POLITEKNIK PREMIER

SULTAN SALAHUDDIN ABDUL AZIZ SHAH

THE EFFECTIVENESS OF FACILITY CONDITION ASSESSMENT IN FACILITY MAINTENANCE AT PULAU PINANG HOSPITAL

MUHAMMAD NURHAZIQ BIN HANAPI

AUGUST 2020

POLITEKNIK PREMIER

SULTAN SALAHUDDIN ABDUL AZIZ SHAH

THE EFFECTIVENESS OF FACILITY CONDITION ASSESSMENT IN FACILITY MAINTENANCE AT PULAU PINANG HOSPITAL

MUHAMMAD NURHAZIQ BIN HANAPI

Dissertation submitted as part of the requirements of the

Bachelor of Facilities Management Technology with Honors

Facility management studies

Civil engineering department

Politeknik Sultan Salahuddin Abdul Aziz Shah

AUGUST 2020

FACILITY MANAGEMENT STUDIES

CIVIL ENGINEERING DEPARTMENT
POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DECLARATION OF UNDERGRADUATE DISSERTATION/PROJECT REPORT COPYRIGHT

Author's Full Name	:	MUHAMMAD NURHAZIQ BIN HANAPI
Dissertation / Report Title	:	The Effectiveness of Facility Condition Assessment in Facility Maintenance at Pulau Pinang Hospital
MyKad Number	:	950216-04-5355
Registration Number	:	08BFM16F3008

I declare that this dissertation / report is classified as:

	Confidential*	(Contains confidential information under the Official Security Act.1972)
	Restricted*	(Contains restricted information as specified by the organization where research was done)
	Open access	I agree that my dissertation/report to be published as open access (full text)

I acknowledge that Politeknik Sultan Salahuddin Abdul Aziz Shah reserves the right as follows:

1. The dissertation/report is the property of Politeknik Sultan Salahuddin Abdul Aziz Shah
2. The Library of Politeknik Sultan Salahuddin Abdul Aziz Shah has the right to make copies of the dissertation/report for the purposes of research only
3. The Library of Politeknik Sultan Salahuddin Abdul Aziz has the right to make copies of the dissertation/report for academic exchange

Author's signature:	Certified by:
……..	……
Author's full name: **MUHAMMAD NURHAZIQ BIN HANAPI**	Supervisor's full name: **PN. ZURIATI BINTI ABDUL MAJID**
Date:	Date:

NOTES: * If the dissertation/report is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization with period and reasons for confidentiality or restriction

AUTHOR'S DECLARATION

I declare that the work in this dissertation is original and is the result of my own work, unless otherwise indicated and acknowledged as referenced work.

Student's name	:	MUHAMMAD NURHAZIQ BIN HANAPI
Student registration number	:	08BFM16F3008
Student MyKad number	:	950216-04-5355
Dissertation Title	:	The Effectiveness of Facility Condition Assessment in Pulau Pinang Hospital
Programmed	;	Bachelor of Facilities Management Technology with Honors
Department	:	Civil Engineering
Institution	:	Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam

Signature of student : ……..

Date :

Verified by :

Name of Supervisor	:	PN. ZURIATI BINTI ABDUL MAJID
Department	:	Civil Engineering
Institution	:	Politeknik Sultan Salahuddin Abdul Aziz Shah

Signature of Supervisor : …….

Date :

ACKNOWLEDMENTS

Alhamdulillah, thanks to Allah S.W.T because with His permission this study and dissertation was successfully completed despite various challenges that need to be passed. First of all, thank you to the lecturer, especially my supervisor, Pn. Zuriati Binti Abdul Majid who always taught, helped and guided me in carrying out this study. As well as all the comments, advice and suggestions that have been given in carrying out the dissertation process of this study.

Millions of thanks are also given to my parents who have always been supportive and encouraged to help me in completing this writing. It is with the spirit that they give that is able to strengthen me to go through the research conducted.

In addition, many thanks also to the industry mentors who always provide help and encouragement in producing this writing. Not to be forgotten also to the friends for all the suggestions and knowledge sharing given throughout the implementation of the study.

Finally, thanks are also extended to all parties involved either directly or indirectly. Only Allah S.W.T is able to repay your services. May we all be blessed. Amin.

ABSTRACT

In this modern time, facility condition assessment are one of the best method to assess the facility conditions in the buildings that are often used. In general, time, financial and management issues have been a major challanges in determining the effectiveness of facility condition assessment in facility maintenance. Although the studies of facility condition assessment have been widely conducted in previous studies, however in terms of effectiveness of facility condition assessment in facility maintenance, it still not achieve the expected effectiveness. Therefore, this study was conducted to identify the factors that affecting the effectiveness of facility condition assessment in facility maintenance. Therefore, to achieve the aim of this study Pragmatism philosophy will be used as a reference with the abductive approach. The research strategy used is a mix method. Meanwhile, the research instruments used are semi-structured interview methods and questionnaires. In addition, the appropriate analysis technique used in this study is descriptive analysis that is factor analysis and mean score by using Statistical Package for Social Sciences (SPSS) software. For this study researchers will use stratified random sampling type in the research and the sample involved is 86 respondents for the questionnaire consisting of management team and operational team of Edgenta Mediserve Sdn. Bhd. The findings have found that the factors that affect the effectiveness of facility condition assessment depends on how time factors are handled, financial or budget allocation were planned, and how the management handled the facility condition assessment activities.

Keywords: facility condition assessment, condition assessment, facility maintenance, public hospital

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

The healthcare sector is usually considered among the important sectors in any country (Sweis, et al 2013; Sweis, 2015). A hospital building is a place where patients heal, so keeping the hospital in a good condition is a very important issue to ensure a healthy and safe environment. The main reason of poor hospital buildings state is the lack of maintenance (Mirdeeliana, 2012). It is said that the qualitative aspect of the building is the matter of maintenance (Adenuga,2012). Many intangible factors were studied in order to figure out the services quality and applied on health sector, and how the outcomes can be affected the outcomes (Abu-Hussein et al, 2016) but few studies focused on the building of the hospitals.

The purpose of the facility condition assessment is to establish the basis for determining the level of preventive maintenance needed for a building's systems and components (NCES, 2003). Kaiser (2009, p. 3) defines it as a ''process for developing a comprehensive picture of the conditions and the functional performance of buildings and infrastructure.''

An instrumental part of managing a facility includes facilitation of a condition assessment and then reporting that information in a concise and usable format. But, there are currently minimal standards in the industry for carrying out facility condition assessments (FCA), the analysis process, and reporting the results. This is especially true with regards to the use of specific metrics like the Facility Condition Index (FCI) and benchmarks for planning purposes.

One of the greatest obstacles to the development of an efficient condition assessment process is the subjectivity and ensuing lack of accuracy. However, based on Brooks' (2004) historical account of the FCI, Applied Management Engineering, Inc. originally developed the index as a ''great starting point to measure success'' and it was not developed as an accurate account of condition. ''It was designed to be a quantitative method of uniformly comparing and monitoring groups of comparable facilities over time.'' Traditionally, a condition assessment for a building is performed through visual inspection by experts in specific building systems, e.g., architectural, structural, electrical, and mechanical. While many asset management systems incorporate some measures to ensure uniformity such as staff training and the use of a numerically based rating system, the current condition assessment process is nevertheless highly subjective, and its accuracy is highly dependent on the experience and training of the field inspectors and assessors.

This is very crucial for the maintenance management team to make decisions in technical aspects. The effectiveness of Facility Condition Assessment would be doubted and questioned eventhough the assessment have been done, the performance of the facilities remains poor. Therefore, this research is done to prove the effectiveness of facility condition assessment towards maintenance management.

1.2 CONCEPTUAL STUDY CONCEPT

The sub-topic of determining the concept of this study will discuss the statement of the issue of study, study goals, study issues, study objectives, study scope, and study interests.

1.2.1 PROBLEM STATEMENT

Facility Condition Assessment is very important to supports decision making and it is also critical to the management in achieving the service standards for maintenance. Facility Condition Assessment reflects the physical state of the buildings and facilities hence its performance. So the organizations, buildings and maintenance managers must have a knowledge in monitoring the condition of their buildings to prevent defects and failure of the buildings. Inefficiencies of the system of building maintenance work can give rise to defects and damage to the building. Defects and damage is a problem faced in any building regardless of age of buildings and construction type. Besides that inefficiency in handling defects or damage buildings systematically generate a variety of effects and negative impact to users and is also the owner of the building.

The data of defects collected and registered during the assessment or inspection on site is crucial for maintenance decision. All building components have to contend with performance loss through ageing, use and also external causes.

In order to improve the current process of building inspection, a simplified, standardized and largely automated condition indication system has been developed by Public Work Department (PWD) to respond to the challenges in managing and maintaining the assets. BCA systems have been developed according to the requirement of Government Total Asset Management Manual. A condition assessment system is performed primarily to facilitate the ranking of all the components of the asset according to the amount of needed repair, and to produce consistent, relevant and useful information. By knowing the objective, examination would allow examiners to take advantage of a limited time during site inspection. Maintenance can only be effectively managed if the maintenance demand is properly quantified.

Building inspection is very important to support the goals of the Organization in providing office facilities, accommodation/high quality work in an environment that is safe, comfortable and sustainable manner. Low level of building performance can impact negatively on the organization and involves an increase in operating cost.

However, the effectiveness of the facility condition assessment remains unclear whether the maintenance management implementations on the facilities really effective or not.

1.2.2 RESEARCH QUESTION

How effective Facility Condition Assessment towards Facility Maintenance in Pulau Pinang Hospital?

1.2.3 Research Aim

To study the level of effectiveness of facility condition assessment in facility maintenance and to evaluate the effectiveness of facility condition assessment

1.2.4 Secondary - Research Question

- Is facility condition assessment really effective in maintenance management?
- What is the factor that affecting the effectiveness of facility condition assessment?
- How to identify the effectiveness of facility condition assessment?

1.2.5 Research Objectives

The fundamental objective of this research is to achieve what the research aim is, and the three (3) objectives below must be achieved:

- To study about the effectiveness of facility condition assessment in Pulau Pinang Hospital
- To identify factors affecting facility condition assessment effectiveness
- To evaluate the effectiveness of facility condition assessment in Pulau Pinang Hospital

1.3 SCOPE OF THE RESEARCH

The research will be done in Pulau Pinang General Hospital (GH) only. This is mainly because it is one of the oldest hospitals in Malaysia and it possess many facility maintenance issues as it is the busiest hospital in Pulau Pinang and main focus for residents here. The locations included is the whole hospital which is from Block A, Block B, Block C, Blocj D, Block ACC, Block CRC, Block CDR, and all other places which is included in the concession agreement. This research only focus on the facilities and equipments.

1.4 SIGNIFICANCE OF THE RESEARCH

It is hoped that the findings of this research can be used as a guide and reference to employers and employees in Pulau Pinang General Hospital in obtaining data and information to identify the level of effectiveness of facility condition assessment towards facility maintenance.

1.5 RESEARCH LIMITATIONS

This research focused solely on facility condition assessment of Pulau Pinang General Hospital and thus might not be applicable and compared to other hospitals. The outcome of this research may only be able to be used for the year 2020 as the hospital is continuosly doing improvement activities and conditions of the facilities and equipments may change together with the effectiveness of condition assessments.

1.8 SUMMARY OF THE CHAPTER

In this chapter, the introduction, background of the research, the research questions and research objectives have been explained. Besides that, the problems statements and the significance of the research have also been explained. With the research limitations set, the focus of the research has been narrowed and allows the research to be done in a more effective way.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Facility Condition Assessment (FCA) is a powerful executive equipment for both strategic capital planning and tactical project prioritization. The purpose of an FCA is to establish the basis for determining the level of preventive maintenance needed for a building's systems and components (Pauline K.et. al., 2016). Eric T. et al (2001) defines it as a ''process for developing a comprehensive picture of the conditions and the functional performance of buildings and infrastructure.''

Recently, Facility Condition Assessment system primarily used to collecting deficiency information to manage deferred maintenance backlogs. FCA plays an important role in providing facility condition and budget data for the repair and upkeep of facilities. As a result, FCAs help facility management teams know how to better prioritize funds for repair and replacement. To relate healthcare in Facility Condition Audit, facilities management should be able to provide care for the healthcare instituitions.

The consumer trend is currently shifting into a more localised community based medical care centres: they are in fact micro hospitals with small scale but sufficient inpatient facilities. The health industry gains more revenue from outpatients rather than from inpatients facilities.

Facility Condition Assessment can help to coordinate patient's room data, medical facilities, building equipment, security, cleanliness and maintenance. The healthcare industry top priority is to deliver the best care service, ensure safety

and hygiene for patients. A well-maintained medical centre regularly improves communications, patients; safety care, and building maintenance

2.1.1 Facility Condition Assessment (FCA)

A facility assessment is a formal process used to identify, evaluate, and report on the condition of a facility's physical plant (James E. Piper, 2004). Its purpose is to evaluate existing condition within the facility and to identify exiting deficiencies. With this information, maintenance managers can identify existing maintenance problems, develop budgets for future maintenance and capital renewal projects, and track deferred maintenance backlogs.

Facility assessments examine all building components and infrastructures, including mechanical equipment, electrical equipment, the building shell, interior structures and finishes, transportation systems, and the building site (James E. Piper, 2004).

A complete facility assessment provides the facility manager with a snapshot of the conditions that exist within the facility. Having that information available allows the facility manager to quantify the renewal and replacement effort required to put the facility and like new condition. It identifies areas where maintenance attention is needed to prevent minor problems from escalating into major headaches and expenses. It identifies both long and short-term maintenance and renewal needs. It helps in establishing both renewal and replacement priorities. Most importantly, it allows the facility manager to switch from a reactive mode of operation to one where activities are planned and scheduled. And if the assessment is repeated on a regular basis, it allows the facility manager to track deterioration over time.

Besides that, according to Eric T. et al, 2001, facility condition assessments is a multi-disciplinary review of the various systems of a facility, or

group of facilities. A technical investigation and review of one or more assets or systems to provide findings and recommendations regarding the root cause of deterioration or failure symptoms.

The data is often summarized in a Facility Condition Index (FCI) that provides an objective benchmark against which the owners and operators can monitor changes over time.

2.1.2 Facility Condition Index (FCI)

Facility Condition Index is method of analysation for Facility Condition Assessment. According to Eric T. et al. (2001), Facility Condition Index (FCI) is a key performance indicator (KPI) which is used to objectively quantify and evaluate the current condition such as physical health of a facilities and to make two (2) types of benchmark comparisons on the relative condition of that one facility with other facilities within the same portfolio against the same facility at a some time in the past

Eric T. et al. (2001) also mentioned that the FCI provides a measure of the "catch-up" costs of a facility (freehold property) and is typically derived from a Facility Condition Assessment (FCA) carried out by an experienced consulting team. In the case of a leasehold interest, the catch-up is quantified by the principle of permissive wasting. It is important to note that FCI is a measure of condition relative to the reproduction cost of the building. FCI is not an absolute statement of the size of the backlog of catch-up work. A large and complex facility, with a high reproduction cost, requires a larger backlog of deferred maintenance to raise the FCI than a smaller/simpler building.

The principal value of an FCI rating, particularly for the owners and operators of a single facility or a portfolio of facilities. It can be identified as to assist in making resource allocation decisions amongst the buildings in a

portfolio, particularly with limited budgets that are not adequate to address the deferred maintenance in all the facilities. It is therefore a means of identifying priorities. It is also used to determine the annual reinvestment rates to prevent further accumulation of deferred maintenance. Besides, it does help to calculate catch-up costs, to provide a KPI for resource allocation decisions and to help track the extent of condition drift over time.

Eric T. et al, 2001 said that one of the most powerful types of benchmark data that can be derived from such information is called the Facility Condition Index. The FCI is a ratio and is used to measure the relative condition of a single building or portfolio of buildings taking into account either a specific priority or system or all systems. It is calculated by dividing the Current Replacement Value (cost of replacing an asset) of the systems in question by the existing Cost of Deficiencies for those same systems.

$$\text{Facility Condition Index} = \frac{\text{Cost of Deficiencies}}{\text{Current Replacement Value}}$$

From the formula above, one can see that the higher the FCI, the worse the building system(s) condition. A new building with no deficiencies and a 100% replacement value would have an FCI of 0.

FCI Range	Condition Rating
Under .05	Good
.05-.10	Fair
Over .10	Poor

Table 2.1: FCI Rating

Thus the object of the portfolio manager is to minimize the FCI – or at least to understand the FCI implications of a specific investment policy.

Using such data, it is possible to perform financial analyses over time – taking inflation into account. For example, an FCI can be calculated taking assumed annual funding levels projected over a certain time span. Similarly, it is possible to hold FCI steady and calculate the investment rate required to maintain a specific FCI. Finally, one can look at the effect on funding to achieve a desired FCI. Figure 4 below illustrates such an analysis. The curves and associated bars (representing the three funding scenarios) illustrate the degradation of the FCI at a fixed funding level; the center line fixes the FCI at the desired rate and calculates the funding required to keep the FCI constant; and the third (decreasing) curve shows the improvement in the building FCI by increasing the funding rate.

2.1.3 Facility Maintenance

Facilities maintenance encompasses a broad spectrum of services, competencies, processes, and tools required to assure the built environment will perform the functions for which a facility was designed and constructed (Don Sapp, 2017). Operations and maintenance typically includes the day-to-day activities necessary for the building/built structure, its systems and equipment, and occupants/users to perform their intended function. Operations and maintenance are combined into the common term O&M because a facility cannot operate at peak efficiency without being maintained.

Facility maintenance involves preventive (planned) and unplanned actions carried out to retain a system in or restore it to an acceptable operating condition. Optimal maintenance policies aim to provide optimum system reliability/availability and safety performance at lowest possible maintenance costs. Proper maintenance techniques have been emphasized in recent years due to increased safety and reliability requirements of systems, increased complexity, and rising costs of material and labor (Dana J. et. al., 2018).

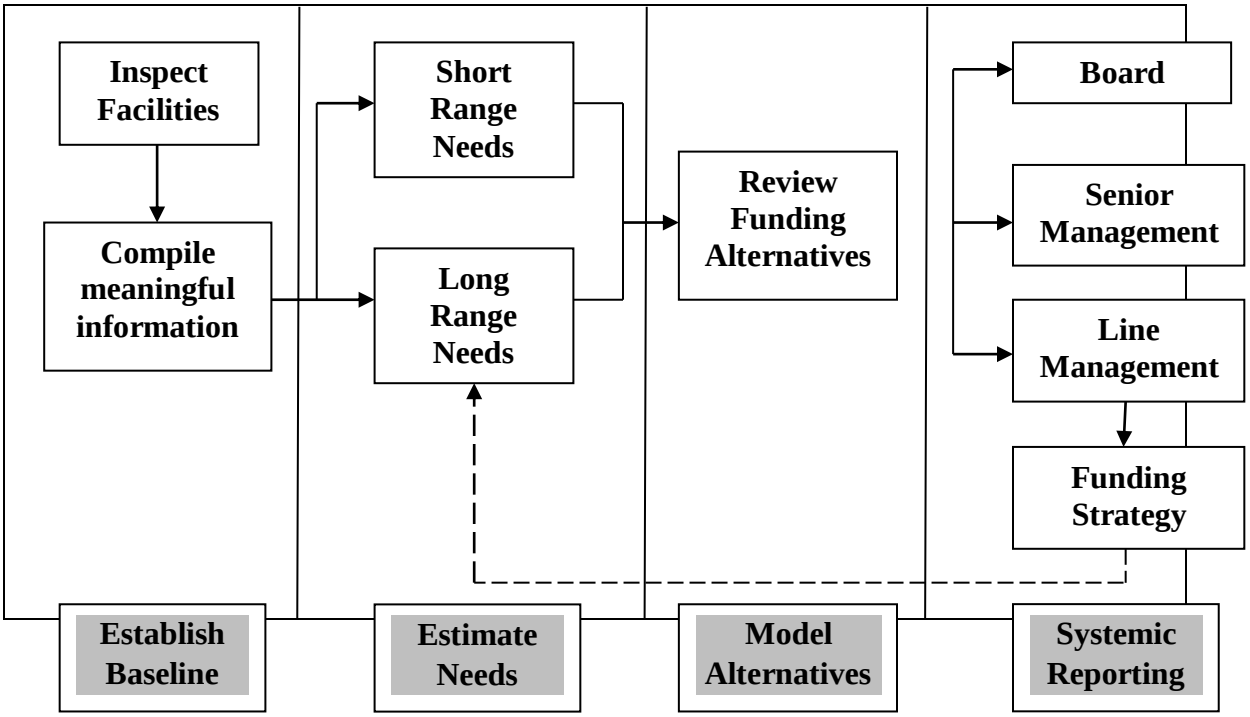

Figure 2.1: Facility Condition Assessment Process

According to Eric T. et al, 2001, the planning process begins with a building inspection that includes the determination of what data needs to be collected in figure 2.1 Facility Condition Assessment Process . FCA data can be quite flexible in its determination and include not only physical systems (architectural, civil/mechanical, electrical, other engineering systems, underground facilities, physical infrastructure, etc.) but include other parameters associated with space utilization, air quality, code compliance issues and even the consideration of esthetic parameters.

Preparing for the inspection involves, for example, the determination of what systems need to be inspected, what priorities are to be assigned for maintenance and renewal deficiencies, what data associated with preventive maintenance needs to be collected for equipment, whether life/safety information is to be collected, types of standards and coding schemas that are to be applied,

how cost correction data bases for deficiencies are to be used, whether space utilization data is to be collected, and so forth (Eric T. et al, 2001). At a minimum, the following data are recommended be collected:

- Building number/name;
- Gross square footage;
- Date of construction;
- Type of construction;
- Functional use;
- Number of floors;
- Current replacement value.

The inspection team must obviously reflect the skill sets of the baseline data requirements being collected. For large projects, or for geographically disbursed buildings, multiple teams might be deployed. The teams can be in-house or outsourced – there are advantages and disadvantages to both. If outsourced, care must be taken to insure data consistency – particularly if multiple teams are deployed, even from the same outsourcing group.

Teams must work with the client to review procedures, priorities, standards and other data. Correction information must be determined. Judgments regarding whether entire systems or components of systems need to be determined. Source data (e.g., floor plans, craft codes, local labor rates, contact information, safety precautions – if required, historical data) must be gathered and calendar schedules for inspections determined. Deficiency information must be described during the inspection along with locational information, priority, type, corrective information (including craft required to perform the corrective action, quantity and timing data) and other details that will enable cost estimates (including labor and material information) to be generated for budgeting purposes.

Once FCA data has been collected and analyzed, the types of analysis that can be performed, is considerable. Another FCA analysis that is possible relates to life cycle information. For each of the building systems inspected, it is

possible to estimate the current position of that system within its life cycle as well as the replacement value of that system at the end of the life cycle. One of the most powerful types of benchmark data that can be derived from such information is called the Facility Condition Index. The FCI is a ratio and is used to measure the relative condition of a single building or portfolio of buildings taking into account either a specific priority or system or all systems.

2.1.4 Types of Maintenance

Maintenance types have been presented by different researchers in different perceptions. Maintenance types refer to the way in which the maintenance tasks are planned and scheduled. According to BS 3811 (as cited in Ogunmakinde et al., 2013), maintenance is divided into planned and unplanned maintenance. Planned maintenance is a type of maintenance that is organized and has a predetermined schedule. It is divided into four types.

Num.	Types of Maintenance	Explaination
1.	Preventive Maintenance	This type is executed at predetermined intervals, and intended to decrease the likelihood of failure
2.	Corrective Maintenance	This type arises after failure has occurred and makes effort to return an item to its normal condition so it can perform its function again.
3.	Predictable Maintenance	This type is a normal periodic work that intends to maintain the performance characteristics of a product and to fix the product after it has completed a functional life span.
4.	Schedule Maintenance	This is also a type of preventive maintenance that occurs at predetermined intervals of time and number of operation.

Table 2.2: Types of Planned Maintenance

Unplanned Maintenance is a type of maintenance that has no predetermined schedule (Semi-emergency maintenance). It is divided into three types as in table below.

Num.	Types of Maintenance	Explaination
1.	Unpredictable Maintenance	Unpredictable Maintenance: This type takes place when unexpected damage or breakdowns occurs due to external causes.
2.	Avoidable Maintenance	This type is required to correct failures caused by incorrect installation, incorrect design or the use of improper materials.
3.	Emergency Maintenance	This type is executed in order to avoid severe problems. Otherwise, it is referred to day-to-day maintenance.

Table 2.3: Types of Unplanned Maintenance

2.2 CONCEPTUAL FRAMEWORK OF THE STUDY

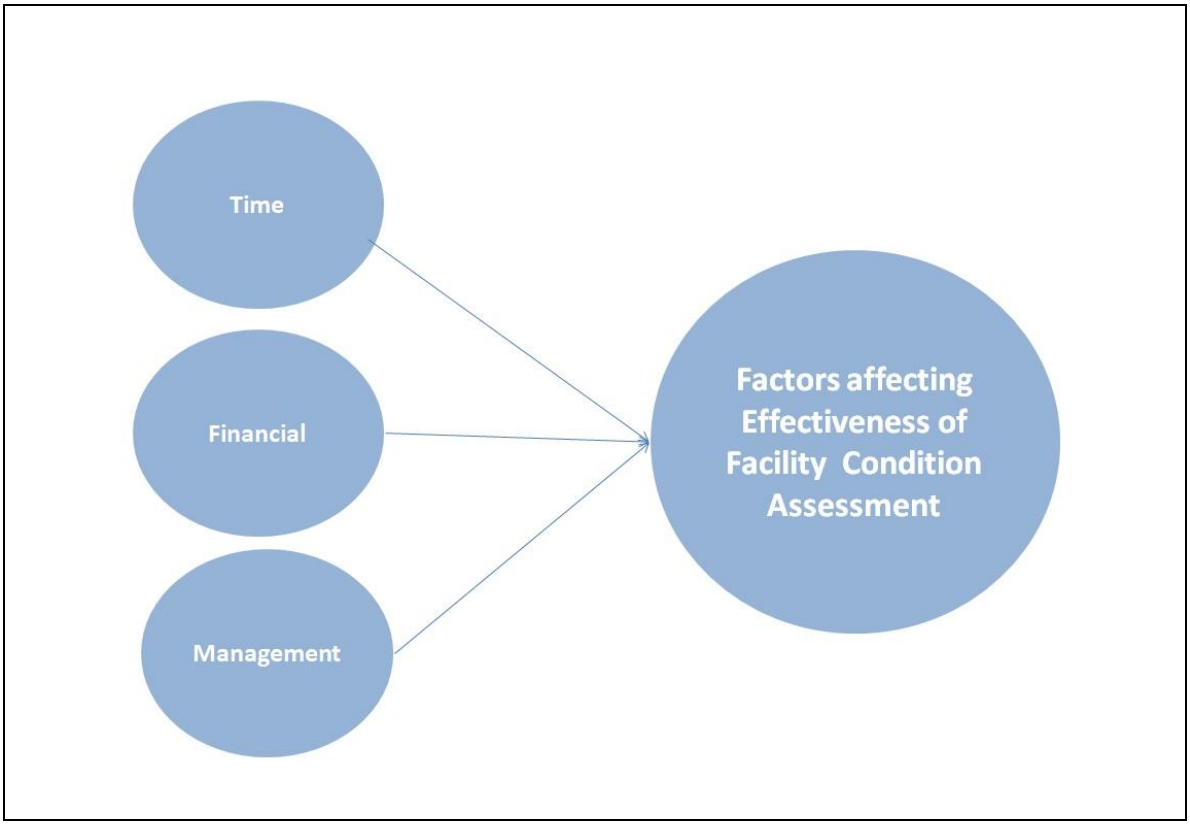

Figure 2.2: Conceptual Framework of the Study

2.2.1 Time

Effectiveness of facility condition assessment are affected by the time factor. To inspect a particular building depends on the level of detail, the size and number of components, the accessibility and complexity of the facility and the resources allocated. The inspection process requires a large amount of the expert's time spent on activities that don't require their skills, such as moving from one place to another, taking photos, and making notes. The process can also be extremely expensive, when the number of facilities is large. Current method of adding / deleting / managing component manually (e.g., a boiler with

sub- components) is extremely time-consuming. There is a need to reduce the time required for the inspection process by standardizing the list of components and avoiding the addition or deletion of instances. In comparison, inserting pictures of the parts checked is a manual procedure that again takes a lot of time and is difficult to handle. As an example, a single building may have about 200 components (roof, doors, boilers, HVAC systems, transformers, etc.).

According to G. Mayo et. al. (2016), FCAs are generally resource intensive, subjective, time-consuming, and costly. One of the greatest problems faced by facilities administrators is monitoring all of the concerns that occur in a building. Prioritizing and analyzing critical vs. minor problems, and then determining a plan for the facility's smooth running, can be very time-consuming and can result in job interruption or closure, thereby increasing operating. Also mentioned by Elhakeem et. al. (2005), maintenance of the buildings is a difficult activity, mainly due to the design of structures in terms of a large number of components and specific maintenance specifications.

2.2.2 Financial

Corporate Finance Institute (CFI) mentioned that activities like investing, borrowing, lending, budgeting, saving and forecasting can be defined as finance. Controlling cost remains one of the most critical challenges in building maintenance (Buildings Smarter Facility Management). According to U.S Environment Protection Agency (EPA), up to 30% of energy in buildings is used inefficiently or unnecessarily. Without long term preparations, maintenance operation cost can increase and affecting the instituitions itself (Dana J. et al, 2018).

Much as we might not like to admit it, In every modern company cash is a priority and therefore we must respect the role of finance and accounting people in keeping the organisation afloat. Lack of funds can drive inefficient, ineffective

or even unsafe maintenance practices, where components are kept in service past their useful lives, cheaper suppliers are used, temporary repairs are made or inappropriately skilled trades people are asked to make a repair. All of these variables will push up the risk of maintenance and the cost in the long term. This is also critical that spending for large equipment should be specifically monitored against budget. It will help us assess whether the work is being carried out and even if the machinery meets standards. Any equipment which wastes that is targeted is clearly a candidate for replacement in the following year.

2.2.3 Management

Management is a set of principles relating to the functions of planning, organizing, directing and controlling, and the application of these principles in harnessing physical, financial, human and informational resources efficiently and effectively to achieve organizational goals. In healthcare industry, facilities maintenance are really important things and should be focus on and priortise. Less attention given to maintenance of facilities may lead to a deterioration in quality of maintenance and a decrease of healthcare services (Dana J. et al, 2018).

Subjectivity and consequent lack of consistency is one of the greatest challenges to establishing an efficient condition assessment process. However, based on Eric T. et al. (2001), historical account of the Facility Condition Index (FCI), Applied Management Engineering, Inc. originally developed the index as a ‘‘great starting point to measure success’’ and it was not developed as an accurate account of condition. It was designed to be a quantitative method of uniformly comparing and monitoring groups of comparable facilities over time. Traditionally, a condition assessment for a building is performed through visual inspection by experts in specific building systems, such as architectural, structural, electrical, and mechanical. Although certain asset management

systems include such steps to ensure continuity, such as staff training and the use of a numerically based ranking system, the existing condition appraisal process is also extremely subjective, and its accuracy relies heavily on the expertise and experience of field inspectors and evaluators.

In fact, almost all current condition assessment systems lack a comprehensive record documenting the progression of the condition of each component over time. The field inspector can not then easily make visual correlations with the building component 's previous condition. Ideally, condition assessments, after the first cycle has been done, are not as time intensive as reports are revised instead of generated.

2.3 SUMMARY OF CHAPTER

This research were focusing on the effectiveness of facility condition assessment in facility maintenance. The factors that affecting the effectiveness of facility condition assessment have been discussed in this chapter which is the time factor, financial factor and the management factor. Based on the previous research, these factors can be classified as the main factors that contributed to the effectiveness of facility condition assessment in facility maintenance.

CHAPTER 3

RESEARCH METHADOLOGY

3.1 INTRODUCTION

This chapter reviews related concepts of research methodology and point out the proposed research design for this study. (Saunders et al., (2012) also referring research methodology as the theory of how research should be undertaken. Research can be stated as an activity that involves finding out, in a systematic way (Walliman 2011). While for Methodology is being stated that the philosophical framework within which the research is conducted or the foundation upon which the research is based (Brown, 2006). As being stated in the title, this chapter will be including the research methodology of the dissertation. In more details, in this chapter will outlines the research method, the research approach, the methods of data collection, the selection of the sample and the type of data analysis.

3.2 PHILOSOPHY AND RESEARCH APPROACH

There are various philosophical patterns and research methodologies. In this chapter, it indicates a flexible approach that should be included in the application of mixed methods research in solid waste research by conducting it within the pragmatic paradigm, especially when a paradigm is defined as shared beliefs among members of a specialty area (Brierley, 2017). It had a difficulty in developing a corresponding philosophical paradigm when mixed methods research has been regarded as the third methodological movement after quantitative and qualitative research (Johnson and Gray, 2010).

3.2.1 RESEARCH PHILOSOPHY

Saunders et al. (2012) have also provided four alternatives of epistemological approaches as being called Positivism, Realism, Interpretivism and Pragmatism. According to Saunders and Paul (2012), the impact of practical findings on the importance of research is underpinned by the philosophy of pragmatism used by researchers. the same can be said when Pragmatism shown that the research question should be determine the research philosophy adoption. Since the research question drives the research flow, the pragmatist focuses on practical approaches to answer practical questions. In pragmatism, there are 3 types of pragmatic approaches that can be chosen by research (Saunders, 2011).

3.2.1.1 Deductive Approach

A deductive research uses a quantitative approach. A deductive approach allows research to develop hypothesis based on existing theories conducting research to test the hypothesis. In simple words, deductive approaches are best suited for quantitative research designs.

3.2.1.2 Inductive Approach

According to Thagard et.al. (2005) Inductive begins with observations that are more specific and limited in scope, and proceeds to a conclusion that is likely considering accumulated evidence. Besides that, research is carried out by the inductive method that are gathering evidence, seeking patterns, and forming a hypothesis or theory to explain what is seen.

3.2.1.3 Abductive Approach

The abductive approach is developed with the observation of the real situation in the world. For example, human behavior or human interpretation of a particular situation. Therefore, to determine the condition of both qualitative and quantitative approaches are required. The results are based on both observers in qualitative and quantitative data. In other words, an abductive approach allows researchers to evaluate results based on more than one observation angle.

In this study, researcher uses the abductive approach to analyse data for aspects that can further improve the effectiveness of facility condition assessment in facility maintenance. Therefore, to achieve the goal in this study, a deductive approach will be used as the study intends to find out the factors that affect the effectiveness facility condition assessment in facility maintenance.

3.3 RESEARCH DESIGN

Acording to Maxwell's theory (2012), the researcher's design consists of five components. The design of the study is a research guide for the purpose of the appropriate approach to use in implementing this study. The design of this study is adhered to achieve th ultimate goal. This design is used to determined the strategy of the method and the suitability of choosing a statistical test to analyse the research data based on figure 3.1.

Based on Maxwell's research design (2012), the research question of this study is considered as a central point and in other words, the fivecomponents of the objective, the conceptual framework, the research questions for the research. This component has relationship with the conceptual framework and the method of study because through the goal of this study will create a conceptual framework and at the same time it will also determine the appropriate method

selection for the study information and answer the questions of this study. Validity has a relationship between the goals, the conceptual framework, the methods and the question of the study. All components must be validated either through confirmation and structured interviews to experts or using system software that many researchers use to prove the validity and reliability of the research.

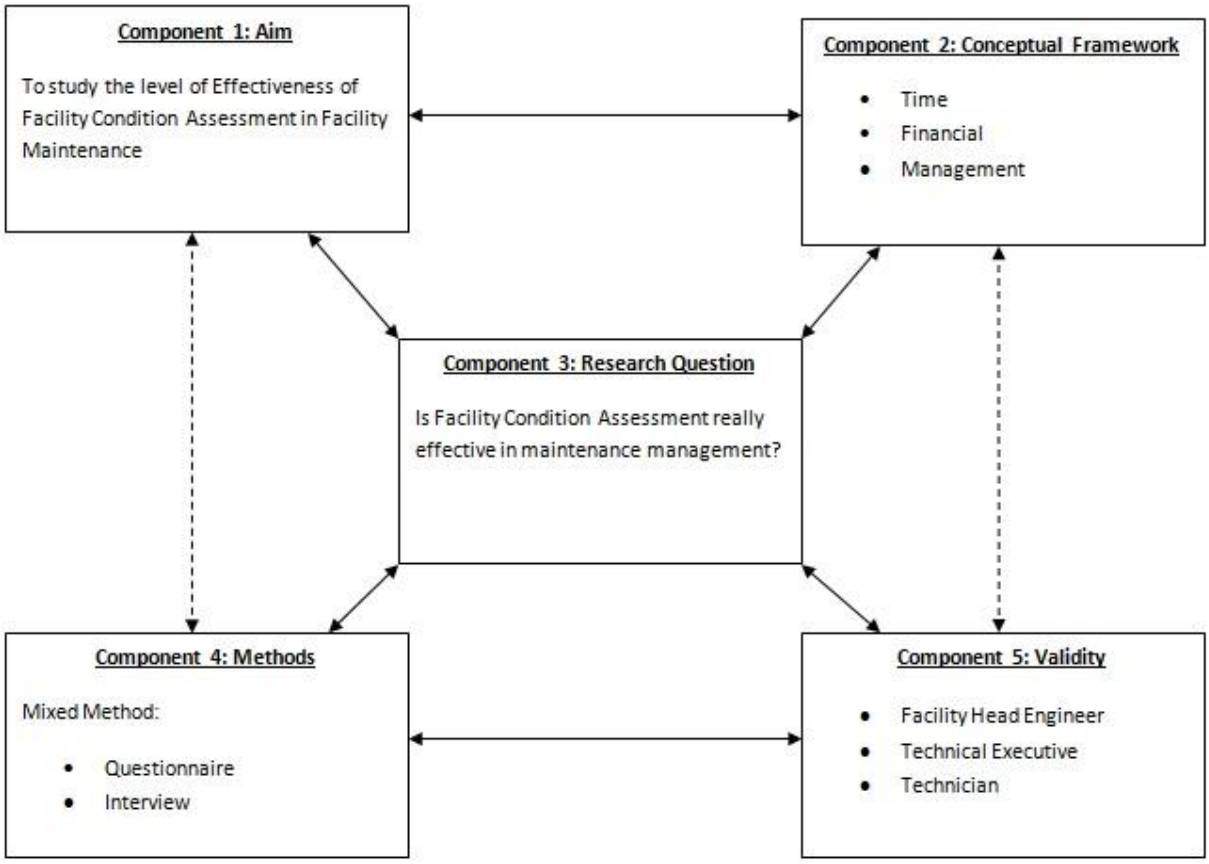

Figure 3.1: Research Design (Maxwell, 2012)

3.3.1 Aim

The aim of the study is a combination of the purpose, objectives and the whole of the subjects being studied in the above chapter. The aim of this study was to evaluate and improve the Effectiveness of Facility Condition Assessment on facility maintenance.

3.3.2 Conceptual Framework

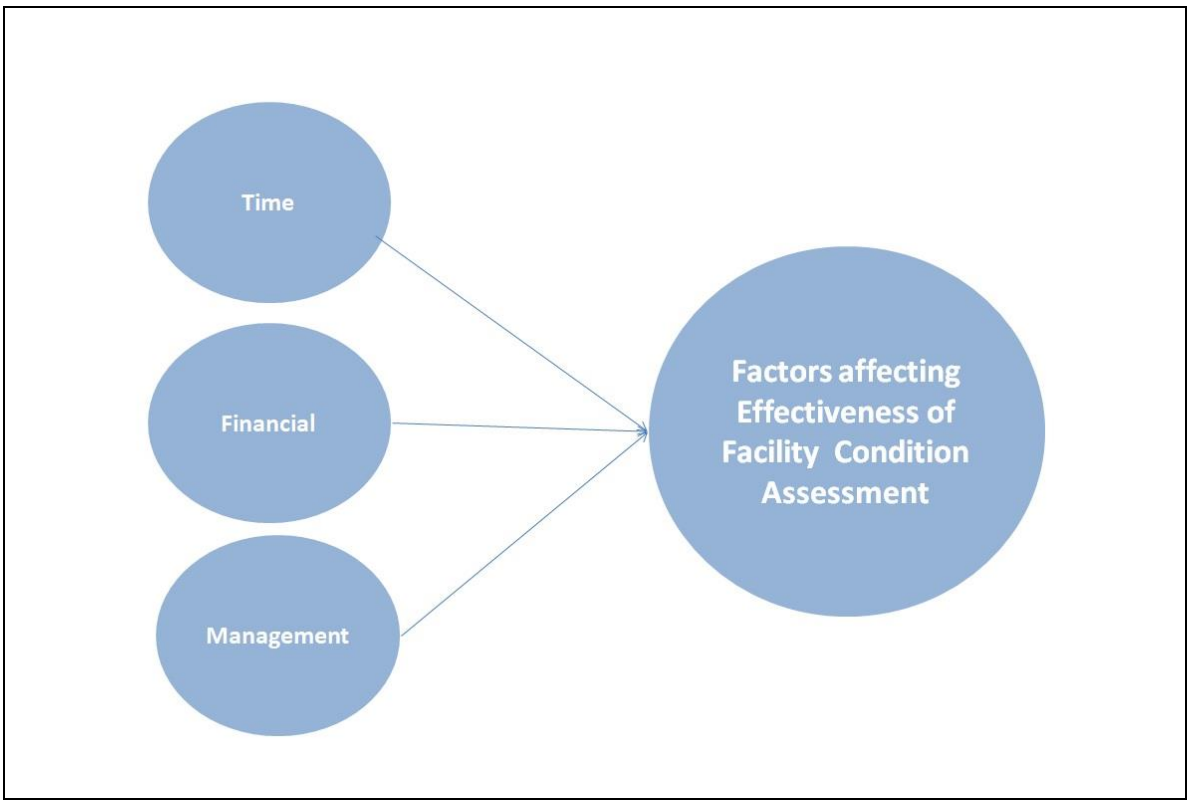

Figure 3.2: Conceptual Framework

The conceptual framework of the study in figure 3.2, the conceptual framework has three (3) contructs that represent the factors that affect the effectiveness Facility Condition Assessment in facility maintenance. Based on previous research that has been discussed in chapter two (2), this research had

suggested one conceptual framework that briefly explain about the relationship of the factors that affect the effectiveness of Facility Condition Assessment in maintenance management.

There are indicators that can be measured through the three (3) constructs to answer the research questions. The constructs are time factor, followed by the financial factors of the organization and lastly the management factor.

3.3.3 Research Questions

The research question is one of the most important aspects of a study, as it is one of the key factors in generating research goals, conceptual frameworks, appropriate methods for gathering information and validating the results of the study. In order to carry out this study, several research questions have been raised and need to be addressed. In conducting the study, the research question becomes a very important guide. In addition, a study was conducted to find the solution for the following:

1. Is Facility Condition Assessment really effective in maintenance management?
2. What is the factor that affect the effectiveness of Facility Condition Assessment?
3. How to identify the effectiveness of Condition Assessment?

3.3.4 Validity

According to Kothari (2004) validity is a criterion and is an indication of how sound the research was. More specifically, validity can apply both the design and methods of the research. Validity in data collection means the findings truly represent the phenomenon claiming to live. In research, one of the main concerns is validity and by controlling all possible factors that can threaten the research validity for every good researcher is a primary responsibility.

The researcher has obtained the approval and conduct of expert interviews from the Penang hospital's Facility Head of Engineer (FEMS), Technical Executive and Technician to ensure that the items used in the questionnaire meet the research requirements. It will also be evaluated in terms of the content of language usage and the format of the questionnaire used.

Once this study is carried out, the conclusions from the overall data of this study will also be verified by the Facility Head of Engineer (FEMS) for the concession company Edgenta Mediserve Sdn Bhd for the Hospital Pulau Pinang.

3.4 METHODS

According to Idris (2010), all research involves data collection. Data refers to information obtained by researcher on the subject of research or research. The instrument used for data collection can be made through the distribution of questionnaires. The construction of the instrument is the result of its own research design based on the objectives to be achieved based on scientific readings and other examples of other studies. This study is conducted using primary data and secondary data obtained through field studies. The field survey was conducted using a questionnaire. Questionnaire and focus group form used to obtained data form Edgenta Mediserve staff. According to Bartlett et al (2001),

it is the main objective of survey research to collect data to represent the actual population of a study.

In this research, from the personal view of the author, it is believed that the most effective data collection method is by using a mixed method. It is a mixture of qualitative and quantitative method of the data collection with an abductive approach.

3.4.1 QUESTIONNAIRE

Both quantitative and qualitative method on questionnaires can be classified depending on the questions. Aside from that, answers obtained through the closed-ended questions with multiple choice answer options are been analyzed using quantitative methods and that they maybe involve pie-charts, bar-charts and percentages. (Dudovsky,2019).

There are following types of questionnaire are computer questionnaire, telephone questionnaire, in-house survey, mail questionnaire. For this type of questionnaire method that can be used in this research were in-house survey. It is because this type of questionnaire needs to visit respondents in their houses or workplaces. The advantage of in-house survey is that can focus more towards the questions be gained from respondents. However, in-house surveys also have disadvantages which including time consuming, more expensive and for various reasons respondents may not want to have the researcher in their houses or workplaces.

Types of question can be found on questionnaire are open questions questionnaire, multiple choice questions, dichotomous questions and scaling questions. For this type of questions are be used were multiple choices, dichotomous and scaling questions.

3.4.2 Semi-structured Interview

According to Chua (2006), interviews can be conducted using face-to-face and non-face-to-face methods. In this study, the interviews used in this study were semi-structured types of interviews which only the main questions were provided and subsequently the follow-up questions based on respondents' responses would be questioned. This is because the researcher feels that face-to-face method is more appropriate as researchers are more likely to interact with respondents to obtain research information. In addition, to look into the needs of the study, the researcher chooses to obtain th data by semi-structural interview methods individually.

3.5 RESEARCH INSTRUMENTS

To carry out this research, the research instrument should be determined first. There are several research instrument that can be used for the data collection process. The data collection instrument used is a questionnaire for the data collection process. In this research, there are two type of instrument used namely interview and questionnaires.

3.5.1 Instrument 1: Questionnaire

Questionnaire research is a popular research tool used in research because the questionnaire can cover broad areas and can be easily crafted. Through questionnaire information regarding the respondents can be kept confidential. This allows the respondents to respond to comfortably questions without worry.

Questionnaire are divided into two (2) sections, the first part about the respected background between the questions contains is the gender, position, education level and the years of working experience. While the second part is about the factors that affecting facility condition assessments in facility maintenance.

The form of questions found in this questionnaire is a closed question. This type of question is easy to analyse and delight the respondents to provide answers because they are only required to choose one of the answers given (Jasmi,2012). The questionnaire was carried out with briefly description of the author of the questionnaire conducted by stating that personal information was kept confidential. This question is not a test and there is no correct or wrong answer. Questionnairewas more focused to obtained data on the respondents' background and their level of facility condition assessment effectiveness.

Questionnaire was one of the methods in the research instrument and most easily obtained information (Jasmi,2012). This questionnaire instrument is also a method used to obtain reflection.

3.5.2 Instrument 2: Semi-structured interview

According to Chua (2006), interviews can be conducted using face-to-face methods. In this study, the interviews used in this study were semi-structured types of interviews which only the main questions were provided and subsequently the follow-up questions based on respondents' responses would be questioned. This is because the researcher feels that face-to-face method is more appropriate as researchers are more likely to interact with respondents to obtain research information. In addition, to look into the needs of the study, the researcher chooses to obtain th data by semi-structural interview methods individually.

Interviews were held with Facility Engineering Maintenance Services (FEMS) to gain their views. This can indirectly help to provide a more rational description of the phenomenon that is the subject of the study. The purpose of the interview was to ensure the validity of the questionnaires developed according to the planned concept and to ensure that the respondents' level of understanding understood what was answered based on the questions in the questionnaire. This interview is one of the ways to ensure the third objective of the study are answered and enable the data to be collected with this process and the collected data can be analysed carefully and thoroughly.

The interview became a supporting instrument that further strengthened the findings through questionnaire and become one of the ways to ensure the third objective of the study were answered and thecollected data could be analysed and thoroughly. The interview question is attached in Appendix.

3.6 SAMPLING

Sampling is a one of the process used in a statistical analysis in which a predetermined number of observations are been taken from a larger population. depends on the type of analysis being performed, the methodology is used to sample from a larger population, but it may can be include simple random sampling or systematic sampling. (Alicia Touvila,2019)

Selection of sampling method must depend on the type of research study. There are three types of sampling methods which is probability sampling and non-probability sampling. Each of these methods includes different types of techniques of sampling (Hamed,2016). Figure 3.2 illustrates the stages that are likely to go through when conducting sampling (Hamed,2016).

3.7 SUMMARY OF CHAPTER

There are various methods and approaches that can be used to conduct the study in order to obtain the data and information needed to obtain the results. The research methods and data acquisition as discussed above have been applied in this study to meet the needs of the study. The process of analyzing the data obtained is from the questionnaire form. In addition to the analysis process, this chapter will also explain the methods, instruments and sampling used to carry out the research process and learn how to use data analysis using SPSS (Statistical Package for Science Social).

CHAPTER FOUR

DATA COLLECTION

4.1 INTRODUCTION

Response of facilities management staff to the effectiveness of condition assessment is explain in this chapter. Data collection is done to obtain the information needed in order to achieve the aim of the research. Data collection is the most important step in the investigation (Creswell, 2008). In this chapter, researchers use the sampling design developed by Saunders (2012) which describes two types of sampling design i.e. probability sampling and non-probability sampling.

In this study, the researcher chooses to adapt simple random sampling which is under probability sampling. Since this study uses SPSS, the researcher selected the sample size developed by Krejcie & Morgan (1970). In this chapter, the researcher has also explained about the purpose of each item used in the research instrument. The whole chapter will discuss the method of data collection to conduct the study.

4.2 RESEARCH SAMPLING

Sample research are a very important aspect in the study because the use of inappropriate samples will reduce the validity and accuracy of any survey study. Sampling refers to the process in selecting a number of samples from the population which refers to the target group of researchers, the group to whom the results will be generated and as respondent of research (Awi. H ,2013).

According to (Awi. H, 2013) the sample of the study consists of respondents of study respondents who have been chosen to delegate a population. The setting of a population study is important in the study as the population will be able to determine how and the number of samples to be selected in the study.

4.2.1 Sampling Design

According to Sabitha (2006), the sample size design is determined based on the purpose of the study, the sample size required, the cost and time allocated.

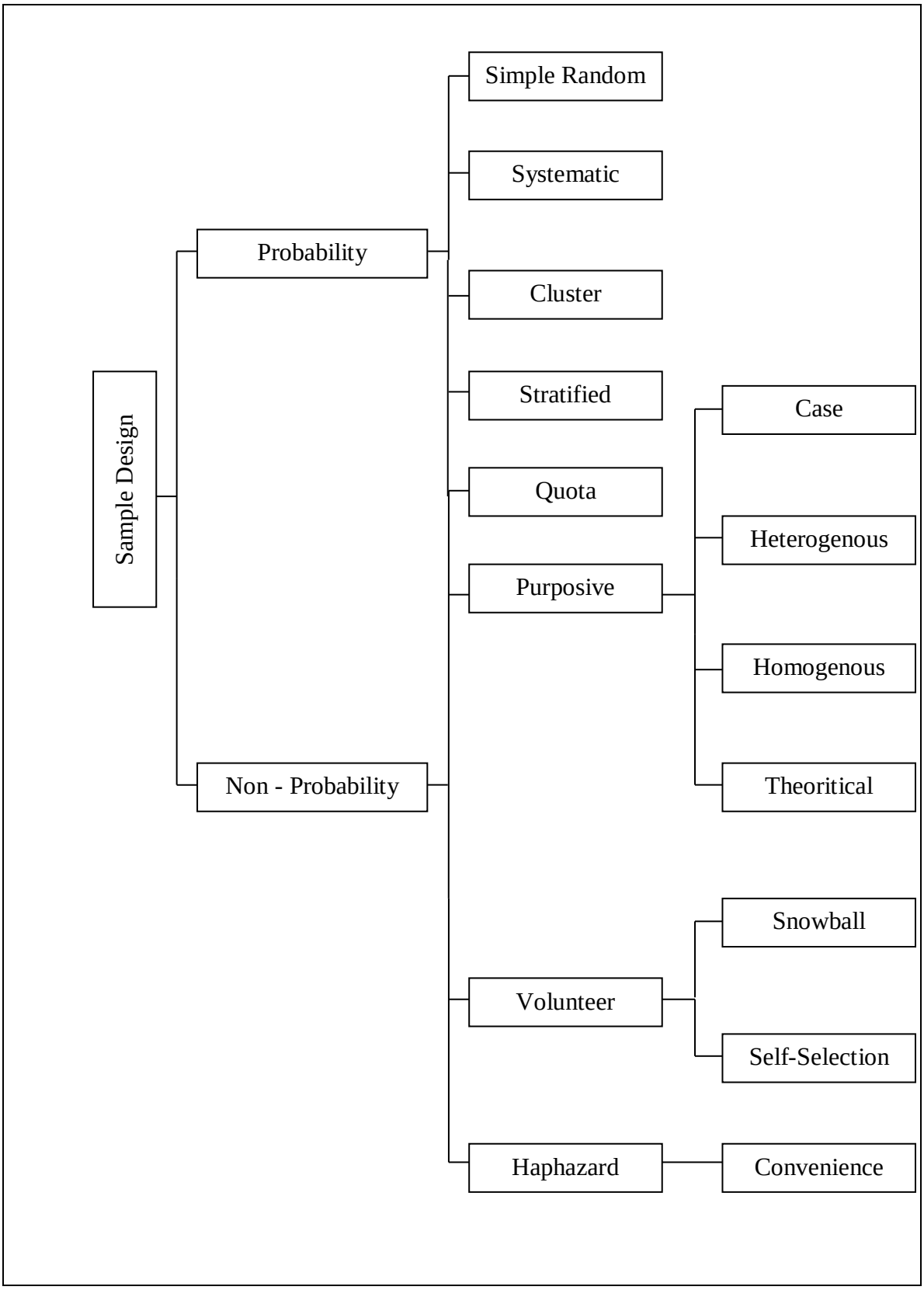

Figure 4.1: Sampling Technique

Figure 4.1 shows that sampling methods are broadly divided into two categories: probability and non-probability.

In probability sampling every member of population has a known chance of participating in the study. Probability sampling methods include simple, stratified systematic, multistage, and cluster sampling methods.

In non-probability sampling, on the other hand, sampling group members are selected on non-random manner, therefore not each population member has a chance to participate in the study. Non-probability sampling methods include purposive, quota, convenience and snowball sampling methods. The explaination for all type of sampling is explained in Table 4.1 below.

Sampling Design	Sampling Technique	Definition
Probability	Simple Random	In a group of sample sizes, the group members are selected randomly
	Systematic	Each unit or subject in the population has the opportunity to be chosen as a respondent
	Cluster	Cluster of participants representing population are identified as sample group members
	Stratified	Representation of specific subgroup or strata

Non - probability	Quota	Sample group members are selected on the basis of specific criteria
	Convenience	Obtaining participatans conveniently with no requirements whatsoever
	Snowball	Sample group members nominate additional members to participate in the study
	Purposive	A group of subjects with certain characteristics are selected
	Case	Specific cases involving strange behavior, unusual or rare
	Self-selection	The self-selection sample involves two simple steps: a) publicizing your need for units (or cases) ; and b) checking the relevance of units (or cases) and either inviting or rejecting them

	Hetergenous	Every member has a different value for the characteristic you're interested in. For example, if everyone in your group varied between 4'3" and 7'6" tall, they would be heterogeneous for height
	Homogenous	All the items in the sample are chosen because the have similar or identical traits. For example people in a homogeneous sample might share the same age, location or employment
	Theoritical	The process of collecting, codeing and analyzing data in a simultaneous manner in order to generate a theory

Table 4.2:Sampling Technique Explaination

4.2.1.1 Sampling Techniques

The selection of this sampling technique depends on several factors such as the main objectives of the study, the sample size required, the cost and the time allocated by the study (Mariah,2015). The researcher chose a samples to represent the population in the study.

The sample refers to a population or the total number of items observed. According to Bartlett (2001), sampling means a process in which something is choosen based on the population. For this study, the population includes the entire facilities management organization of the Penang General Hospital. Therefore, the study focuses only on management and technical staffs of the facilities service provider in Pulau Pinang General Hospital. The selected sample consists of managers, engineers and technicians.

4.2.2 Sample Size (N)

According to Abdul Ghafar (2003), the population is a group of people who have the characteristics. The population of the study refers to the target group of the research activity. In an investigation, researchers are not able to use all existing populations but only use samples that represent the population being studied.While according to Abbott (2002), the sample was a small number of individuals from the population considered in the study. According to Krejcie and Morgan (1970), samples can represent the size of the population involved is 133 and the required sample is 117 which is divided into two strata namely management personnel and ground personel.

Department	Population	Sample Size (N)
Management	20	19
Technician	83	70
Total	103	86

Table 4.3: Sample Size

The table of Krejci and Morgan (1970) is used if the true number of populations are known.

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Table 4.4: Table Krejci and Morgan (1970)

4.3 DATA COLLECTION INSTRUMENT

The instrument is one of the methods used in the data collection process. The data collection instruments used in this study were the survey and the

interview. The questionnaire was formed in obtaining data relating to reviewing the effectiveness of facility condition assessment in facility maintenance. Designing items in the questionnaire needs to be designed in advance so that the assessment and Its importance can be maintained in every question raised.

4.3.1. Semi Structured Interview – Instrument

According to Chua (2006), interviews can be conducted using face-to-face and non-face-to-face methods. In this study, the interviews used in this study were semi structured types of interviews which only the main questions were prepared and the follow-up questions will be asked based on respondents' responses. This is because the researcher feels that face-to-face method is more appropriate as researchers are more likely to interact with respondents to obtain research information. In addition, to look into the needs of the study, the researcher chooses to obtain data by semi-structural interviews methods individually.

Interviews were held with selected professionals experts who were directly involved with the management of facilities at sectors like mechanical and electrical. This can indirectly help to provide a more rational description of the problem that is the subject of the study. The purpose of the interview was to ensure the validity of the questionnaires developed according to the planned concept and to ensure that the respondents' are able to understand the questions in the questionnaire. This interview is one of the ways to ensure the three objectives of this study are answered and enable the data to be collected with validity.

The interview became a supporting instrument that further strengthened the findings through questionnaire and become one of the ways to ensure the three objectives of the study were answered and the collected data could be analyzed well and thoroughly. The scope of the issue in this interview includes:

i. Based on the research framework, time are one of the issues for implementing Facility Condition Assessment as it really time consuming to be done especially at Pulau Pinang Hospital.What is your opinion about this issue based on your experiences?
ii. Financial/ cost are the main issues based on my research. The assessment cannot be perform frequently as the cost involved in the process. What is your opinion about this issue based on your experiences?
iii. In terms of management, one of the issues are about the practice of performance monitoring in Asset management are always being neglected compared to building operation, maintenance management, space management, and security. What is your opinion about this issue based on your experiences?

4.3.2 Questionnaire – Instrument

This questionnaire is a method used to study the factors affecting effectiveness of condition assessment on facility maintenance. Questionnaire is also the easiest way to obtain information (Jasmi, 2012). All the information provided by the respondents in this questionnaire is confidential and is only used for the studies specific study only. The items in this questionnaire are based on the first, second and third construct in the conceptual framework of the study. The questionnaire was also used to answer the third objective of the study. This questionnaire is divided into four sections which is listed below and the details of the questionnaires as in Appendix A.

Part A : Respondent Background

Part B : Effectiveness Of Assessment Of Facility Conditions

Part C : Factors Affecting Facility Condition Assessment.

Part A is a question of respondents' background also known as demography which consists of gender and position, and department. The purpose of this section is to obtain the appropriate information that can be used for comparative purposes forresearch conducted. This section will answer the number of male and female staff member as as respondents' posts.

Part B has twelve (6) questions and will focus on the second (2) objective of the research paper and the all three framework constructs which is the factors affecting effectiveness of condition assessment. Table 4.3 describes the items in section B of the questionnaire.

Item	Description
B1.1	Time saving can be achieved by eliminate repetative maintenance by performing the Facility Condition Assessment.
B1.2	Implementation of Facility Condition Assessment will affect the operation of other maintenance works as its time consuming
B2.1	Implementation of Facility Condition Assessment requires high cost to be implemented
B2.2	Cost involved in Facility Condition Assessment are the reason why it cannot be implemented frequently.
B3.1	The involvement of various parties during the Facility Condition Assessment makes it difficult for the assessment to be implemented
B3.2	Consultant incharged for FCA should use the same data collection method and formula to avoid faulty and inaccurate data

Table 4.5: Questionnaire Section B

Section C contains eight (6) questions. Each item constructed is based on the third (3) objective of the study and in chapter one, which is the Effectiveness of Facilities Condition Assessments. Table 4.4 illustrates the purpose of items questioned in the questionnaire.

Item	Description
C1.1	Time saving can be achieved by eliminate repetative maintenance by performing the Facility Condition Assessment.
C1.2	Facility Condition Assessment can solve facilities maintenance backlog issues thus saving time
C2.1	Facility Condition Assessment helps reduce unnecessary maintenance costs
C2.2	Savings in terms of manpower, use of spare parts, maintenance costs and time can be reduced after Facility Condition Assessment implemented
C3.1	Maintenance priorities can be implemented with the help of Facility Condition Assessment
C3.2	Priortising the Facility Condition Assessment will increase the effectiveness of facility maintenance

Table 4.6: Questionnaire Section C

4.3.3 Research Instrument

Part B and C use the likert scale of four options where the choice is based on frequency. This section uses a semantic difference scale of four options where respondents only need to indicate an option that can reflect their feelings on the Factors affecting Facilites Condition Assessment and the level of Effectiveness of Facilities Condition Assessments**.** The greater the value chosen, the higher the level of agreement that the respondent describes. The score will be evaluated to determined the total score and be graded according to three levels of low, medium and high.

Saunders (1992) suggests that the index should be built by adding items related to a concept. The Likert scale of this score was chosen because this easy scale was built and controlled by researchers and most respondents were

familiar with the use of this Likert scale. The Likert scale question is used to controlthe questions raised in order to be consistent with the research questions to achieve the objectives of the study. In addition, the question of this form is easier to analyse.

Answer	Score
Strongly Disagree	1
Disagree	2
Agree	3
Strongly Agree	4

Table 4.7: Likert Scale

According to Najib (1999), score analysis based on the minimum score of one item is 1 and the maximum score is 4. When it is associated with Likert scale, the analysis is as shown in Table 4.7

Mean Score	Level of Agreement
1.00 – 1.75	Strongly Disagree
1.76 – 2.50	Disagree
2.51 – 3.25	Agree
3.26 – 4.00	Strongly Agree

Table 4.8: Likert Scale Analysis

The formulation of questionnaire items is based on the results of reference books, survey and researcher's knowledge. Purification of the questionnaire instrument has been through the process of reviewing and validation from

managers of the Edgenta Mediserve Sdn Bhd as well as pilot studies to produce research instruments for the purposes of data collection.

4.3.4 Pilot Study

According to Najib (1999), a pilot study was carried out prior to the actual study using samples that had the same characteristics as the population to be tested. After this pilot study, researchers can be define the characteristics of the questions that need to be modified or maintained as items and during actual research. It can also help researchers identify any incorrect or inaccurate study methods or instruments. In this study, a total of ten staff of the company was randomly selected to carry out this pilot study.

The purpose of this pilot study is to examine and make sure that the questionnaire has clear and easy-to-understand questions and instructions when responding to them. Additionally, reliability testing of built-in items was also carried out. If the coefficient value exceeds 0.7, the researchers conclude that the questionnaire has high reliability (Najib, 1999). As a result of the reliability test, the Reability Analysis – Scale Alpha that uses the SPSS program has shown that the alpha value is above the alpha value of 0.7. Reliability value for questionnaire in this research is = 0.900. Therefore, it is believed that the items built have good reliability.

Section	Total Items	Cronbach's Alpha
B	6	0.645
C	6	0.713

Table 4.9: Questionnaire's Reliability Statistics

4.4 SUMMARY OF THE CHAPTER

In this chapter, researchers have explained about the instruments used for the data collection process and chose to adapt stratified sampling under probability sampling. Because this study uses the SPSS researchers chooses the sample size developed by Krejcie & Morgan (1970) for the facilities management.

CHAPTER 5
DATA ANALYSIS AND FINDINGS

5.0 INTRODUCTION

This chapter will focus on findings and analysation of the data obtained from the distribution and recollection of questionnaires at the asset management company managing the Pulau Pinang Hospital, which is Edgenta Mediserve Sdn Bhd. The analysis process based on findings obtained from the sample using the selected instrument such as interview and questionnaire based on the research, effectiveness of facility condition assessment on facility maintenance in Pulau Pinang Hospital.

This study were conducted at General Hospital of Pulau Pinang or known as Hospital Pulau Pinang (HPP) because of it is are one of the old hospital with old building structures. The questionnaire was distributed to Facility Engineering Maintenance Service (FEMS) staff which is from management and operational staff. The total of 110 questionnaires are distributed and only 103 forms are completed and returned within given period of time. All the returned questionnaires are processed and analyzed. The detailed number of questionnaire delivered is shown in the table below:

Category	Population (N)	Sample (S)
Total Staff	103	86
Management Staff	20	19
Operational Staff	83	70

Table 5.1: Research Population and Sample Size

In this chapter, the researcher wants to know whether the objective of the study can be achieved from the data analysis and the findings. All these findings are processed in this chapter to identify the correlation from the factor analysis. The researcher also determine the data based on the reliability analysis, descriptive analysis, and correlation analysis.

Analysis results obtained from the research data will be presented in the form of tables and charts. The data obtained were analyzed using SPSS software. The analysis method used was in the form of Cronbach's apha, percentage, and mean using SPSS software. The respondents involved in this study were all FEMS staff members of the concessionaire.

5.1 DEMOGRAPHIC

This section will describe the respondents' backround analysis which consists of gender, position, education, and working experience. The sums of different category of staffs are shown in percentages in Table 5.2 and Figure 5.1 below.

Item	Frequency	Percentage (%)
Male	82	79.6
Female	21	20.4
Total	103	100

Table 5.2 Total number of respondents by gender

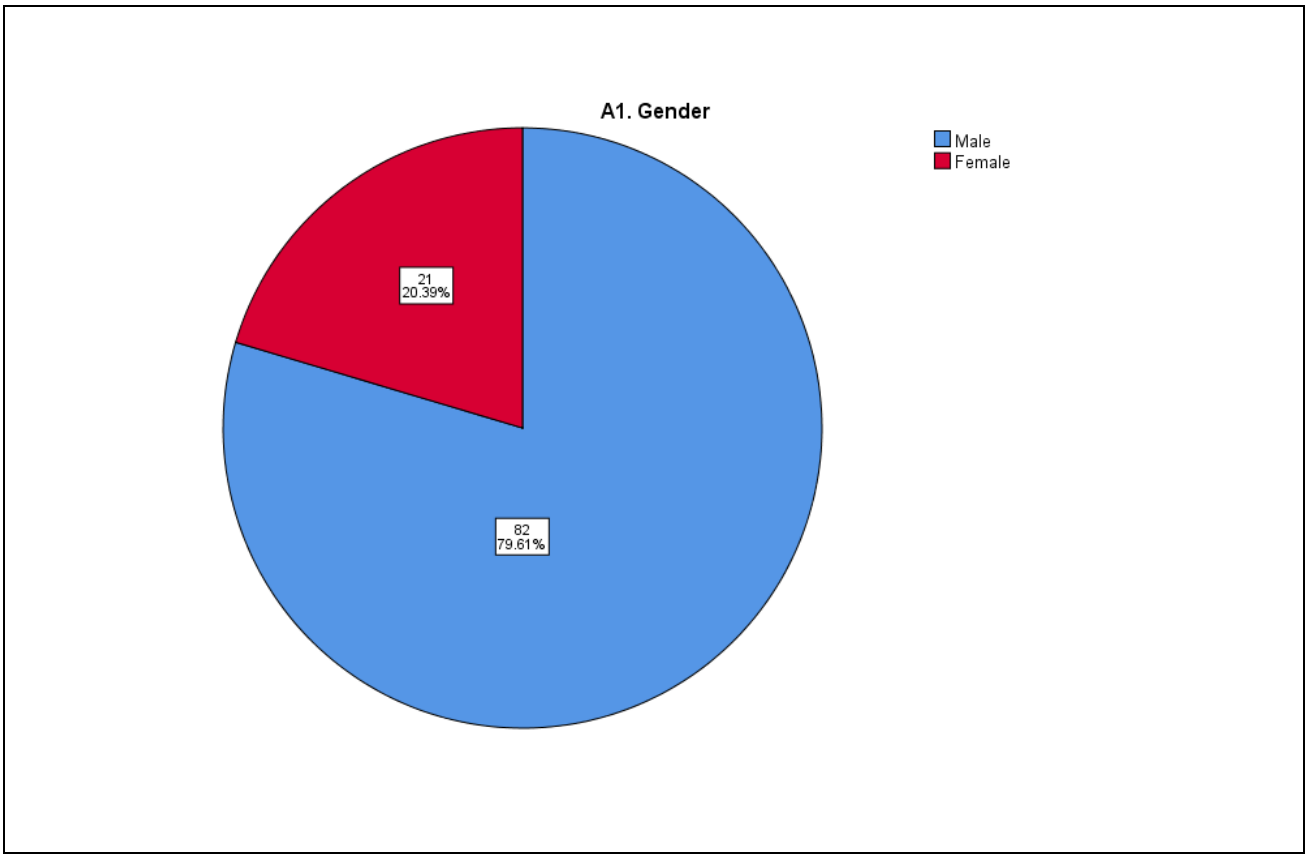

Figure 5.1: Pie Chart for gender

Refered to table 5.2 and figure 5.1, the number of respondents by gender were presented in the form of table and pie chart. The highest percentages of respondents of the questionnaires were from males staffs which is 79.6% with 82 respondents. Meanwhile, 20.4% with 21 respondents were from females staffs which showed a lower percentage.

Respondent's position data in the company were also collected to determine the numbers of respondent's position involved in this study.

Item	Frequency	Percentage (%)
Operation	79	76.7
Management	24	23.3
Total	103	100

Table 5.3 Total number of respondents by position

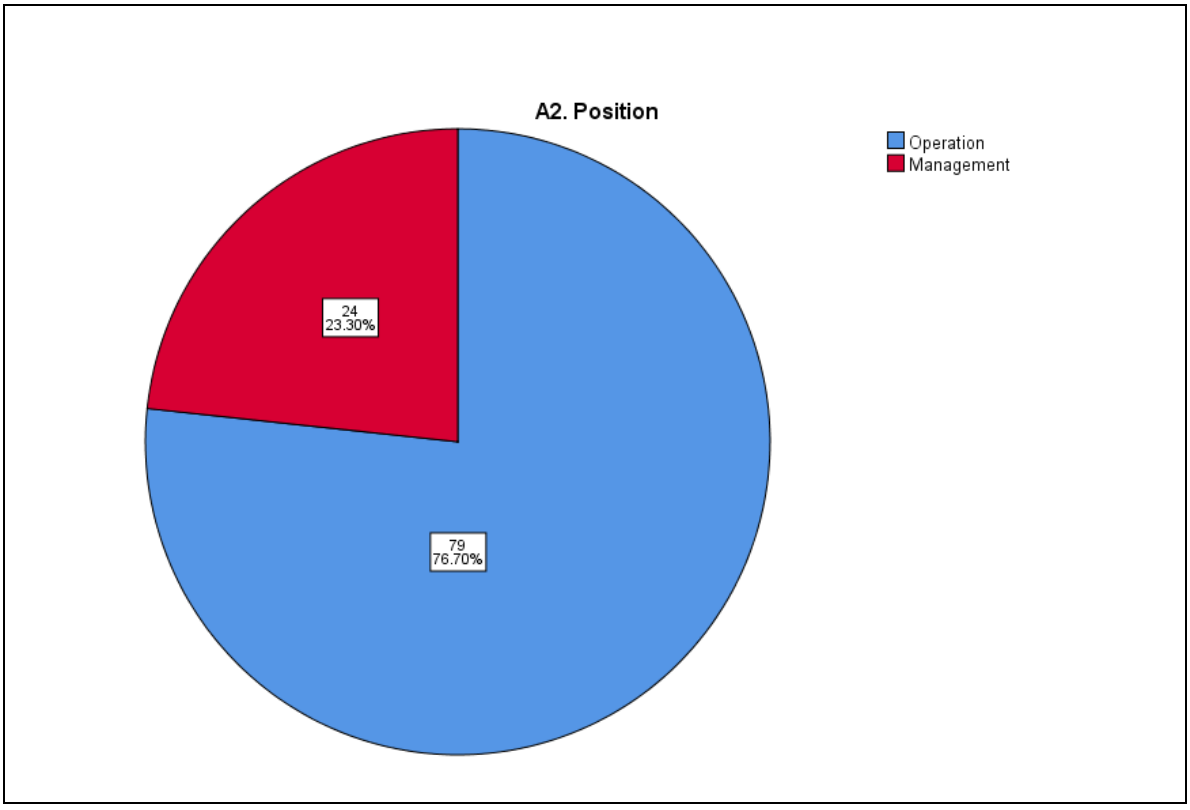

Figure 5.2: Pie Chart for position

Based on the data above from table 5.3 and figure 5.2, it present the data of position of the respondent. It mentioned that operation staff has the highest percent of 76.70% with 79 respondent while the management staff has the lower percent of 23.30% with 24 respondents.

Then, the level of education of FEMS staff also collected for the use of research to determine the number of education level of the respondents.

	Frequency	Percentage (%)
Certificate	33	32
Diploma	44	42.7
Advance Diploma	14	13.6
Bachelor Degree	11	10.7
Master Degree	1	1
Philosophy Doctor	0	0
Total	103	100

Table 5.4: Respondent's level of education

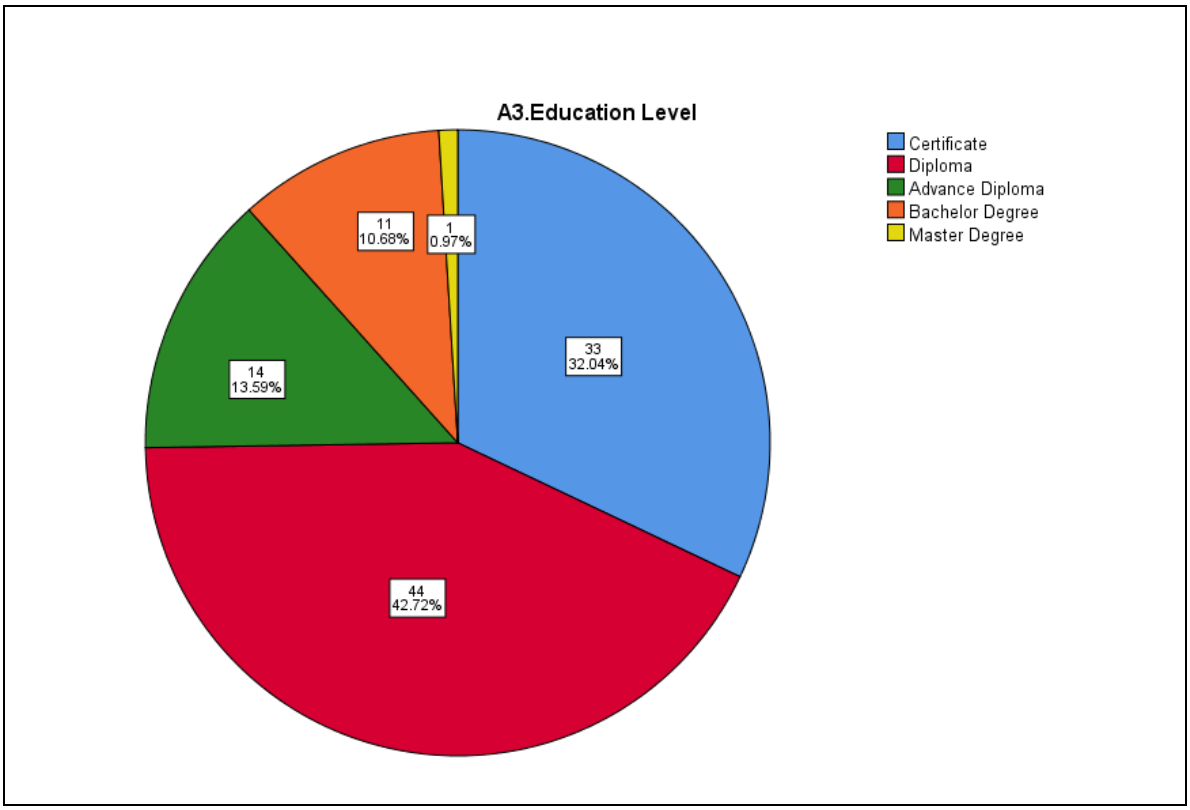

Figure 5.3: Pie Chart for education level

From the data stated on the table 5.4 and figure 5.3, it explain about the educational level of the respondents in FEMS. The data analysed and figured out that the highest percentage of educational level coming from diploma level which is 42.72% with 44 respondents. The second highest percentage are from Certificate level which is 32.04% with 33 respondents. For Advance Diploma level, the percentage are 13.59% with 14 respondents while the Bachelor Degree level percents are 10.68% with 11 respondents. Then the last two educational level are Master Degree and Philosophy Doctor which is 0.97% with 1 respondents and 0% with no respondents.

The last data collected through demographic question are focusing on the working experience of the respondents.

	Frequency	Percentage (%)
1-5 years	50	48.5
6-10 years	33	32
11-15 years	20	19.4
Total	103	100

Table 5.5: Respondent's working experience data

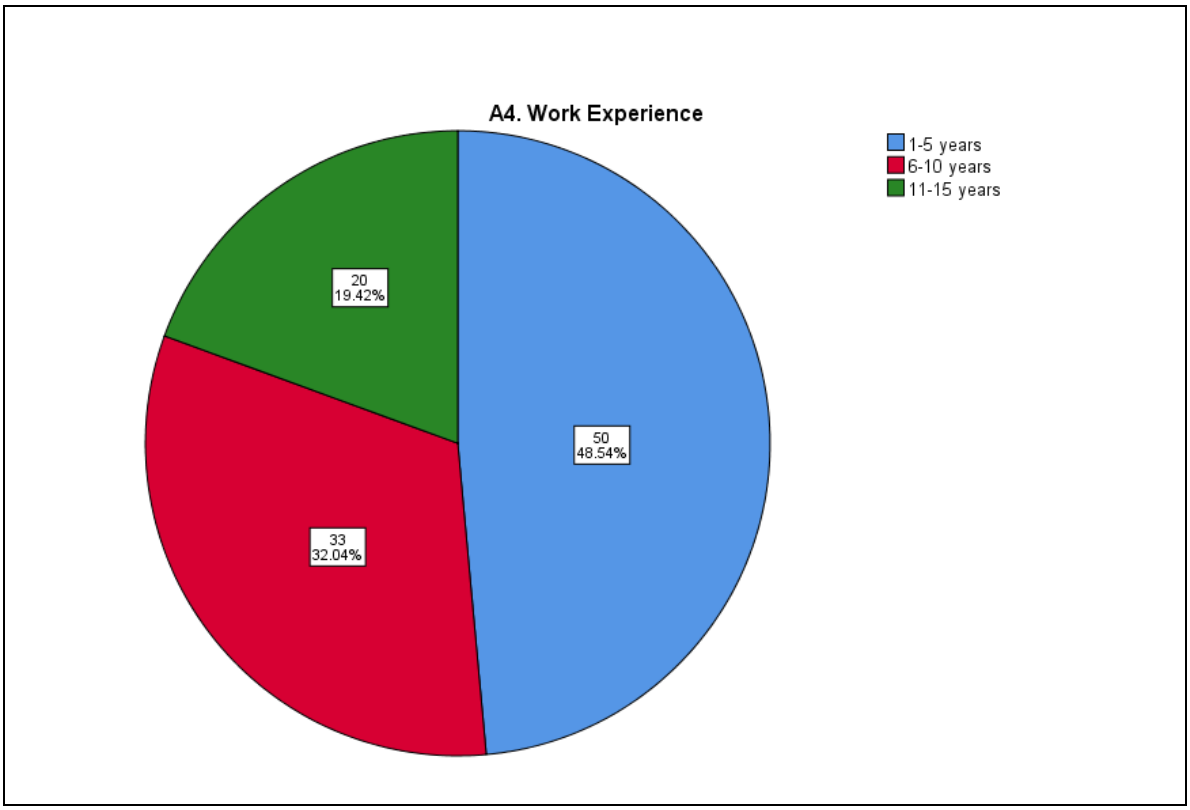

Figure 5.4: Pie Chart for work experience

From the data stated on the table 5.5 and figure 5.4, it mentioned the number of years of working experience by the respondents in the form of table and pie chart. The data above stated that the highest percentage of work experience within range 1-5 years which is 48.54% with 50 respondents. The second higher percentage for work experience of the respondents are in the range of 6-10 years with 32.04%, 33 respondents. The two lowest percent of

work experience of respondents comes from the range of 11-15 years with 19.42%, 20 respondents and more than 15 years with no respondents.

5.2 RESEARCH FINDINGS FOR FIRST OBJECTIVE

This section focus to analyze the data collected to achieve the first objective which is to identify the effectiveness of facility in Pulau Pinang Hospital. Therefore, the steps taken to achieve the first objective are by thorough review of literatures.

Besides, to achieve the first objective, the information were obtained through the data collection from questionnaire which has been distributed to the respondents. The questionnaire were constructed based on the conceptual framework which is financial, time and management.

To identify the effectiveness of facility in Pulau Pinang Hospital, the data collected from the Facility Engineering Maintenance Services (FEMS) will be analyzed based on the study constructs using Cronbach's Alpha method.

5.3.1 RELIABILITY ANALYSIS

Reliability analysis was performed to determine how powerful the items in the set of variables whether they can interact with one another. Table 5.6 below displays the Alpha coefficient spectrum and also the intensity relation from Alpha reliability testing by the Cronbach:

Alpha Coefficient Range	Internal Consistency
<0.6	Poor
0.6 to <0.7	Moderate
0.7 to <0.8	Good
0.8 to <0.9	Very Good
0.9	Excellent

Table 5.6: Cronbach's Alpha

5.3.2 ACTUAL TEST

There were 103 questionnaires provided by researchers at the Pulau Pinang Hospital. In order to determine the method of distribution of questionnaires, a stratified random sampling was selected beforehand. The questionnaires were distributed to Facility Engineering Maintenance Services (FEMS) on management and operational level. Apart from that, the researcher will need only 86 respondents from the stratified random sampling distributions. Nonethless, to ensure that all questionnaires provided are obtained, the total of 103 questionnaires were distributed.

Construct	Cronbach's Alpha	N of Items
Time	0.785	2
Financial	0.802	2
Management	0.785	2

Table 5.7: Cronbach's Alpha of Constructs

Based on the table 5.7 as shown the results of the actual test of reliability analysis. From this analysis made, it has been proved that all items in each variable are reliable. All the variables each of them has a very good internal consistency which is include the time, cost and management.

5.3.2.1 Time

Based on table 5.7, the value of Cronbach's Alpha for time is 0.785 which can be viewed as a very good internal surpasses the 0.60 and its eventually considered as reliable. In this variable consists of 2 items and the internal consistency is good.

5.3.2.2 Financial

The financial variable contains two (2) items, and the value of Cronbach's Alpha is 0.802. As it passed the 0.6 value its eventually considered as reliable. In this variable consists of 2 items and the internal consistency is very good.

5.3.2.3 Management

In this variable, management also have 3 items in it and the value for Cronbach's Alpha is stated more than 0.60 which is 0.785. This eventually can be proved that these 2 items are reliable for the research and it also has a good internal consistency.

5.4 THE FINDINGS OF THE RESEARCH FOR THE SECOND OBJECTIVE

This section focusing on analyzing the data at achieving the second objective to identify factors affecting facility condition assessment effectiveness. In order to achieve the objective, a questionnaire has been distributed to Facility Engineering Maintenance Services (FEMS) staff as an instrument to be used to gain the data and to identify any issues and deficiencies that exist within the study perimeter. The questions prepared are based on the literature reviews on previous studies that have been researched and discussed in chapter 2.

Then, to identify factors that affecting facility condition assessment effectiveness, the data already collected from the eight study areas will be analyzed and processed based on the study constructs using mean score and percentage method.

5.4.1 DATA ANALYSIS FOR TIME FACTOR.

As mentioned, this section purposely designated to analyse the first construct which is time factor. Based on the table 5.8.1 and bar charts, the results were as follows:

Item	Question	Mean	Standard Deviation
C1.1	Time saving can be achieved by eliminate repetative maintenance by performing the Facility Condition Assessment.	3.00	1.000
C1.2	Facility Condition Assessment can solve facilities maintenance backlog issues thus saving time	2.98	1.137

Table 5.8.1 Analysis score mean and std. deviation for time factor

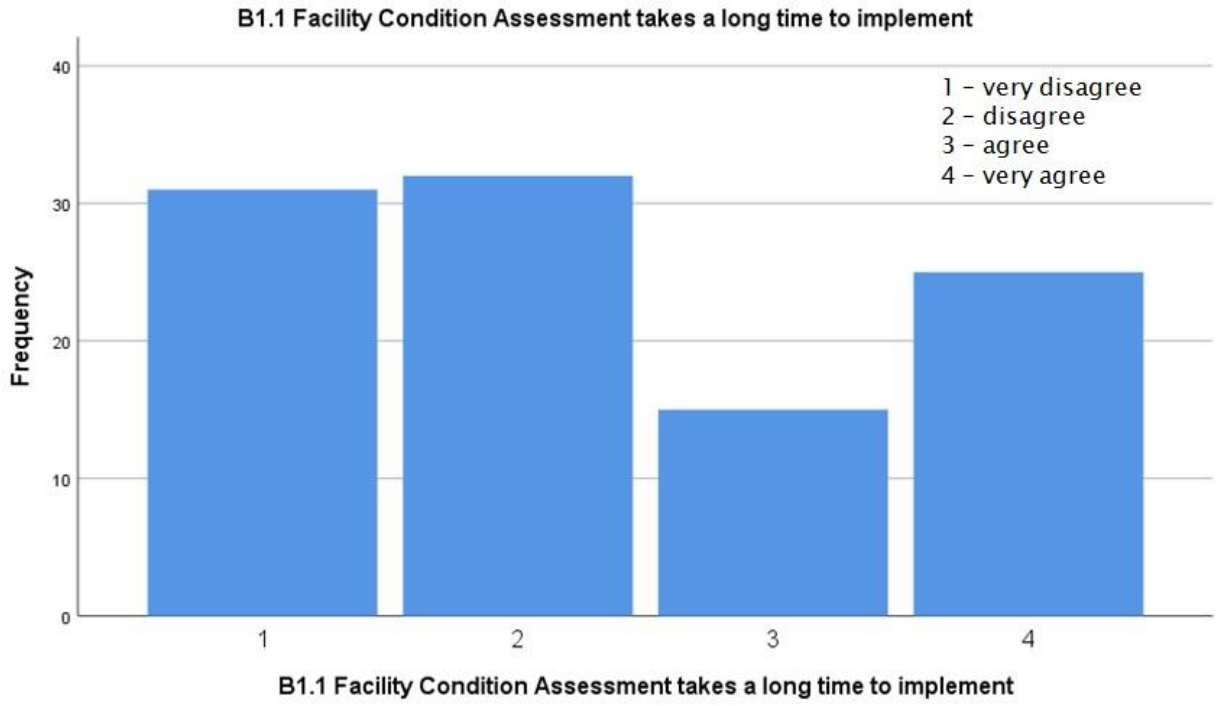

Figure 5.5.1 Bar chart for question B1.1

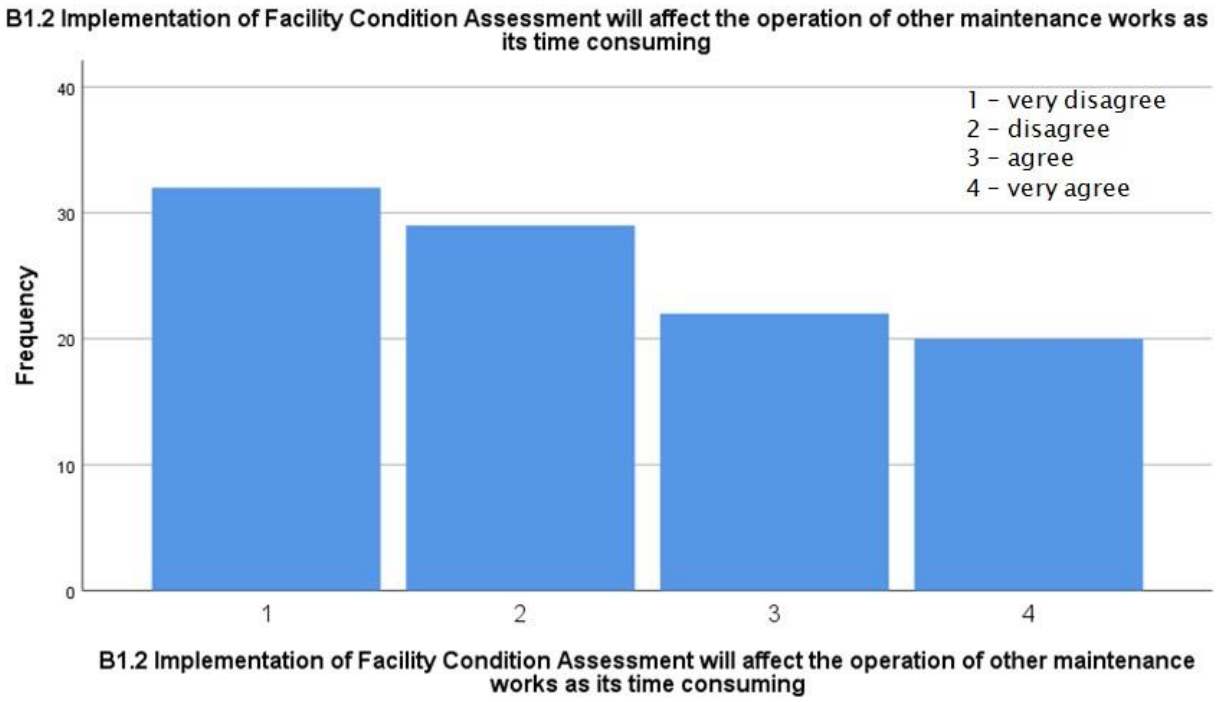

Figure 5.5.2 Bar chart for question B1.2

Referring to the respondent questionnaire for the first construct on time factors, the researcher found that most respondents generally disagreed with the questions asked by the researcher. It also shows that the level of effectiveness of facility condition assessment in facility maintenance is very much given attention to the importance of time factors related to effectiveness of facility condition assessment in facility maintenance.

Referring to Figure 5.5.1 Bar chart for question B1.1, there are several items that the respondents agree with. Table 5.8.1 analysis score mean and std. deviation for time factor show the mean value of each item in the time factor construct. In this build, two (2) items in it. For item B1.1 the mean value is 3.00 and the standard deviation is 1.000.

Based on the Figure 5.5.2 Bar chart for question B1.2, most of the respondents disagreed with the questions. Less than 30 persons agreed with the

questions B1.2. Referring to Table 5.8.1 Analysis score mean and std. deviation for time factor, the mean are 2.98 and the standard deviation are 1.137.

5.4.2 DATA ANALYSIS FOR FINANCIAL FACTOR

As mentioned, this section purposely designated to analyse the second construct which is financial factor. Based on the table 5.8.2 and bar charts, the results were as follows:

Item	Question	Mean	Standard Deviation
C2.1	Facility Condition Assessment helps reduce unnecessary maintenance costs	3.48	0.726
C2.2	Savings in terms of manpower, use of spare parts, maintenance costs and time can be reduced after Facility Condition Assessment implemented	3.42	0.835

Table 5.8.2 Analysis score mean and std. deviation for cost factor

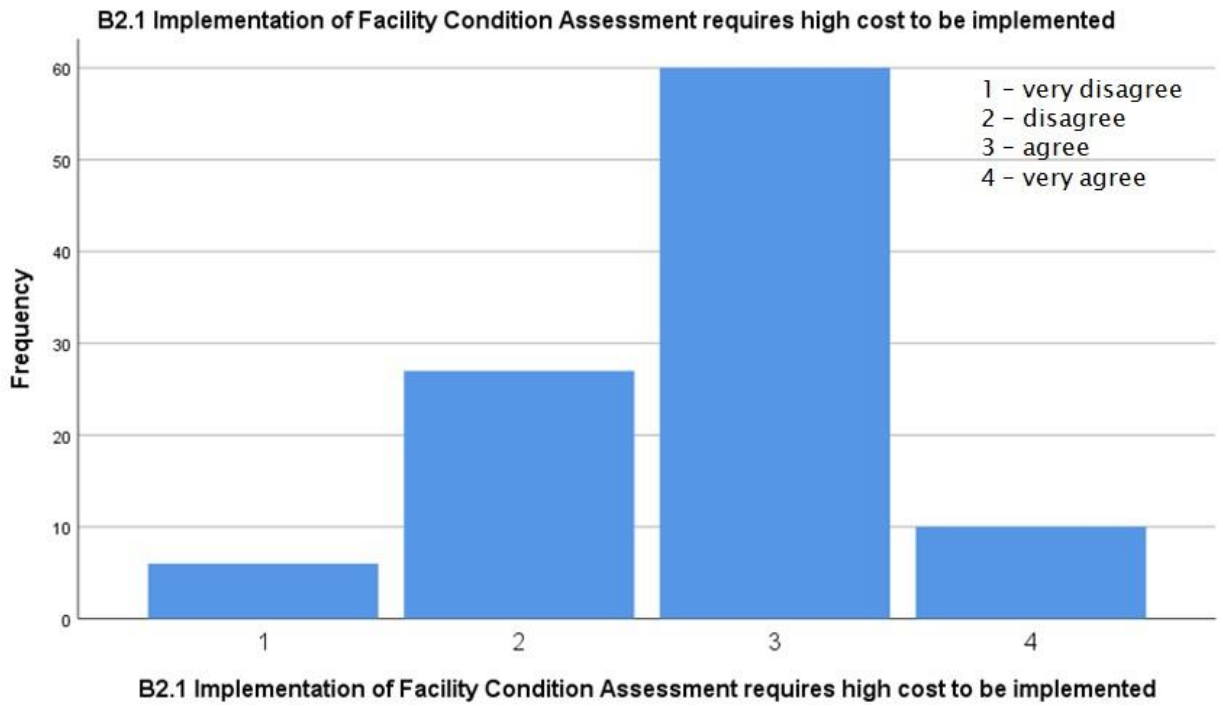

Figure 5.5.3 Bar chart for question B2.1

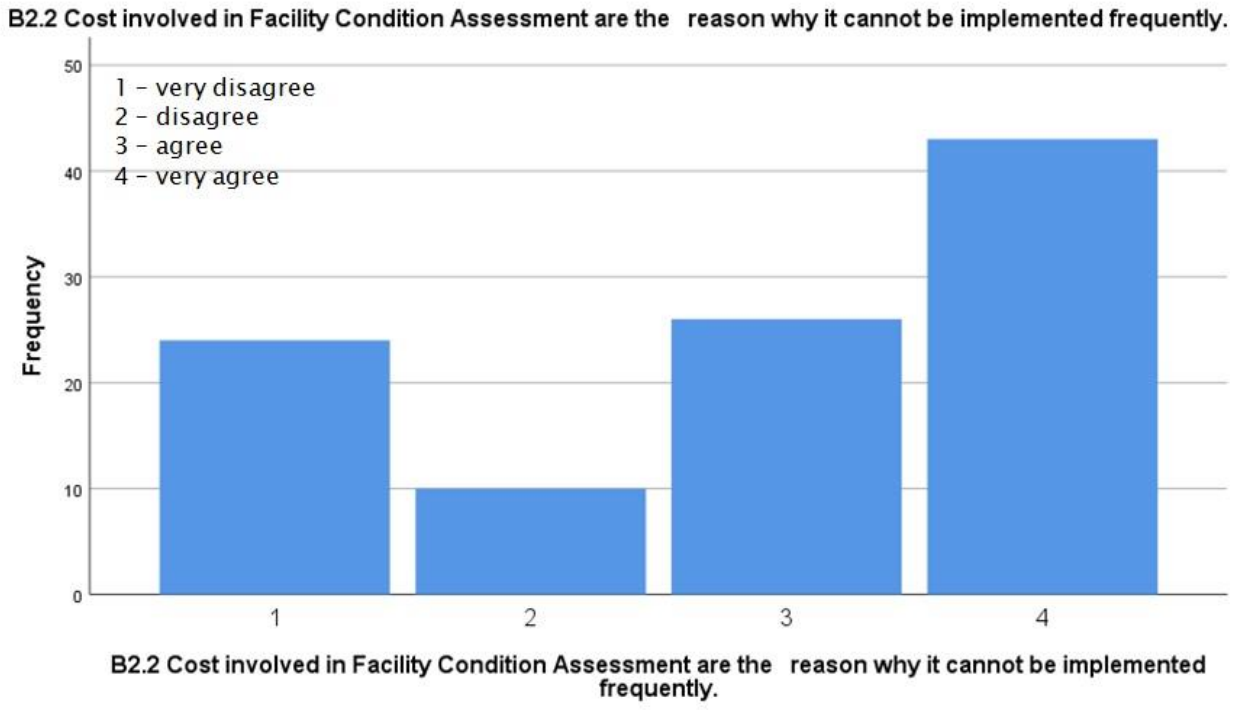

Figure 5.5.4 Bar chart for question B2.2

Referring to the questionnaire respondent for the second construct which is about financial factor, the researcher has found that most respondents agreed with the questions given by the researcher. 60 respondents have agreed that facility condition assessment does help in reducing cost of the facility maintenance. Less than 10 respondents strongly disagree with the question. It also shows that the level of effectiveness of facility condition assessement in facility maintenance is very important to the Pulau Pinang Hospital.

Refer to table Figure 5.5.3 bar chart for question B2.1, 60 respondents agreed with the questions, 28 respondents disagree and less than 10 respondents very disagree with the questions. it can be conclude that most of the respondents agreed with the question B2.1. The mean for question B2.1 is 3.48 and the standard deviation is 0.726.

For question B2.2, more than 40 respondents agreed that cost involved in the facility condition assessment is the reason why the assessment cannot be implemented frequently. The mean for this question is 3.42 and the standard deviation is 0.835. In the conclusion, financial factors does affect the effectiveness of facility condition assessment in facility maintenance at Pulau Pinang Hospital.

5.4.3 DATA ANALYSIS FOR MANAGEMENT FACTOR

As mentioned, this section purposely designated to analyse the second construct which is financial factor. Based on the table 5.8.3 and bar charts, the results were as follows:

Item	Question	Mean	Standard Deviation
C3.1	Maintenance priorities can be implemented with the help of Facility Condition Assessment	3.27	0.899
C3.2	Priortising the Facility Condition Assessment will increase the effectiveness of facility maintenance	3.23	0.866

Table 5.8.3 Analysis score mean and std. deviation for management factor

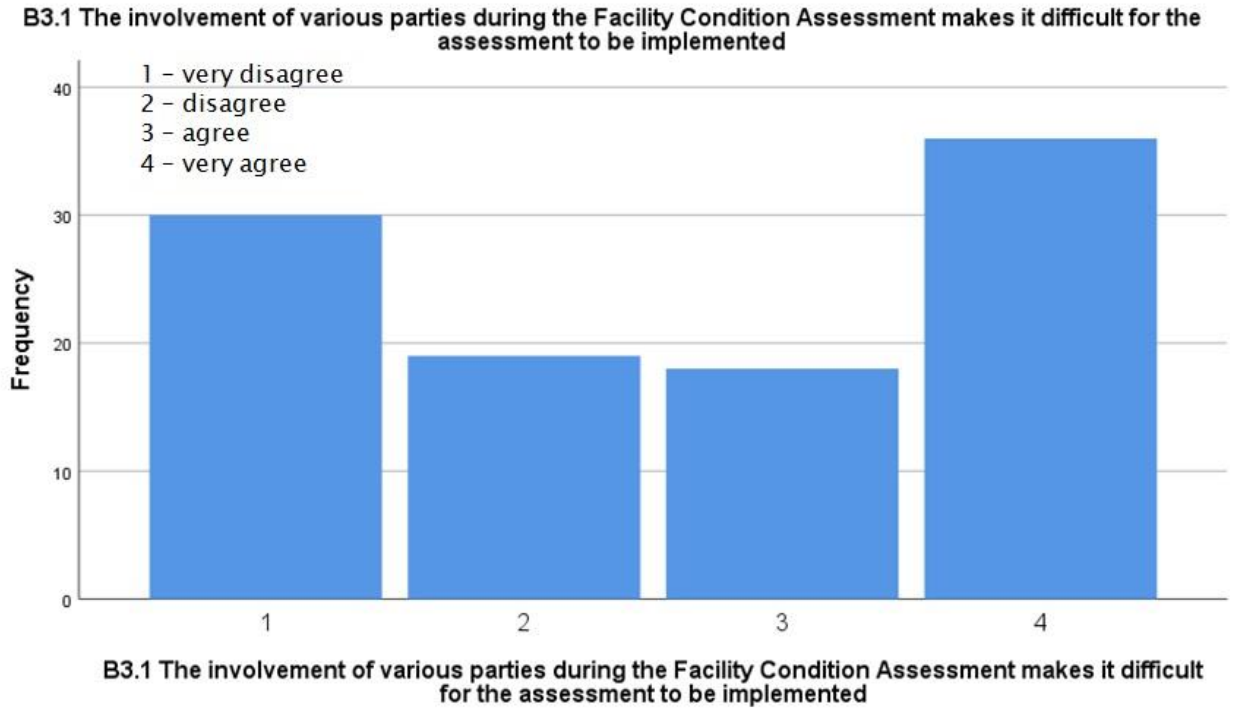

Figure 5.5.5 Bar chart for question B3.1

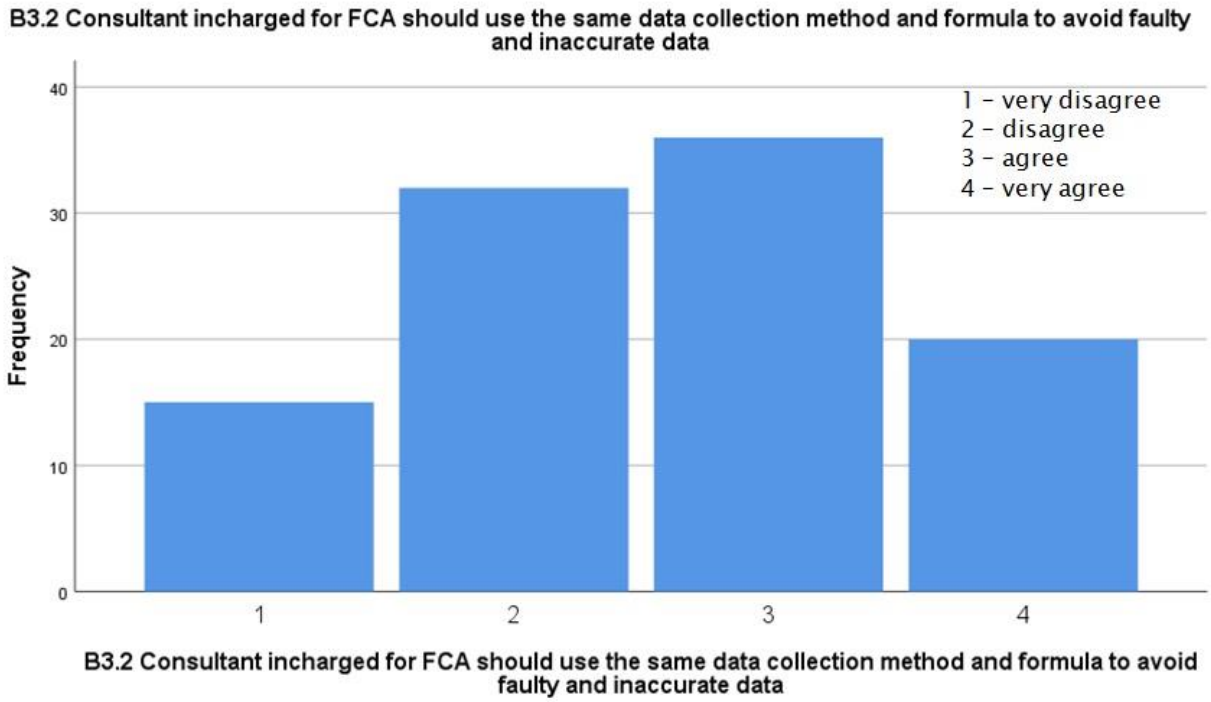

Figure 5.5.6: Bar chart for question B3.2

For this construct, the researcher has two (2) items for management factor in effectivesess of facility condition assessment in facility maintenance. Based on the questionnaire for management factor, the researcher found that there is slight different of opinion on the question B3.1. For the respondents that very agreed with the questions are 37 respondents while 30 respondents very disagreed with the question. According to table 5.8.3 analysis score mean and standard deviation for management factor stated that the mean for question B3.1 is 3.27 while the standard deviation is 0.899.

Referring to figure 5.5.6: bar chart for question B3.2, there is also slight different between respondent that agreed and disagreed upon that question. 37 respondents agreed while 32 respondents disagreed with the question. The mean for this question is 3.23 and the standard deviation is 0.866. To conclude this third construct, the respondents does agree that management factor affect

the effectiveness of facility condition assessment in facility maintenance at Pulau Pinang Hospital.

5.5 THE FINDINGS OF THE RESEARCH FOR THE THIRD OBJECTIVE

Study results for the third objective have been done to suggest an improvement of the effectiveness of facility condition assessment on facility maintenance. The method used to attain this third objective is to use the semi-structured method of interview. The researcher has conducted a semi-structured interview with top management , middle management and operational as outlined in the sub-topic research design about validity in chapter three to get their views, suggestions, and any support provided to achieve the third objective.

5.5.1 Suggestion to improve the effectiveness of facility condition assessment in facility maintenance at Pulau Pinang Hospital.

Based on interviews conducted with the staff of Edgenta Mediserve Sdn. Bhd for Facility Engineering Maintenance Services Department (FEMS), a few respondents were successfully interviewed with great cooperations from them which is Facility Head Engineer (Top Management), Mechanical Engineer, Electrical Engineer, Technical Executive (Middle Level Management) and Technician. There are several suggestions and improvements that can be made to improve the effectiveness of facility condition assessment on facility maintenance.

5.5.1.1 Improvement on time aspects in the effectiveness of facility condition assessment on facility maintenance.

There are several suggestion obtained during the interview session. All these suggestion and recommendation can be use as opinions and alternatives from different perspective. Edgenta Mediserve Sdn. Bhd. can use all these suggestion as continual improvement.

i. Quality Management Unit should held a training and audit on the recording methods of the data and documentations. All the unit leader should monitor the data recorded so all the asset data are always in ready mode and up-to-date. These activities will help to reduce the time for Facility Condition Assessemnt planning process.
ii. Choosing the right certified consultants with years of experiences to perform the Facility Condition Assessment also will cut the time wastage.
iii. Planning, scheduling and monitoring should be done accordingly. This will help the smoothness of the assessment to be done within period of time.

5.5.1.2 Issues regarding to financial towards the effectiveness of facility condition assessment on the facility maintenance.

i. Facility Condition Assessment is a complex, details, costly and critical tasks. Therefore proper coordination and planning should be done in terms of criticality.
ii. To reduce the cost of assessment, the medium level of the consultants can be hired to implement the Facility Condition Assessment. At the same time, Edgenta Mediserve should accompany the consultants and monitor the inspection so the task can be implemented successfully.
iii. Facility Condition Assessment can be implemented in-house. This require a proper guidance from regional office team. Instead of that, Edgenta

Mediserve can provide intense training for Facility Condition Assessment candidates so that cost related to this task can be reduced.

5.5.1.3 Management factors on facility condition assessment on facility maintenance.

i. Team of asset management or unit should be established in Edgenta Mediserve to work full time only for the asset management including the Facility Condition Assessment. These unit then will need to be trained and monitored regularly so that all the asset data collection will up-to-date.
ii. The management team should properly plan and schedule the activities in terms of workload and number of manpower. To much work to be done and accomplish just will reduce the productivity thus provide inaccurate data of the facilities that need to be assess and maintain. All these activity then should be monitored regularly and if there is issues arise, it can be rectified as soon as possible.
iii. Asset sometimes cannot be assessed in the full scale because of lack of understanding towards the objective of the Faciltiy Condition Assessment. Therefore, systematic coordination should be prioritize.

5.6 CONCLUSION

As a conclusion, based on the research results that have been analyzed by the researcher through questionnaire and semi-structured interview have been described very carefully, clearly, and analyzed. All data were collected and processed using the SPSS program. The results of this study have already been

discussed using the help of a table and figure. A comparison of the mean score and percentage was done according to item satisfaction for each construct. Based on the findings of the study, the researcher has obtained the desired answers to the three objectives for this research.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

This chapter will discuss the summary of a comprehensive review of the effectiveness of Facility Condition Assessment (FCA) in Pulau Pinang Hospital. Summary and conclusions are focused on the study in a holistic way which includes the implications of the suggestion of improvements of the study. All the data from this discovery has been divided into three matters, which is to summarize the first objective which is to identify the effectiveness of facility condition assessment in Pulau Pinang Hospital, the second objective are to analyze the factors affecting facility condition assessment effectiveness and lastly the third objective are to suggest the improvement of effectiveness of CA in Pulau Pinang Hospital was also involved in the scope of research.

The findings from the chapter one, chapter two and chapter three have stated several factors that influenced the effectiveness of facility condition assessment. Meantime, data analysis and information obtained in chapter five has produced a summary for the findings for each research objective.

The results of the analysis of survey and semi-interview questions that have been filled by the study respondents are gained from the evaluation of effectiveness of facility condition assessment. Questionnaire scoring are constructed in the form of likert scale which is very disagree, disagree, agree and very agree. From the semi-interview method, the findings were use for suggestions and improvements of the effectiveness of facility condition assessment.

6.2 SUMMARY OF RESULT FOR RESEARCH QUESTION

This study was conducted to study the effectiveness of facility condition assessment in facility maintenance. Regarding to Chapter 5, the study have been discussed and analyzed in order to achieved the research objective. This chapter have been conducted to:

- To identify the effectiveness of Facility Condition Assessment in facility maintenance
- To analyze factors affecting Facility Condition Assessment effectiveness
- To suggest the improvement of effectiveness of Facility Condition Assessment in Pulau Pinang Hospital

To verify all the objectives are answered, the suitable method were used which was survey form methods and semi-structured interviews. All respondents were from Edgenta Mediserve Sdn. Bhd. from Facility Engineering Maintenance Services (FEMS). All three (3) level of management in FEMS department were involved in the interview.

6.2.1 Research question 1

The results of the research question were answered. The question were built based on the objective which is to identify either the facility condition assessment effective in maintenance management in Pulau Pinang Hospital.

From the questionnaire distributed to the Faciltiy Engineering Maintenance Services (FEMS) staff on effectiveness of facility condition assessment, there were few factors found. These factors are stated in the list below:

a. Lack of asset details and record

b. Asset not updated correctly and difficult to trace the previous issues.

c. Complex systems of facilities in the hospital require long time to be implemented

d.Proper planning and coordination of work force and time should be aligned

6.2.2 Research Question 2

From the questionnaire distributed, it also targeted to achieve the second (2) research questions which is what is the factor that affecting the effectiveness of facility condition assessment?

The results of the research question were answered. It is to analyze the factors affecting the effectiveness of facility condition assessment. There were a few factors found and stated as below:

a. Certain part of Facility Condition Assessment preparation require high cost because of the involvement of the professionals.

b. Asset management process really time consuming because of hugh amount of data need to be process and updated from planning phase to disposing phase.

c. Location of the asset that always being misplaced

d. Proper performance monitoring of the facilities should be done

e. Performance monitoring practice need more preparation, training, time and right amount of manpower.

6.2.3 Research Question 3

The third (3) secondary research question that was constructed is how to identify the effectiveness of facility condition assessment? The results of the research and data analysis were obtained from the interview questions. Below are the questions of the interview with the answer obtain from sessions.

Section C: How to identify the effectiveness of facility condition assessment?

Regarding to the third objective of research, chapter 5 analysis results were discussed in the form of proposals and improvements to the factors that have been processed and analyzed. In general, time management especially for initial planning for facility condition assessment should be prepared. This will help the smoothness of the implementation of the assessment. Eventhough the facility condition assessment (FCA) activities is time consuming, with well preparation and detail scheduling, this factors can be reduce and improve.

Other than that, cost also one of the factors that influencing the effectiveness of facility condition assessment. Conclusion can be made that facilties condition assessment will be implemented if there are problems occur or requested by the user. The frequency of the assessment activities depends on the issues severity. It is implemented frequently if it cover small issues as frequent as twice a month. To perform full scale of facility condition assessment is really costly.

Regarding to the third (3) construct, management are the other factors that affecting the effectiveness of condition assessment in facility maintenance. This aspects can be summerise that facilties condition assessment (FCA) activities should be manage since at the planning phase. Proper management and monitoring of the activity should be priorize from the beginning till the end.

6.3 IMPLICATION OF RESEARCH

Regarding to the framework in chapter 2, the results of the study stated that it does help in several aspects. Based on the data collected, discussed and analyzed, the results can be conclude and some suggestions and improvements can be obtained. All these information can be used as a reference by the facility engineering maintenance service (FEMS) for continual improvements. Besides, some proposals were also provided to overcome the existing issues based on the factors mentioned previously. With this studies, the researcher wishing that the ideas proposed can helps the company to get fresh new alternatives in order to overcome current issues.

6.4 RESEARCH LIMITATION

This section discusses about the limits that existed in between the research time. One of the limitations that occurred during the process of conducting this research. Below are the lists of limitation that the researcher had during the whole process:

i. Invalid questionnaires

a) Some respondents did not answer all the questions in the questionnaires.

b) Certain respondants skip a few questions.

ii. Appointment for interview session

a) Its quite difficult for the researcher to set the date for interview session since all the interviewee really busy with their daily task.

b) Interview session cannot be done directly or face to face due to current pandemic issues, Covid-19.

c) Interviewee are busy with the task and the researcher have to find other candidates.

iii. Late response for the permission

a) The researcher was supposed to join the audit activities with Facility Engineering Maintenance Services (FEMS) but they do not response for quite some time.

b) Unfortunately, there were no responses received for activites permission asked and caused delay in the whole process.

iv) Movement Control Order (MCO)

i. In addition, there were Movement Control Order (MCO) by the government due to Covid-19 pandemic which restrict the researcher to involve in the audit activities thus limit the source of data collection.

However, the above stated problems did not prevent the process of the research findings. Those problems have been managed professionally. The involvement and cooperations of the management and operational staff of Facility Engineering Maintenance Services (FEMS) assist the researcher to complete the questionnaire and survey has reduced the problem of the researcher to the bottom. Therefore, this study has been able to reach its target and objectives successfully.

6.5 RECOMMENDATION AND SCOPE OF FURTHER STUDY

This research may be a initial study that only focusing on the small scale which is at the Hospital Pulau Pinang only due to limitation occurred during the period of the research conducted because of pandemic Covid-19. This research may be furthered with more informations gathered from various source in the future. From the results of the studies, the researcher has found some issues.

Hence, the researcher would like to offer some suggestions that are expected to clear up the matter. It includes:

i. Time management does affect the effectiveness of facility condition assessment in facility maintenance. Therefore, coordinations of task or activities should be done properly before it is implemented. The individual or team that responsible for the task should clearly understand the objectives of the activities.

ii. Other than that, shortage of parts or other sources that directly linked to the activity also affect the effectiveness of facility condition assessment in term of time. Implementing the facility condition assessment itself already time consuming, then this issues will surely drag the time thus wasting the time. Hence, the preparations of equipments or other resources that related with the activities and proper planning should be extra concerned.

iii. Financial issues are one of the sensitive topics in the business-based company. Through this research, cost for maintenance activity usually allocated during annual budget. If there is increasing number of activities related to the maintenance within a year, distributions of the budget should be done accordingly. The improvement can be suggest here are the continual monitoring towards maintenance activities including equipments upgrading, performance monitoring, condition assessments and other activities related to facilities maintenance. This will help the management to forecast the budget range for the next and upcoming years.

iv. Management of the maintenance, asset management, scheduling, maintenance and performance monitoring should be well planned and coordinate at the initial phase. This will help the smoothness of the project or the activities. Deep understanding of what is the objectives

and the outcomes of the task should be well digest. Synchronizing the management objectives and the implementation at the ground level will resulted to continuos improvements.

6.6 CONCLUSION

To conclude, the research are targeted to identify the challenges that obstruct and affect the effectiveness of facility condition assessment. The result form the research and analysis explain that effectiveness of facility condition assessment were influenced by several issues which can be classified into three (3) main factors that had been classed in the conceptual framework. It is time factors, financial issues and management matters. These three (3) factors have been discussed in deep in this research.

The implementation of facility condition assessment is really important to the maintenance management, asset management, and other facilities related. As the facilities and building getting old, the investments towards them in terms of maintenance also increase. Therefore proper monitoring and assessments should not be left out so the conditions of the facilities including equipments, systems, and buildings are in good shapes. Pulau Pinang Hospital have plenty of assets that need to be take care and maintain so the user or patients can enjoy the facilities with no worries. There are several cases that involving the user that cannot access the facilities in the hospital because of the unattended maintenance. This is not because of the operational staff did not do their works, but it is caused by a few factors that had been mentioned before. Here it proved that facility condition assessment does play it roles in maintaining the performance of the facilities.

REFERENCES

Adnan E. et. al.,2015, Assessment of Operational Maintenance in Public Hospitals Buildings in the Gaza Strip, International Journal of Sustainable Construction Engineering & Technology, (ISSN: 2180-3242), Vol 6, No 1

Ali, A.S. et. al., 2010, Factors affecting housing maintenance cost in Malaysia, Journal of Facilities Management, Vol. 8 No. 4, pp.285-298.

Baba, W. and Buba, V., 2013, Evaluation of Factors Affecting Residential Building Maintenance in Nigeria: Users' Perspective, Civil and Environmental Research, Vol. 3 No. 8, pp.2224-5790.

Dana J. et. al., 2018, Factors Affecting Maintenance of Hospital Buildings: A Literature Review

Don Sapp, 2017, Facilities and Operation Maintenance Overview

David M.M, 2013, Evaluation of The Effectiveness of Facilities Maintenance Management in Major Public and Private Hospitals in Kenya

Eric T. et al, 2001, Facility Condition Assessment Practice

Federal Transit Administration,2014, Facility Condition Assessment Guidebook

Fauzi M. 2010 Guidelines on FMP Research Format

Hafizi, Z. et. al., 2012, Financial Factor Affecting Maintenance Management in Safety and Health Practices , International Journal of Modern Engineering Research, Vol. 2 No. 5, pp.3061-3067.

Ibrahim Y. et. al.,2017, Poor Facility Management in the Public Schools of Ghana: Recent Empirical Discoveries, Journal of Sustainable Development Studies, Journal of Sustainable Development Studies, ISSN 2201-4268, Vol.11, Number 1, Pg 1-30

Kym F. et. al., 2015, Maintenance Management Models: A Study of Published Literature to Identify Empirical Evidence a Greater Practical Focus is Need, International Journal of Quality & Reliability Management, Vol. 32 No. 6, 2015, pp. 635-664, DOI 10.1108/IJQRM-11-2013-0185

Kaarthiek A. 2018 Readiness Level of Facilities Management Company in Providing Facilities in Accordance with The National Healthcare Standard (MSQH)

Krejcie, R. & Morgan, D. (1970), Determining Sample Size For Research Activities, Educational and Psychological Measurement

Michael H. G, 2018, A Review of Maintenance Management Models: Application for the Clinic and Hospital Environment, The International Journal of Engineering and Science (IJES), Vol 7, Issue 9, Ver.IV, Pg 01-17, ISSN (e): 2319 – 1813

Maxwell, J.A., 2012, Qualitative Research Design: An Interactive Approach, pp.214-249

Pauline K.et. al., 2016, State of Practice for Facility Condition Assessment

Pauline K. et. al, 2018, Building Condition Assessments – Methods and Metrics, Journal of Facility Management and Research, Vol 2

Pillinger, J., 2012, Review of literature and guidelines on accessibility in healthcare that underpin the National Guidelines on Accessible Primary, Community and Hospital Services.

Piper, J.E. (2004). Handbook of facility assessment. Lilburn, Ga: Fairmont Press; New York

Syamilah Y. et. al., 2016, Building Condition Assessment: Lesson Learnt from Pilot Projects, MATEC Web of Conferences, DOI: 10.1051

Saunders M. et.al.,2012 Research Methods for Business Students" Chapter 4: Understanding research philosophy and approaches to theory development

Tan Sri Lee Lam Thye, The Star, 2017

APPENDICES

Appendix A

QUESTIONNAIRE

A STUDY ON THE LEVEL OF EFFECTIVENESS OF FACILITY CONDITION ASSESSMENT ON FACILITY MAINTENANCE

This questionnaire was used to survey the level of effectiveness of the Facility Condition Assessment on the maintenance of the facilities at the Penang Hospital. All the information provided is CONFIDENTIAL and is used for research purposes only.

There are 3 sections in this questionnaire:

Part A: Background of the respondent

Part B: Factors Affecting Facility Condition Assessment

Part C: Assessing the level of effectiveness of the Facility Condition Assessment

Your cooperation is greatly appreciated and is preceded by a word of thanks.

SECTION A: RESPONDENT BACKGROUND

INSTRUCTION: Please tick ☑ on your choice.

A1: Gender : ☐ Male ☐ Female

A2: Position : ☐ Management ☐ Operation

A3. Education level:

Certificate	☐	Bachelor Degree	☐
Diploma	☐	Master Degree	☐
Advance Diploma	☐	Philosophy Doctor	☐

A4. Work experience:

1 – 5 years ☐ 11 – 15 years ☐

6 – 10 years ☐ More than 15 years ☐

Others, Mention : _____

On section B, section D, please tick ☑ on your choice based on the scale below.

1	2	3	4
Very Disagree	Disagree	Agree	Very Agree

PART B: EFFECTIVENESS OF ASSESSMENT OF FACILITY CONDITIONS

Item	Questions	Scale			
		1	2	3	4
B1.1	Facility Condition Assessment takes a long time to implement				
B1.2	Implementation of Facility Condition Assessment will affect the operation of other maintenance works as its time consuming				
B2.1	Implementation of Facility Condition Assessment requires high cost to be implemented				
B2.2	Cost involved in Facility Condition Assessment are the reason why it cannot be implemented frequently.				

B3.1	The involvement of various parties during the Facility Condition Assessment makes it difficult for the assessment to be implemented				
B3.2	Consultant incharged for FCA should use the same data collection method and formula to avoid faulty and inaccurate data				

PART C: FACTORS AFFECTING FACILITY CONDITION ASSESSMENT.

Item	Question	Scale			
		1	2	3	4
C1.1	Time saving can be achieved by eliminate repetative maintenance by performing the Facility Condition Assessment.				
C1.2	Facility Condition Assessment can solve facilities maintenance backlog issues thus saving time				
C2.1	Facility Condition Assessment helps reduce unnecessary maintenance costs				
C2.2	Savings in terms of manpower, use of spare parts, maintenance costs and time can be reduced after Facility Condition Assessment implemented				

C3.1	Maintenance priorities can be implemented with the help of Facility Condition Assessment				
C3.2	Priortising the Facility Condition Assessment will increase the effectiveness of facility maintenance				

Appendix B

]

INTERVIEW FORM

STUDY ON THE EFFECTIVENESS OF FACILITY CONDITION ASSESSMENT ON FACILITY MAINTENANCE

This interview form is used to conduct a survey on the effectiveness of facility condition assessment on facility maintenance and suggestion towards improvement can be made for continuous enhancement. All the information provided is CONFIDENTIAL and is only used for study surveys solely.

A1. Based on the research framework, time are one of the issues for implementing Facility Condition Assessment as it really time consuming to be done especially at Pulau Pinang Hospital.What is your opinion about this issue based on your experiences?

_____
_____
_____
_____

A2. Based on your opinions **(A1)** , what is your suggestion/ recommendation regarding the issue that will help for continuous improvement of Facility Condition Assessment in Pulau Pinang Hospital.

_____
_____
_____
_____

B1. Financial/ cost are the main issues based on my research. The assessment cannot be perform frequently as the cost involved in the process. What is your opinion about this issue based on your experiences?

_____
_____
_____
_____

B2. Based on your opinions **(B1)**, what is your suggestion/ recommendation regarding the issue that will help for continuous improvement of Facility Condition Assessment in Pulau Pinang Hospital.

_____
_____
_____
_____

C1. In terms of management, one of the issues are about the practice of performance monitoring in Asset management are always being neglected compared to building operation, maintenance management, space management, and security. What is your opinion about this issue based on your experiences?

_____
_____
_____
_____

C2. Based on your opinions **(C1)**, what is your suggestion/ recommendation regarding the issue that will help for continuous improvement of Facility Condition Assessment in Pulau Pinang Hospital.

_____
_____
_____
_____