other interval, it will be specified in the timetable for servicing equipment.

Building managers should rely to the recommendations by the manufacturers of the specific equipment in order to produce the checklist. This is because, manufacturers' guidance will indicate which preventive maintenance tasks are necessary and suitable to their frequency. This is really important because in some cases, manufacturers' warranties remain in effect only if owners conduct the required preventive maintenance.

Nevertheless, realistically in the industry, manufacturers' recommendations are not always available. Other than that, some other sources are also helpful for the checklist which including the records of the equipment's maintenance history,

employees' experience, preventive maintenance guides which are prepared by the industry groups and trade associations, as well as the building or other safety codes or standards.

3. Schedule Timelines to Perform Tasks

In advance, building managers should prepare one-year schedules of the preventive maintenance tasks to be performed as part of the annual work plan. The timelines of the progress should be referring the equipment manufacturers' recommendations or other predetermined intervals.

The schedule should have all details especially when the tasks are to be completed and estimated amount of time needed for each activity. Then, it should list all activities that need to be completed for each week in the year.

Additionally, building managers should time the projects to minimize disruptions to the building users and take advantage of equipment down times when setting the schedule. In the same way, consolidating multiple tasks within a single building or scheduling the similar types of work together helps to maximize the efficiency.

4. Adopt Written Procedures to Manage the Program

Procedures are needed to guide how the program is planned and budgeted and how the actual work will be coordinated in order to adequately manage a preventive maintenance program. A written procedure of manual is required. Beneficially, following a procedures manual are helpful to bring consistency to the program. Besides, it also offers some control over activities that might otherwise be done haphazardly or not at all.

Written procedures will differ according to the district but it should typically address the certain elements. For instance, who is responsible for controlling work orders and administering staff should be established in the procedures. Furthermore, procedures should specify a cost-accounting system as well as the format for reporting the budget to aid in the budget preparation.

In addition, procedures should define the responsibilities expected of each trade represented on staff for managing the maintenance projects. What work is expected from each trade and help to coordinate multiple tradespeople who may be involved in a single project need to be included in the procedures as well. Specifically, written procedures are helpful for employees to understand what is expected of them.

On the other hand, if districts employ outside help to perform maintenance, they should follow procedures on and it will be helpful to supervise them while on the job. Plus, the procedures must specify the services for which contractors will be used especially for the services that are performed infrequently or that require special equipment or expertise such as roof repairs.

Another reason why building managers should have procedures is to achieve good contracts. Significantly, effective contracts from the historical practice explicitly stated:

(1) The quality and quantity control of the needed services.
(2) The specific measures to determine the service quality.
(3) The steps to take if the service provided is inadequate.

Consequently, contracts that are lack of criteria for defining the satisfactory work could prevent local jurisdictions from verifying proper completion of the job. Moreover, written procedures are essential to control the inventories of the maintenance department's materials and equipment. The person who is responsible for monitoring and requisitioning parts and equipment should be assigned to ensure the adequate supplies of materials are on hand when in needed without overburdening available storage space.

Last but not least, it is important that the building managers to have procedures on how to manage emergency situations. This is beneficial so that the staff will know their responsibilities and appropriate roles when having emergencies such as storms or electrical failures. With formal procedures designed in advance, it will prevent a minor emergency to quickly escalate into a major one.

2.7 Budgeting and Controlling Cost for Maintenance Management

2.7.1 Budgeting the Maintenance

To begin, a budget can be defined as a financial and or a quantitative statement forecast of an individual's or organization's income and expenses which are expected in some period of time for the future. Presently, in most national budgets maintenance process is always at the bottom of the agenda. The additional costs on building maintenance will only downscale the commercial achievement. In the future, it will be somebody else concern if any problem arise from the lack of maintenance. Therefore, according to (Shen and Spedding, 1998), the budgets for building maintenance cannot meet the necessity of ever-increasing maintenance which resulting the problem of deferred maintenance which is common in most countries.

After some process of inspections, critical analyses and estimations, the budget limits will be established using the provided essential supporting data as previously described. Significantly, one of the major management functions is to implement budgetary control which important to plan and control the use of its resources in order to achieve its objectives. The maintenance budget was calculated based on the previous years of allocations plus the percentages. Nevertheless, the skills and empiricism of the building maintenance manager with their wide range of experiences in the construction projects, performance and the cost of repairing the buildings are very useful and important to provide a sound base for budgeting since there is no standard method for budgeting. Described by (Ivor H.Seeley 1984), an effective budgetary control system must satisfy the following criteria:

a) A clear understanding of aims and priority order.

b) An organized analysis with a proper evaluation of the needs and demands from the main objectives.

c) A reasonable balance of those demands against the desired purposes within the acceptable constraints of labour, material, time, management skills and funds.

d) The prevention of waste especially in the context of financial resources.

e) An efficient control system is develop based upon some aspects such as the identification of needs, an adequate measurement of resource requirements, setting of work standards, performance measurement, the evaluation of significant deviation from standards and the control of present and future opportunities through this knowledge.

2.7.2 Controlling Cost for the Maintenance

In the process of maintaining the building, cost controlling is one of the biggest duties for the maintenance manager. An efficient control of cost is able to prevent unnecessary works that can cost a waste to the maintenance budget. The definition of management process of controls is described by Ray G.H (1989) as:

1) Performance standards are set at the appropriate level to gain proposed objectives.
2) Actual performance is measured and compared to the outlined standards.
3) Appropriate actions are taken especially in the event of actual performance deviating from its standard.

According to (Jarman M V 1985), he has outlined following guide to achieve an effective total cost control as:

1) An absolute knowledge about the relationship between budgeting and finance.

2) A proper breakdown arrangement of the budget into specific sections under capital and revenue with appropriate reference to renewals and replacements.
3) The factors which potentially affecting the budget are assessed reasonably including the plan for maintenance progress.

4) The result of non-maintenance problem such as loss of amenities or productions due to the breakdown of excessive running costs and increased health hazards are evaluated.

5) Budgetary control should include a calendar programmer for authorisation and implementation of plans for capital, renewal and replacement expenditure.

6) Using the accurate techniques of costing which involving cost coding and methods of classification systems for cost collation and investigations as well as for control purposes, feedback of relevant cost information is needed.

2.8 Summary

Buildings and its structures are the precious assets for the sectors of either government or private. Significantly, in the effort to maintain a good conditions of buildings, the development of an effective and efficient maintenance management should be prior. To conclude, there are four criteria that should be considered which including the organisations structure and general responsibilities of maintenance management, the maintenance policies and standard for maintenance, the maintenance management planning and scheduling and the maintenance management for budgeting and cost controlling.

CHAPTER 3

METHODOLOGY

3.1 Introduction

To begin, chapter three described and outlines the method of how researcher seeking for answers to the research questions issue from the research problems statement. Furthermore, throughout the research methodology, the variables of the study are operationalised by the researcher as well as in the collection of data phase, the instruments of proposed research used are also defined. Significantly, the techniques which implemented in the analysis of the data that are collected by the researcher are also included in this chapter.

In addition, the questionnaires of survey conducted have been distributed to the respective organisations of the public school within the district of Kuantan. In order to fulfil the objectives of the study, a standard set of questionnaires have been prepared. This questionnaire is provided only to be answered by the school personnel. For instances, the respondents including the principal, senior staff, teachers as well as who are involved in monitoring the maintenance work of the school directly.

3.2 Thesis Structure

There are five phase involved in the progress of this research. The first one is the introduction and background of study, the proposal of determination the problems, and the objective established from this research. Secondly, the next phase is continuing further on the literature review section.

Additionally, the third phase of the study is managed regarding a methodology of the thesis. Next, the phase is continued to handle the result and making discussion. Besides, the most important aspect in this phase is the discussion of the result of case study and the questionnaires analysis. Lastly, the final phase of this research involved the conclusion and recommendations which are carried from the analysis of results.

3.3 Data Collection

3.3.1 Primary Data Collection

a) Observational Surveys

Mainly focus on the condition assessment, the observational surveys will be conducted on the sampled buildings. In order to form the basis of the observation schedule, it is important that the researcher have predetermined aspects of maintenance condition on a building. Moreover, the main idea in forming the observation schedule is to record the status of the buildings condition as they are in their natural setting. Therefore, as a non-participant observer, the observation and recording of the phenomena which concern to the study are simply conducted by the researcher.

b) Questionnaires

In consider to reduce the time and cost involved, the researcher proposed the use of questionnaires which will be self- administered to the respondents. The purpose of designing the questionnaire is mainly to ensure the information obtained conforms to the research objectives and able to assist a better understanding about the research problem. Therefore, the set of questionnaire will be constructed in a manner which are able to cover the areas that relates to the main study objective.

In order to get the correct respond from the users, some data is needed to construct the list of question to be asked. For instances, the population of the building occupied and the age of the buildings and its structures. Also, brainstorming session is a

must so that the appropriate questions can be identified to get the accurate information from the users. Lastly, the step is proceeding further to the distribution of the questionnaires to the targeted respondents.

During the process of collecting the primary data, the session will start with an explanation on the purposes of the research to the school personnel in order to give them general view about the objectives of the study conducted. In the meantime, some information are gathered instantly during the interview session with the staffs. Then, the set of standard questionnaires are given to the respondents who were involved directly with full of professionalism and exact knowledge to complete the objective of this research. These individuals are involving the school personnel with different positions from the school principal, senior assistant and teachers. There are sixty two (62) set of questionnaires prepared which have been distributed to the public schools in Kuantan area. For each school, there are about five to ten averages numbers of questionnaires distributed. Other than that, to obtain more information on maintenance services, the researcher has referred the maintenance department which responsible in supervising several school building in Kuantan. Throughout this effort, the researcher could identify the existing procedures and techniques which have been carried out to implement and supervise maintenance works. Additionally, there are also certain data which is gathered from the professional such as a previous researcher Mr, Nazaruddin Mohd Jali (2001) who have contributed his findings on the implementation of maintenance in public school.

In addition, the questionnaire is important as it used to get the data from the user of the building. The information which need to be obtained from distribution of questionnaire including the problems of building maintenance management system, the requirements in implementing effective maintenance management system and the importance of an effective and efficient management system.

3.3.2 Secondary Data Collection

Secondary data can be defined as the data collected from analysis of relevant literature reviews and the records which can be obtained from the maintenance departments and internet sources from the World Wide Web. In this research, both primary and secondary data were extracted as the primary data are gathered from observations and questionnaire which have been distributed to the targeted respondents. In the meantime, secondary data have been collected as the literatures reviews from various sources such as journals, published materials as well as the previous studies which written on similar topic.

Literatures reviews conducted from various sources exposed on an application of IDEF0 Modelling Methodology, factor of effective and efficient maintenance management, policies and standard for maintenance, maintenance management planning and scheduling, as well as the techniques of budgeting and controlling cost for maintenance management.

3.4 Survey Population

Generally, the study has involved many respondents from different level of positions in the school organization. For instances, teachers, senior assistants and principals who are important in organizing the system of school management. The total number of public school involved in this research is 10 school with 6 primary public school located at Kuantan. Additionally, the population of schools are about 400 to 500 people including teachers and all students.

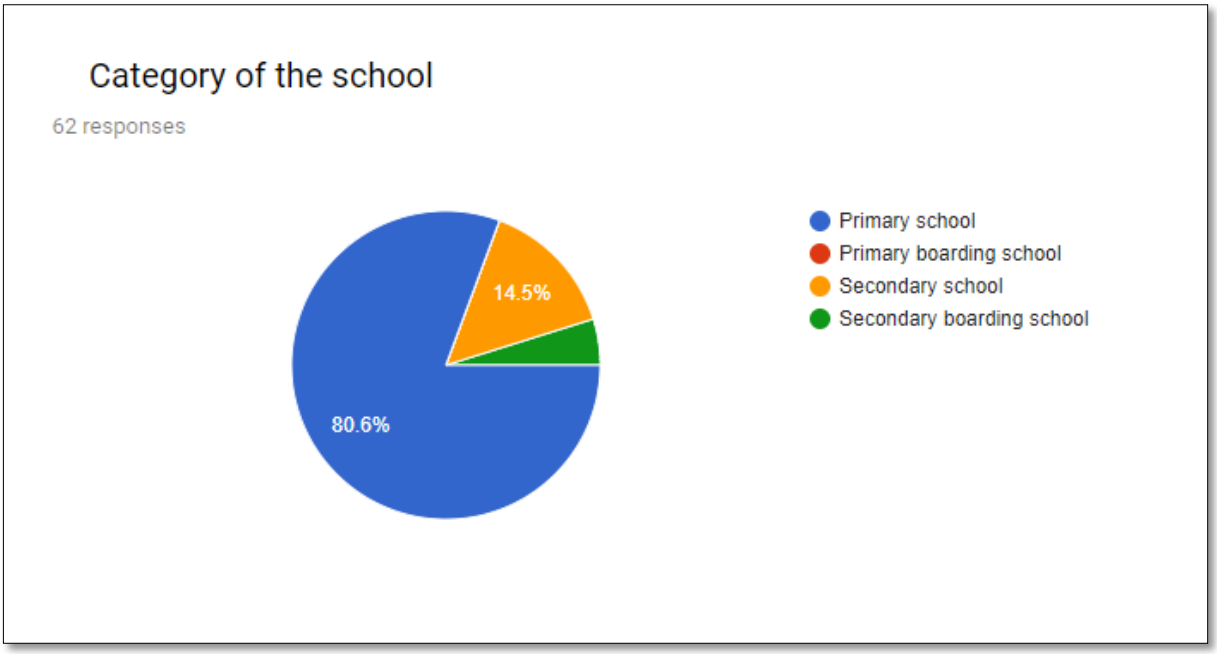

Figure 3.1: The category of public school distribution where primary school (50), secondary school (9), and secondary boarding school (3).

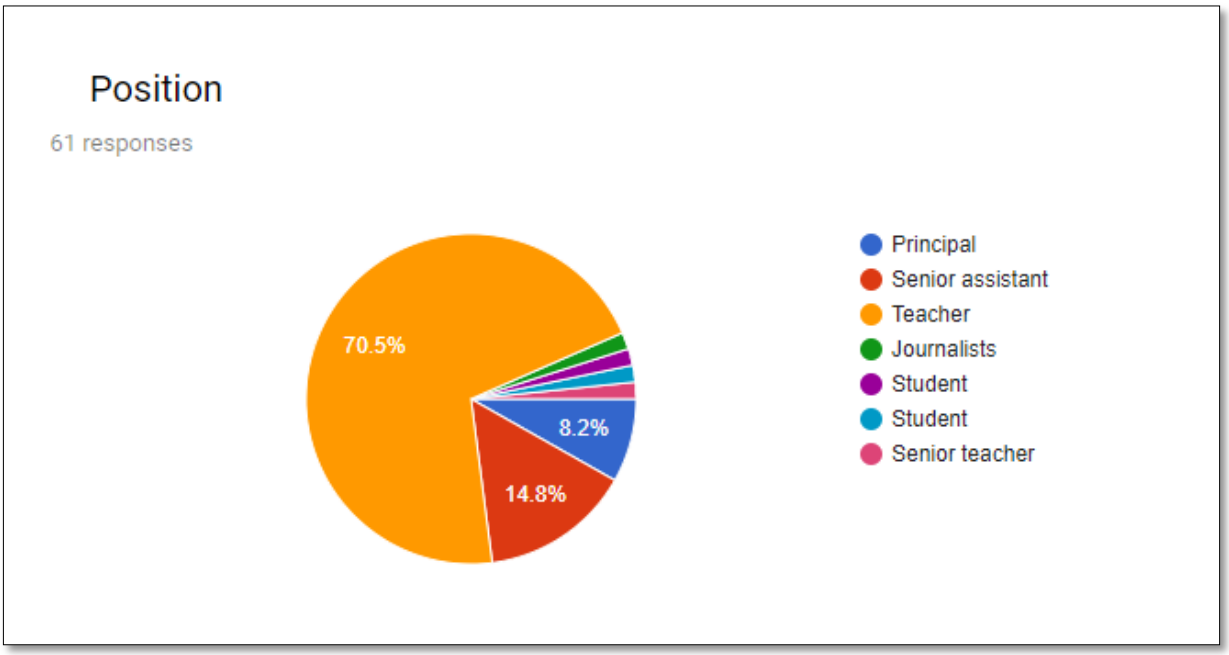

Figure 3.2: The distribution of respondent positions where Principal (5), senior assistant (9), and teachers (43).

Table 3.1: The survey questionnaire distribution

(Sources : School Department Ministry of Education)

NO	PPD	CODE	SCHOOL NAME	SCHOOL ADDRESS	POSCODE	CITY
1.	PPD KUANTAN	CBA4001	SK TERUNTUM	JALAN GAMBUT KUANTAN	25000	KUANTAN
2.	PPD KUANTAN	CBA4092	SK TOK SERA	JALAN TENGKU MUHAMMAD KUANTAN	25050	KUANTAN
3.	PPD KUANTAN	CBA4089	SK SUNGAI ISAP	JALAN GAMBANG KUANTAN	25150	KUANTAN
4.	PPD KUANTAN	CBA4065	SK (FELDA) SUNGAI PANCHING UTARA	(FELDA) SUNGAI PANCHING UTARA KUANTAN	26250	KUANTAN
5.	PPD KUANTAN	CBA4014	SK TANJUNG LUMPUR	TANJUNG LUMPUR KUANTAN	26060	KUANTAN
6.	PPD KUANTAN	CBB4028	SK PEREMPUAN METHODIST	JALAN GAMBUT KUANTAN	25000	KUANTAN

3.5 Data Analysis

In order to perform the research methodology, the questionnaires have been distributed to the selected school at Kuantan to collect the primary data. From the questionnaires result obtained, the statistical data analysis will be conducted in order to fulfil the condition of survey requirement. In this manner, the survey is performed on the current maintenance practice of public school building and information is gathered by analyzed the answers given by the respondents. The data collection presented from the reading materials and surveys by questionnaires are analyzed thoroughly to determine the best practice to be implemented as strategic and effective maintenance planning for public school system in Malaysia.

Pursuing this further, in order to measure the result gained from the respondents, the data gathered by questionnaire distribution will be analyzed by using the method of average index formula. The purpose of using this formula is to determine the ranking of parameters which are given to represent each answer in the questions.

According to the objectives of the study, a research is conducted by expressing several questions related. The majority of the questions in the questionnaire are given five point Likert Scales to represent the answers. In addition, the five point scale is more suitable especially for multi variant analysis than smaller ranges.

The respondents involved in the survey are required to rate against the five-point scale. The scales are expressed in which all the response answers are categorized as 1). "Highly Disagree", 2). "Disagree", 3). "Not Sure", 4). "Agree", and 5). "Highly Agree". These scales are designed to rate respondent's opinion towards their maintenance management system of their schools. The answers are represented in linear scale choices with the "Highly Disagree" response category on the left side and "Highly Agree" on the right side in the questionnaire.

The average index is calculated using the formula as follow:

$$\textbf{Average Index} = \Sigma (a X), X = n / N$$

a = the constant number which shown the value for every hierarchy of importance given to the respondents (1 to 5).

X = **n** / **N** where

,

n = The frequency of response from respondents.

N = Total respondents involved.

Table 3.2 shows the average index and the rating scale which using the method introduced by Abdul Amjid et al (1997) as follow:

Table 3.2 : Rating scale of average index

Avearage Index	Rating Scale
Highly disagree	0.00 – 1.50
Agree	1.51 – 2.50
Not sure	2.56 – 3.50
Agree	3.51 – 4.50
Highly agree	4.51 – 5.00

3.6 Summary

To conclude, this chapter reviewed and discussed briefly the methodology used in the study. The research methodology has been performed by conducting a survey by the distribution of questionnaire to the parties who are related to this study. After that, the analysis of collected data is conducted using Average Index Analysis method. The primary and secondary data collected from various resources such as journals, published materials, magazines, news, and pages of World Wide Web. Other than that, researcher also put an effort in intensive literature reviews on strategic planning, maintenance management and public school. For further discussion of findings analysis and results, it will be deliberate in the following chapters.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

Pursuing the study further to the analysis of data, chapter four will discuss briefly the implementation of the existing maintenance management system in the public school. The primary data collections are gathered from a total of sixty two (62) sets of questionnaire which have been sent to the selected primary school within the district of Kuantan. For instances:

1. SK TERUNTUM
2. SK TOK SERA
3. SK SUNGAI ISAP
4. SK (FELDA) SUNGAI PANCHING UTARA
5. SK TANJUNG LUMPUR
6. SK PEREMPUAN METHODIST

The questionnaire is divided into four sections. First section describes about the respondent profiles and followed by the second section which outlines some question which related to the problems of building maintenance management system in public school of Malaysia. The next section is identifying the requirements in implementing effective maintenance management system in public school of Malaysia. Lastly, the questionnaire is complete in the section four which on the importance of implementing effective maintenance management system in public school of Malaysia.

To conclude, this survey is conducted to identify the major problems of building maintenance management within public schools in Malaysia, in order to improve the effectiveness and efficiencies of current maintenance operation in schools' buildings. The participation in this survey is voluntary and their answers will be kept confidential.

4.2 Findings

4.2.1 Background of Respondents

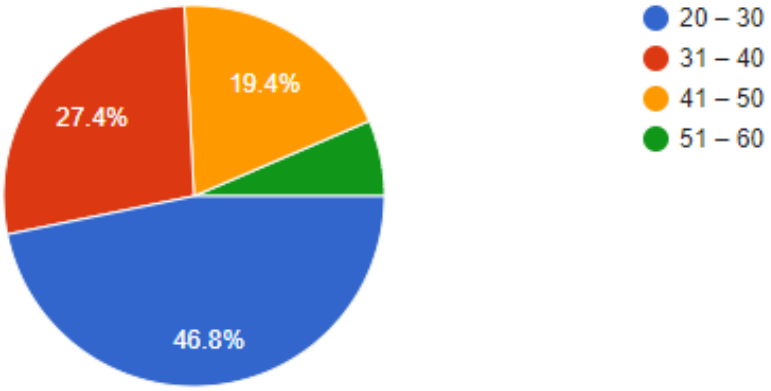

Figure 4.1 The distribution of respondents' age.

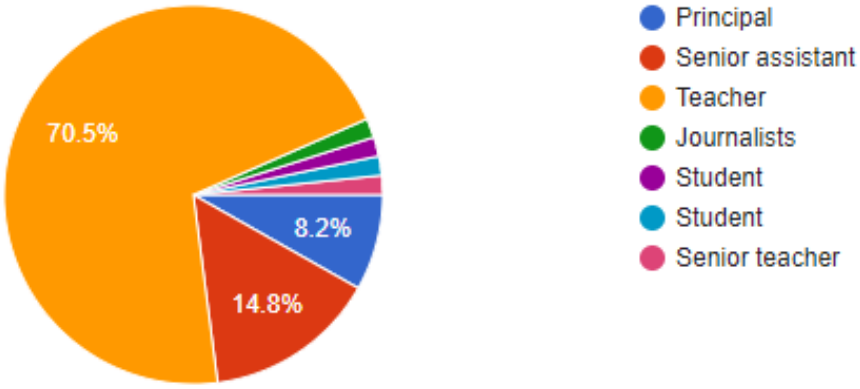

Figure 4.2 The position of schools' personnel.

The pie charts shown in the Figure 4.1 and Figure 4.2 describe the background distribution of the respondents. Generally, this survey involved 46.8% of majority with ages 20 to 30 years old followed by 27.4% of personnel are from 31 to 40 years old and 19.4% have 41 to 50 ages. The least of it could be senior involvement which only 6.5% of 51 to 60 years old.

In addition, this survey encouraged the involvement of various positions of schools' personnel from the highest to the majority. As shown in the Figure 4.2, the pie chart is divided to 70.5% teacher followed by 14.8% senior assistant. While the principals involved is about 8.2%. Plus, principals are the most important person in the school organizations who has the biggest responsibility specifically in the school maintenance aspects which related to this survey. Besides, the cooperation from other respondent groups including teachers and senior assistant benefits in enhancing the results as they have been given their services from one year to maximum twenty years of working experience for that particular school.

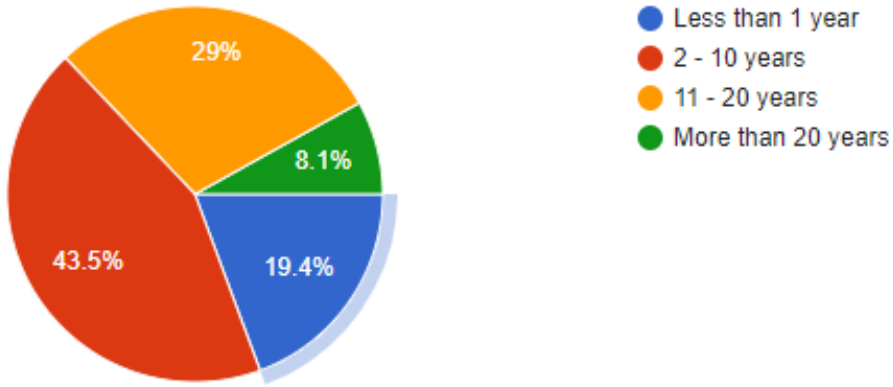

Figure 4.3 The period of working experience by respondents

In consideration of working experience by the respondents, Figure 4.3 indicates that the majority of them as total of 43.5% have given two to ten years of services. While 29% of respondents have eleven to twenty years working experiences followed by 19.4% has experiences less than one year and only 8.1% have working for more than twenty years.

Pursuing this further, in the process of observational surveys conducted before, some interviews and questions have been asked in order to gather some information on the schools buildings and its operations. In order to identify the conditions of buildings and facilities through the implementation of maintenance management system for public school, it is important to know how long the buildings have been used. From the interview sessions, it has been found that most of the schools involved have been established for above than twenty years plus the buildings have been operated for more than ten to fifteen years.

The lack of maintenance practice from the early years of school operation can be reflected by the factors of age of the particular school building. Also, information on the implementation level of maintenance practices for the particular building could be provided by using time frame as a benchmark.

When the age of building operated reaching to five years, it must be maintained as some structures may start rotting. In order to preserve highest performance of its design, that particular building will need an extra care than normal structure as well as the continuous maintenance services. Other than that, the current building condition could be another implication of poor maintenance practice which related to the building ages. For instances in the case of public school, if building structures, components and the facilities are still in good condition although the school has been operated almost for twenty years and above thus it proves that there are possibility of continuous maintenance implementation.

Normally, condition inspection or survey will be used as the method to evaluate the implementation of maintenance practice in the school building. In this manner, the relation between the building condition and ageing factors can be clearly seen through its performance. In addition, the most critical area needs to be emphasised as the structures probably need an immediate maintenance action. In consequence, this data provided can be advantages to establish the actual condition of the school by maintaining the design performance.

4.2.2 Problems of Building Maintenance Management System in Public School of Malaysia.

Table 4.1: The distribution of percentage scales rated by 62 respondents.

Problems of Building Maintenance Management System	Total Rates (%)					Index Number
	1	2	3	4	5	
1. Skilled manpower shortage.	0	5.2	13.8	37.9	43.1	3.92
2. Employee has no specific knowledge in property management.	0	9.7	22.6	25.8	41.9	4.00
3. Building information are not updated.	3.2	6.5	11.3	38.7	40.3	4.06
4. Insufficient knowledge in maintenance management	1.6	6.5	12.9	33.9	45.2	4.15
5. Overlapping responsibilities.	1.6	1.6	16.1	33.9	46.8	4.23
6. Insufficient financial resources.	1.6	1.6	9.7	27.4	59.7	4.42
7. Communication failure due to the complicated procedure.	1.6	1.6	18	31.1	47.5	4.15
8. Difficulty in accessing information.	1.6	3.2	17.7	25.8	51.6	4.23
9. Lack of employees.	1.6	4.8	16.1	29	48.8	4.18
10. Poor management culture.	3.2	3.2	14.5	30.6	48.4	4.18
11. Inadequate space for information storage.	1.6	4.8	21	32.3	40.3	4.05
12. Communication barrier between top management and subordinates.	0	8.1	17.7	32.3	41.9	4.08
13. Buildings are not optimally used.	3.2	8.1	14.5	29	45.2	4.05

Table 4.2: Rating scale of average index.

Rating Scale	Average Index
1	Highly disagree
2	Agree
3	Not sure
4	Agree
5	Highly agree

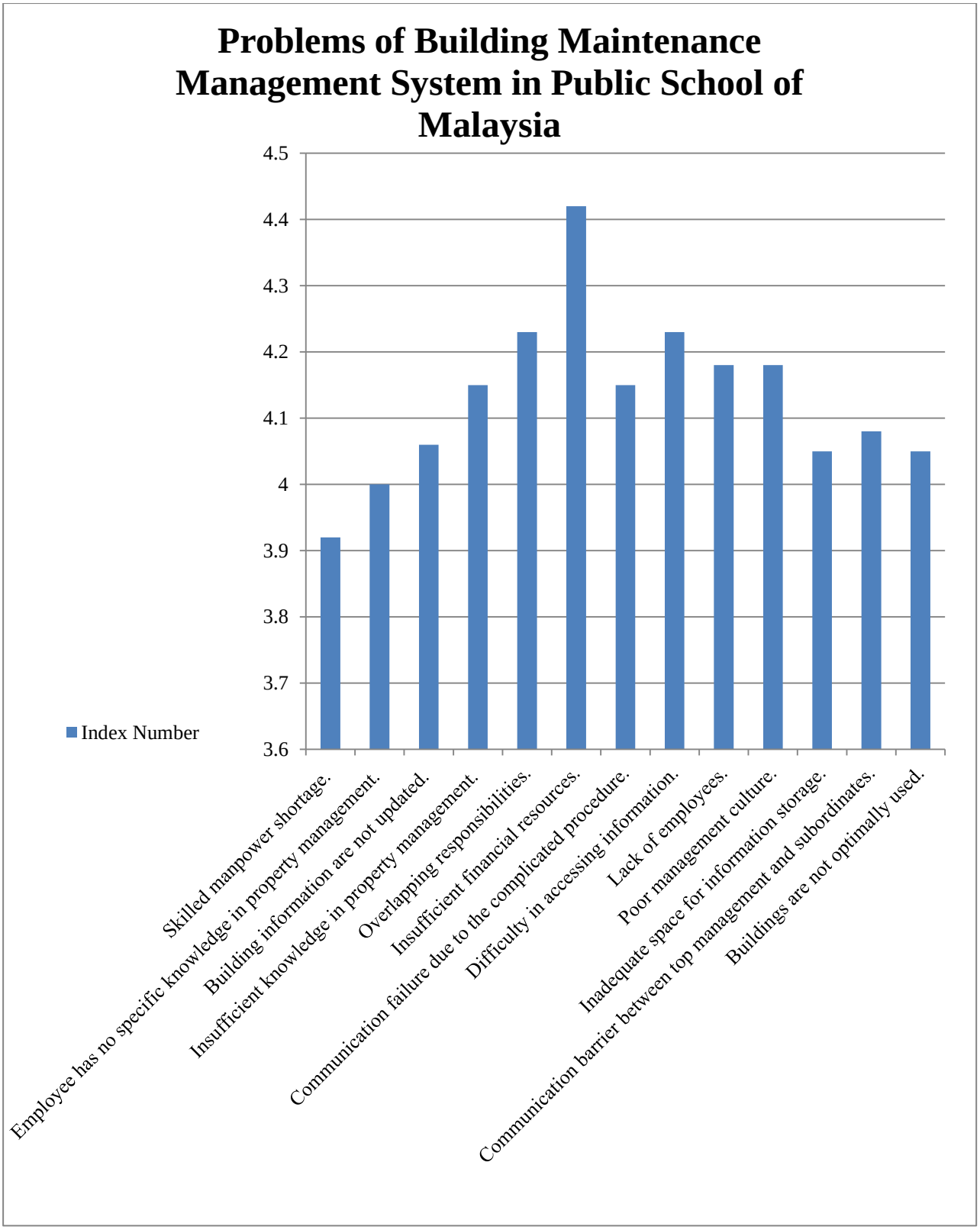

Figure 4.4: Bar Chart Index of Problems of Building Maintenance Management System in Public School of Malaysia

The second section in the questionnaire is useful to investigate on the matters related to the problems of building maintenance management system in public school of Malaysia. There are a lot of problems involved in the system, however some of the major have been outlined in the section of questionnaire and it is important to examine how severe the difficulties faced by the particular school. As the result, Table 4.1 and Table 4.2 indicates that 81% of respondent agreed that the shortage of skilled manpower has become one of the problems. 67.7% of respondent believes that the employee has no specific knowledge in property management and 79% agreed the building information are not updated. While the factors of insufficient knowledge in maintenance management and overlapping responsibilities have 79.1% and 80.7% people admit.

Obviously, the most severe problem could be insufficient financial resources and difficulty in accessing information as it has the highest votes with highly agree as much as 59.7% and 51.6%. Other than that, 78.6% and 77.4% of respondent admit that other factor includes communication failure due to the complicated procedure and the lack of employees. Moreover, poor management culture, inadequate space for information storage and communication barrier between top management and subordinates has been agreed by 79% and 72.6% and 74.2% of respondents. However, apart from all factors described, the problem of buildings are not optimally used has the biggest percentage of disagreement as 11.3% of respondents disagree.

To be specific, there are two problems which have been voted with the highest percentages of highly agree scale. Therefore, the problems of insufficient financial resources and difficulty in accessing information should be given more attention plus reliable actions must be taken in order to resolve these issues. To discuss on these problems, the management has the authority to control the budget on maintenance based on their financial instruction. To be precise, that particular school necessary requirements determine the maintenance allocations. Good information and an easy access should be important to manage data requirements. Thus, this can relate how difficulty in accessing information affects the implementation of effective maintenance management system.

4.2.3 Requirements in Implementing Effective Maintenance Management System in Public School of Malaysia.

Table 4.3: The distribution of percentage scales rated by 62 respondents.

Requirements in Implementing Effective Maintenance Management System	Total Rates (%)					Index Number
	1	2	3	4	5	
1. More cooperation is needed from staff in order to improve your school condition in terms of maintenance.	0	3.3	11.5	32.8	52.5	4.27
2. The principles have to plan the right maintenance scheduling system.	0	0	8.1	37.1	54.8	4.47
3. There are more actions should be taken to improve the existing maintenance condition.	0	0	11.3	30.6	58.1	4.47
4. Gain more information on the services of maintenance.	0	0	12.9	33.9	53.2	4.40
5. Used qualified professional and equipment in maintaining the school.	0	0	12.9	30.6	56.5	4.44
6. Better control of maintenance practice especially for structure system in term of number of work required.	0	0	11.3	32.3	56.5	4.45
7. Allocate a sufficient budget allocation.	0	0	6.5	32.3	61.3	4.55
8. Appoint well-trained personal in maintenance team.	0	0	9.7	32.3	58.1	4.48
9. Increase motivation to related parties in the school organization.	0	1.6	11.3	25.8	61.3	4.47
10. Comprehensive maintenance works and strict policy.	0	3.2	9.7	32.3	54.8	4.39

Table 4.4: Rating scale of average index.

Rating Scale	Average Index
1	Highly disagree
2	Agree
3	Not sure
4	Agree
5	Highly agree

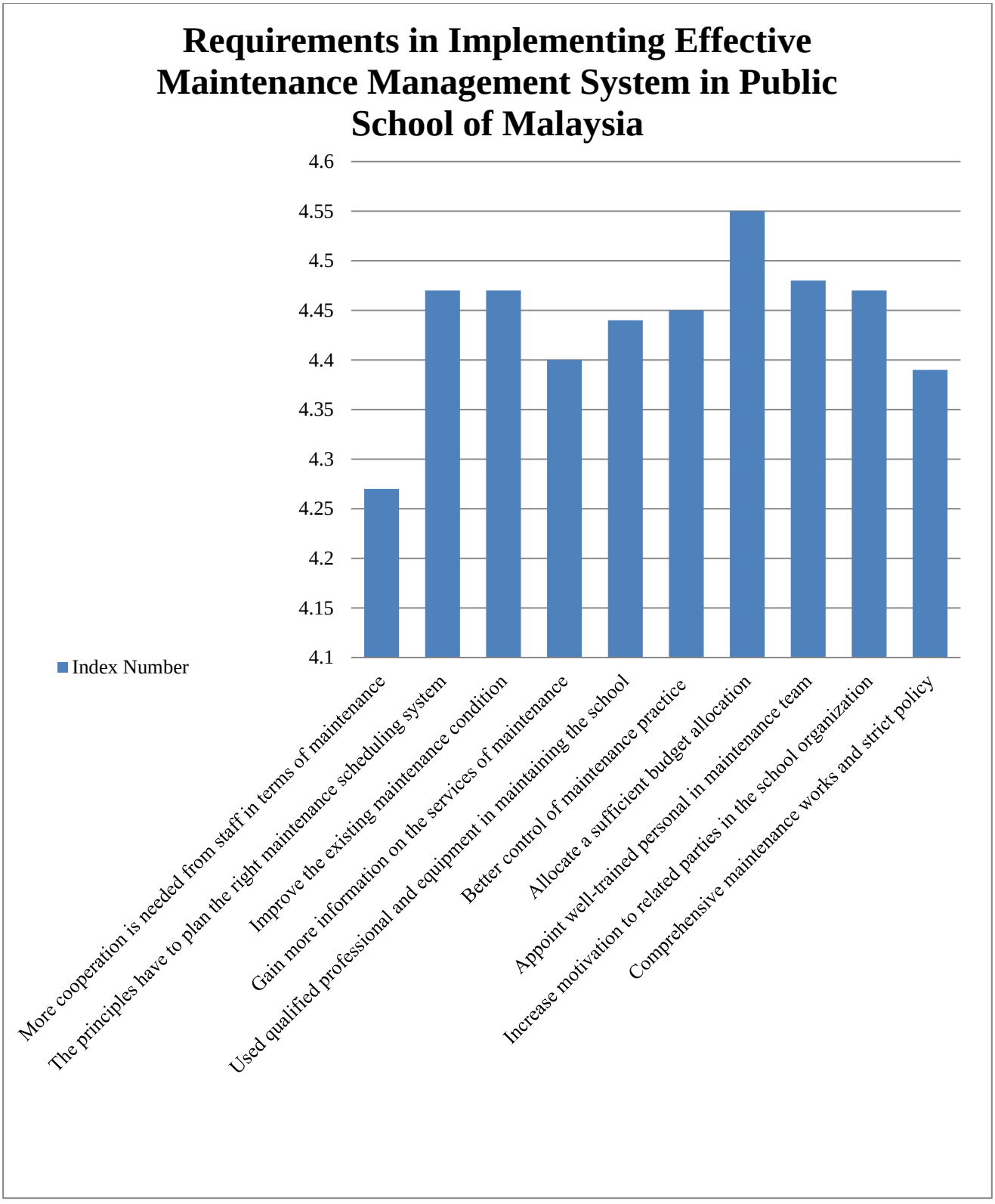

Figure 4.5: Bar Chart Index of Requirements in Implementing Effective Maintenance Management System in Public School of Malaysia

In order to find the best solutions and strategy of effective maintenance management, this survey has examined the main requirements of the system implementation. For this purpose, the third section in the distributed questionnaire has outlined a few requirements in implementing effective maintenance management system. Based on the respondents' opinion, they have rated the options given according to the management system of their schools respectively.

Table 4.3 and Table 4.4 indicate that 85.3% of respondents agreed that the implementation of effective maintenance management system requires more cooperation from staff to improve the condition of schools organization in terms of maintenance. Besides, 91.9% and 88.7% of respondents believe that the principles have to plan the right maintenance scheduling system as well as there are more actions should be taken to improve the existing maintenance condition in their particular school buildings. In addition, other requirements included gaining more information on the services of maintenance which agreed by 87.1% of respondents, 87.1% of them also vote the uses of qualified professional and equipment in maintaining the school, as well as the point of better control of maintenance practice especially for structure system in term of number of work required is admit by 88.8% of respondents.

Significantly, there are two components which have been voted by the respondents with a highest percentages of highly agree scale which include sufficient budget allocation and to increase the motivation to the related parties in the school organization. The two components have been agreed by 93.6% and 87.1% of respondents with both have 61.3% respondents who chose highly agree. Similarly, other requirements of appointing well-trained personal in maintenance team and implementation of comprehensive maintenance works and strict policy achieve 90.4% and 87.1% agreement.

4.2.4 The Importance of Maintenance Management System through Strategic Planning

Table 4.5: The distribution of percentage scales rated by 62 respondents.

Importance of implementing effective maintenance management system	Total Rates (%)					Index Number
	1	2	3	4	5	
1. Increase productivity.	0	0	6.6	41	52.5	4.39
2. Reduce the problems encountered during the process of ongoing maintenance.	0	0	8.1	37.1	54.8	4.47
3. School facilities are appropriately managed and cared for.	0	0	11.3	33.9	54.8	4.44
4. Ensure the safety of occupants.	0	0	6.5	30.6	62.9	4.56
5. Cost effective satisfaction.	0	1.6	6.5	33.9	58.1	4.48
6. Fulfil user expectation.	0	1.6	14.5	27.4	56.5	4.39

Table 4.6: Rating scale of average index.

Rating Scale	Average Index
1	Highly disagree
2	Agree
3	Not sure
4	Agree
5	Highly agree

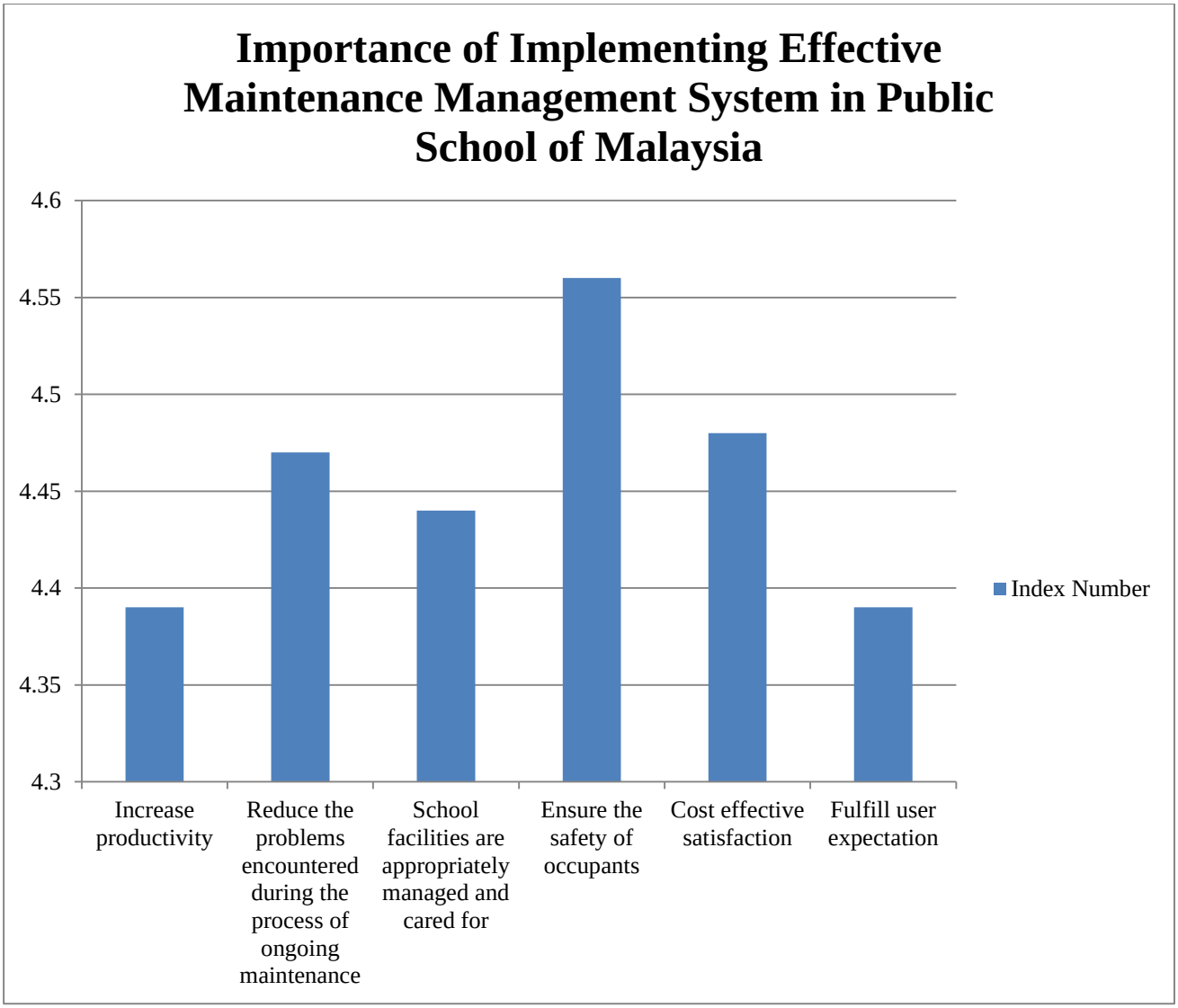

Figure 4.6: Bar Chart Index of Importance of Implementing Effective Maintenance Management System in Public School of Malaysia.

Table 4.5 and Table 4.6 above has shown the percentage of the respondents' result in rating the importance of implementing effective maintenance management system towards the schools organization, buildings' personnel and the public. First, 93.5% of respondents believed that productivity can be increase by implementing effective maintenance management system and 91.9% of them agreed it has ability to reduce the problems encountered during the process of ongoing maintenance.

Furthermore, the implementation of effective maintenance management system is needed to ensure school facilities are appropriately managed and cared for as well as ensuring the safety of occupants and these are agreed by 88.7% and 93.5% of respondents. Significantly, 92% and 83.9% of respondents admit that an effective system is crucial to secure cost effective satisfaction and fulfil user expectation.

4.3 Summary

As the conclusion, chapter four highlighted the components of the implementation of effective maintenance management system for the public school of Malaysia. From the results obtained, all answers and opinion given by the respondents involved have shown that their particular buildings' school need to be maintained as they have been operated more than five years of age. Moreover, from their respond especially related to the questionnaire results, it can be concluded that the effectiveness of maintenance management system and the levels of maintenance conditions still need to be improved. Pursuing this further, because of low levels of maintenance conditions in their schools, majority of the respondents believed that the implementation of the strategic planning into the maintenance system is significant in every schools organization.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Generally, the main ideas of this chapter consist of two parts which are conclusion of the research, and the recommendations for future development. Throughout the elaboration of this chapter, researcher also summarizes the common practice of maintenance management system applied in public school of Malaysia and identifies the problems of building maintenance management system in public school. Furthermore, as the strategic planning in the context of maintenance management is crucial, a broad participation and commitment should include all internal staffs, building personnel and users, as well as the concurrent development of a new management plan reflecting the recommended implementation strategies.

5.2 Conclusions

The efforts in maintaining the nation's education facilities has been more challenging as Malaysian school buildings are aging. Throughout the research implemented, it is found that most of the schools in Malaysia have been operated for more than 5 years. Moreover, for the same reason, routine and unexpected maintenance demands are bound to arise as the performance of building design has been declined. Therefore, the development and implementation of a strategic management plan in every education organization is significant in order to deal with these inevitabilities.

Significantly, the establishment of effective property management system in the public schools of Malaysia should be initiated with the study of current problems in these educational organizations. In the efforts to mitigate or prevent these issues from reoccurring in public school maintenance management system, a better series of solutions may be devised by eliminating these problems.

Pursuing this further, several building defects have been found throughout the research conducted in some of the schools in Malaysia. From the observation carried on the school buildings and its facilities, commonly, the building defects that are occur including fungus stain, erosion of mortar joints, peeling paint, defective plastered renderings, cracking of walls, defective rainwater, roof defects and unstable foundations. Therefore, several recommendations in solving future maintenance problem have been suggested to improve the effectiveness of school buildings maintenance management in Malaysia.

This research aims to accomplish and sustain an effective maintenance process within the public schools organization. To achieve this purpose, the following objectives have been identified as explained in the section 1.3:

1. To study on the common practice of building maintenance management in public schools' of Malaysia.

2. To obtain the information about the problems of building maintenance management faced by the schools' organizations in Malaysia through questionnaire design.

3. To analyse the problems of building maintenance management system applied in public schools' of Malaysia.

In addition, the information gathered with all the data recorded from this research can be utilized as a basis for further study in the same field. In short, the implementation of strategic management plan is important to improve the effectiveness of building maintenance management practice especially in public schools of Malaysia.

5.3 To Identify the Common Practice of Maintenance Management System applied in Public School of Malaysia.

According to the short interview before the distribution of questionnaires towards the respondents, researcher found that majority of the schools have their own scheduling system for the maintenance progress while some of them using their own contingency system in order to maintain the condition of their school buildings.

However, from the observation made by the researcher, the performance of the school which have their own specific maintenance system fall shorts of requirement expectation and need to be improved on the overall school condition because the maintenance implementation only achieved at average level.

Additionally, based on the results of index number obtained from the section 2 of the questionnaire, the main problems which contribute to poor level of building maintenance are due to the insufficient financial resources, difficulty in accessing information, and overlapping responsibilities. Therefore, to ensure the effectiveness of the building maintenance management operate at the best performance, several suggestion have been recommended in this study.

5.4 To Identify the Major Problems of Building Maintenance Management System in Public School of Malaysia

On the other hand, in the process of maintenance implementation, there are several problems faced by Malaysian school maintenance team which involving two different sides. For instances, they have to deal with problems involving the school community and Malaysian Department of Education. Gathered from the secondary data collection or also known as the literature review data, the researcher have compared the findings with the results obtained from the questionnaire. In order to develop an efficient system of maintenance building, all problems related to the maintenance process should be overcome such that the quality, cost and time of maintenance implementation can be managed systematically.

In conclusion, there are several major problems which need to be considered in order to ensure the effectiveness of building maintenance management for the public schools such as:

1. Building information not updated.

2. Insufficient knowledge in maintenance management system.

3. Skilled and specialization manpower shortage in maintenance works.

4. Insufficient financial resources.

5. Communication failure due to the complicated procedure.

6. Inadequate space for information storage.

7. Lack of employees.

8. Poor management culture.

9. Communication barrier between top management and subordinates..

10. Buildings are not optimally used.

5.4.1 To Improve the Maintenance Management System through the Strategic Planning For Public School of Malaysia

By applying the strategic planning concept, most of the schools involved in this research have shown their interest to improve the effectiveness of maintenance management system. Basically, a concept of strategic planning consists of three main elements. The identification of these elements can be seen as the criteria are very common in the management system of Malaysian scenario.

For instances, they include a broad participation and commitment of all users and building personnel to the implementation process, development of performance criteria to change, as well as the concurrent development of a new management plan reflecting the recommended implementation strategies.

According to the data obtained from the questionnaire distributions, majority of the respondents agreed that the main reasons for the implementation of effective maintenance management system in public school include:

1. Increase productivity.

2. Reduce the problems encountered during the process of ongoing maintenance.

3. School facilities are appropriately managed and cared for.

4. Ensure the safety of occupants.

5. Cost effective satisfaction.

6. Fulfil user expectation.

5.5 Recommendations

Average Index Method has been used to analyse all the data gathered from the research. Significantly, throughout the survey conducted, it can be concluded that all schools' organization considered the maintenance aspect as one of the paramount elements in their administration.

Hence, in achieving a better effectiveness of building maintenance management, the following suggestions are recommended:

1. The establishment of specific maintenance department in all school to conduct maintenance works within a standard maintenance policy which fulfil all standard maintenance requirements.

2. Professional, well trained and high skilled person related to maintenance work should be assigned in maintenance department as their responsibility includes the practice of standard maintenance workmanship by or under a close supervision of the superior in their related specialization.

3. Since there are some critical problems which might leads to hidden danger that could risk the safety of public, all complaints related to the maintenance aspect in school must be prioritized as to be monitored by maintenance personnel.

4. Planning, budget estimating, method selection and the requirements of maintenance procedures are the major elements in the process of maintaining the buildings. Significantly for the implementation of strategic planning, these elements also needed to achieve effective and smooth process of maintenance works.

5. In the effort to avoid delays in maintenance operation, priority should be given to the function that needs immediate action. Besides, in the implementation of strategic planning, fast actions are able to avoid the worst condition from existing facilities damage. Additionally, sufficient maintenance budget should be allocated in order to operate emergency maintenance actions.

6. In achieving the objective of schools organization, the awareness of maintenance importance in school building must be well understood by each person involved in the community. School community, which the major users of the buildings should have concerned and appreciates the efforts in conducting effective maintenance practice for the school.

7. The amendment should be applied to the old practice in school maintenance procedures set by the Ministry of Education (MOE). First, to endorse the condition of school buildings, a formal request letter must be submitted to the school maintenance department. The letter should contain all details on the problems including the total calculation on the budget allocation requested by the principals. In order to prevent any risk of accident and ensure the safety of public, MOE should respond to all maintenance report claimed by the school principals immediately.

8. The overall conditions of maintenance aspect should be closely monitored especially by the Public Work Department or Jabatan Kerja Raya (JKR) and Ministry of Education (MOE). As the maintenance works required proper and continuous operations, the progress must be supervised by specialized in building maintenance to ensure the works followed the standard procedures and specifications.

9. The Ministry of Education is recommended to monitor how maintenance funding has been used by the schools' organization to ensure value of money is achieved without significant underspending.

10. In the effort to guide the process of planning and making decisions about property at a portfolio level, Ministry of Education is suggested to improve the systems that are used to hold information about property so that it has a better overview of the entire school maintenance management system portfolio.

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APPENDIX A
SAMPLE APPENDIX 1

- The issues of maintenance management retrieved from the news clipping:


PENDIDIKAN

Syor sekolah cari dana sendiri disokong

Figure 6.1: The news shown on the funding resources issues.

Figure 6.2: The implications of undone scheduled maintenance works

APPENDIX B
SAMPLE APPENDIX 2

BUILDING MAINTENANCE MANAGEMENT IN PUBLIC SCHOOL OF MALAYSIA

This survey is conducted to identify the major problems of building maintenance management within public schools in Malaysia, to evaluate the effective maintenance strategy applied in public schools' and to get opinion which are to analyse the effectiveness and efficiencies of current maintenance operation of schools' buildings. Your participation in this survey is voluntary and your answers will be kept confidential. Thank you for your cooperation.

Instruction : Please answer the following questions as accurately as possible.

SECTION 1 : RESPONDENT PROFILE

No.	Question	Please tick (√) for your answer
1.	Gender	☐ Male ☐ Female
2.	Age	☐ 20 – 30 ☐ 41 – 50 ☐ 31 – 40 ☐ 51 – 60
3.	Race	☐ Malay ☐ Chinese ☐ India ☐ Others (Please specify :.....)
4.	Category of the school	☐ Primary school ☐ Primary boarding school ☐ Secondary school ☐ Secondary boarding school
5.	Position	☐ Principal ☐ Senior assistant ☐ Teacher ☐ Others (Please specify :.....)
6.	Working Experiences	☐ Less than 1 year ☐ 2 - 5 ☐ 6 - 10 ☐ 11 - 20 ☐ Others (Please specify :.....)

SECTION 2: QUESTION RELATED TO THE PROBLEMS OF BUILDING MAINTENANCE MANAGEMENT SYSTEM IN PUBLIC SCHOOL OF MALAYSIA

In your opinion, rate the main problems of building maintenance management system in your school.

1	2	3	4	5
Highly Disagree	**Disagree**	**Average**	**Agree**	**Highly Agree**

No.	Items	Average				
		1	2	3	4	5
1.	Skilled manpower shortage					
2.	Employee has no specific knowledge in property management					
3.	Building information not updated					
4.	Insufficient knowledge in maintenance management					
5.	Overlapping responsibilities					
6.	Insufficient financial resources.					
7.	Communication failure due to the complicated procedure					
8.	Difficulty in accessing information					
9.	Lack of employees					
10.	Poor management culture					
11.	Inadequate space for information storage					
12.	Communication barrier between top management and subordinates					
13.	Building not optimally used					

SECTION 3 : QUESTION RELATED TO THE REQUIREMENTS IN IMPLEMENTING EFFECTIVE MAINTENANCE MANAGEMENT SYSTEM IN PUBLIC SCHOOL OF MALAYSIA

In your opinion, what is the major necessity to ensure the implementation of successful Effective Maintenance Management System in your school?

No.	Items	Average				
		1	2	3	4	5
1.	More cooperation is needed from staff in order to improve your school condition in terms of maintenance.					
2.	The principles have to plan the right maintenance scheduling system.					
3.	There are more actions should be taken to improve the existing maintenance condition.					
4.	Gain more information on the services of maintenance.					
5.	Used qualified professional and equipment in maintaining the school.					
6.	Better control of maintenance practice especially for structure system in term of number of work required.					
7.	Allocate a sufficient budget allocation.					
8.	Appoint well-trained personal in maintenance team.					
9.	Increase motivation to related parties in the school organization.					
10.	Comprehensive maintenance works and strictly policy.					

SECTION 4 : QUESTION RELATED TO THE IMPORTANCE OF IMPLEMENTING EFFECTIVE MAINTENANCE MANAGEMENT SYSTEM IN PUBLIC SCHOOL OF MALAYSIA

In your opinion, what is the main reason for implementing Effective Maintenance Management System for your school?

No.	Items	Average				
		1	2	3	4	5
1.	Increase productivity					
2.	Reduce the problems encountered during the process of ongoing maintenance.					
3.	School facilities are appropriately managed and cared for.					
4.	Ensure the safety of occupants.					
5.	Cost effective satisfaction.					
6.	Fulfill user expectation.					