



# **The Effectiveness of Successful Maintenance Management in Public Hospital Building**

By

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### DECLARATION OF THESIS

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## LIST OF PUBLICATIONS

The following papers were produced to disseminate some concepts and results from the work undertaken by the author during the course of this Master of Science research study.

### **Journal publications**

1. Omar, M.F., Ibrahim, F.A., Wan Omar, W.M.S. (2017). Key Performance Indicators for Maintenance Management Effectiveness of Public Hospital Building. *Matec*, 97, 4.
2. Omar, M.F., Ibrahim, F.A., Wan Omar, W.M.S. (2016). An Assessment of the Maintenance Management Effectiveness of Public Hospital through Key Performance Indicators. *Journal Sains Humanika*, 8, 4

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## LIST OF ABBREVIATIONS

CMMS	Computerized maintenance management system
FM	Facility Management
IFMA	International Facility Management Association
PPM	Preventive planned maintenance
RCM	Reliability Center Maintenance
SPSS	Statistic package of social science
TPM	Total Productive Maintenance

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# **KEBERKESANAN TERHADAP KEJAYAAN PENGURUSAN PENYELENGGARAAN DI BANGUNAN HOSPITAL AWAM**

## **ABSTRAK**

Penyelenggaraan bangunan merupakan salah satu aspek yang penting dalam pengurusan fasiliti dan perlu diberikan penekanan terutama bagi bangunan yang kompleks seperti hospital agar ia dapat beroperasi di tahap yang optima. Disebalik keperihatinan pihak kerajaan memperuntukkan sejumlah belanjawan bagi aspek-aspek penyelenggaraan bangunan, tahap pengurusan penyelenggaraan pada bangunan-bangunan kerajaan masih tidak memuaskan dan tidak berkesan. Masalah yang sama turut timbul pada hospital-hospital awam di mana pencapaian yang kurang memuaskan oleh pihak kontraktor dalam aspek-aspek pengurusan penyelenggaraan. Hasil daripada kajian literatur, pelbagai faktor mempengaruhi keberkesanan dan kejayaan pengurusan penyelenggaraan di bangunan hospital. Namun faktor-faktor ini boleh dirangkumkan kepada tiga konstruk utama iaitu 1) faktor individu, 2) aspek penyelenggaraan dan 3) faktor pentadbiran dan organisasi. Justeru, kajian ini dijalankan bertujuan mengenalpasti petunjuk utama keberkesanan dan kunci kejayaan pengurusan penyelenggaraan di hospital awam, menilai perhubungan antara keberkesanan dan kejayaan pengurusan penyelenggaraan di hospital awam dan memfaktorkan dimensi keberkesanan pengurusan penyelenggaraan di hospital awam. Pendekatan kaji selidik telah dipilih sebagai kaedah pengumpulan data dan sasaran responden dalam kajian ini adalah terdiri daripada pengurus penyelenggaraan di hospital-hospital awam wilayah utara Semenanjung Malaysia yang dikelolakan oleh Edgenta Mediserve Sdn Bhd. Teknik soal selidik urus sendiri digunakan bagi mengedarkan set soalan kaji selidik kepada 32 pengurus penyelenggaraan di hospital awam wilayah utara dan kesemua set soalan kaji selidik berjaya dilengkapi oleh responden. Analisis deskriptif telah digunakan bagi mengenalpasti keberkesanan dan kejayaan pengurusan penyelenggaraan di hospital awam. Hasil analisis deskriptif bagi petunjuk utama keberkesanan pengurusan penyelenggaraan di hospital awam menunjukkan bahawa kesemua konstruk adalah dikategorikan sebagai penting dan ketara dan diterima sebagai indikator utama dalam pengurusan penyelenggaraan di hospital awam. Manakala keputusan analisis bagi kunci kejayaan pengurusan penyelenggaraan di hospital awam mendapati bahawa keenam-enam dimensi iaitu kegagalan, kebolehpercayaan alat, masa, kualiti, kos penyelenggaraan dan keselamatan adalah sangat penting dan diterima sebagai kunci kejayaan kepada pengurusan penyelenggaraan di hospital awam. Seterusnya, perhubungan antara keberkesanan dengan kejayaan pengurusan penyelenggaraan dicapai dengan menggunakan perhubungan pearson dan mendapati bahawa ketiga-tiga konstruk iaitu 1) faktor individu, 2) aspek penyelenggaraan dan 3) faktor pentadbiran dan organisasi mempunyai hubungan yang besar dengan kejayaan pengurusan penyelenggaraan di hospital awam. Analisis terakhir yang dijalankan bagi memfaktorkan dimensi keberkesanan pengurusan penyelenggaraan ialah analisis faktor. Hasil analisis mendapati bahawa tiga konstruk awal iaitu 1) faktor individu, 2) aspek penyelenggaraan dan 3) faktor pentadbiran dan organisasi telah membentuk dua konstruk yang baru iaitu 1) faktor pentadbiran dan organisasi dan 2) aspek teknikal. Secara keseluruhannya, dapatan kajian ini adalah konsisten dengan dapatan kajian sebelum ini.

# **THE EFFECTIVENESS OF SUCCESSFUL MAINTENANCE MANAGEMENT IN PUBLIC HOSPITAL BUILDING**

## **ABSTRACT**

Building maintenance is an important aspect in facility management and should be given particular emphasis especially for complex buildings such as hospital so that it can operate at an optimal level. Despite the concern of the government to allocate a sum of budget for aspects such as building maintenance, the level of maintenance management for public buildings are still unsatisfactory and ineffective. The same problem also arises in public hospitals where poor performance showed by the appointed contractors in the aspects of maintenance management. According to the survey results, various other factors influenced the effectiveness and success of facility management in hospital buildings. But these factors can be summarized into three main constructs namely 1) individual factors, 2) maintenance aspects and 3) administrative and organizational factors. Hence, this study aims to identify the key indicator of the effectiveness and key success of the implementation of maintenance management in public hospitals, evaluating the relationship between the effectiveness and successful maintenance management of public hospitals and factoring the dimension of maintenance management effectiveness in public hospitals. A survey approach has been chosen as the method for data collection and the target respondents in this study are composed of the maintenance managers in the hospitals in the Northern region of Peninsular Malaysia which are maintained by Edgenta Mediserve Sdn Bhd. Self-administration techniques has been used to carry out the set of questionnaire to the 32 maintenance managers in public hospitals in the Northern region and all survey questions sets have been successfully completed by the respondents. Descriptive analysis have been used to determine the effectiveness and successful maintenance management in public hospitals. Descriptive analysis results of the key indicator of the effectiveness of maintenance management in public hospitals showed that all constructs are considered as important and significant and accepted as a key indicator in the maintenance management of public hospitals. While the analysis results of the key success of maintenance management in public hospitals found that the six dimensions namely failure, reliability of equipment, time, quality, maintenance cost and safety are very important and accepted as the key success of maintenance management of public hospitals. Next, the relationship between the effectiveness and successful maintenance management had been achieved by using Pearson correlation and found that all three constructs have a great relationship with the successful maintenance management in public hospitals. The final analysis conducted for factoring the dimensions of maintenance management effectiveness is known as factor analysis. Result of the analysis found that three initial constructs are 1) individual factors, 2) maintenance aspects, 3) administration and organizational factors have formed two new constructs which are 1) administrative and organizational factors and 2) technical aspects. Overall, these findings are consistent with the findings of previous studies.

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This thesis introduces a Master of Science research study which aims to find the key performance indicators for measuring the maintenance management in the public hospital building. As an unfit accommodation for patients will give a negative impact to the government's delivery system and nation development. Therefore, the effectiveness of hospital building maintenance management is very important and significant for successful maintenance management. This chapter presents an overview of this thesis by describing the key issues related to the research objectives, scopes, and method. The chapter begins with Section 1.1, describes the chapter one. Section 1.2 introduces the background of study and the motivation for undertaking this study. Section 1.3 is the problem statement, presents the problems regarding maintenance management in the hospital building. Section 1.4 and Section 1.5, details the research objectives and addresses the scope of the study. Section 1.6 describes the research questions in this study.

### 1.2 Background of Study

Health is a level or circumstances where an individual has been perfect with the well-being of the physical, mental and social and simply free from illness or helplessness



by the World Health Organization (WHO). However, a person who is suffering health problems may refer to any hospital for further treatment. The World Health Organization (WHO) also defines the term 'hospital' as an institution that provides in-patient medical care and nursing. The hospital is equipped with modern amenities and sophisticated medical equipment and professional staffs to provide medical services and treatment to patients.

In addition, there are also some hospitals used as educational institutions for training medical students, doctors and nurses. The broad functions of the hospital building will lead to the damaged and defects to the building equipment and services provided at the hospital. Aging is the main factor for building damage or defects. It is because all the equipment and facilities have certain limit and expiration date.

General building design mistakes often occurred, usually in an effort to reduce the cost of the initial project expenditure which plays an important role in building design (Ahzahar, 2011). In addition, another study conducted by Iyagba & Adenuga (2007) found that the structure and decoration of public hospitals building in Nigeria was very poor and in bad condition. Existing health sectors building in Nigeria lack adequate maintenance attention. Most public hospital buildings are in very poor and deplorable conditions of structural and decorative disrepair. Therefore, there are need to establish and evaluate the factor affecting maintenance management of public hospital buildings.

According to Shohet (2002), maintenance management of the hospital is one of the most complex issues in the field of maintenance. Contributing to this field is the complexity of large hospital building, high mechanical, electrical system and lack of

maintenance. In addition, the performance and operation of the hospital buildings are affected by various factors. These include hospital occupancy compared with occupancy planned, age of building, building environment, resource management and labour invested resources for the implementation of maintenance with the provision of internal or outsourcing. Good maintenance could improve the possibility of an asset where it can provide a satisfactory return. Therefore, an effective maintenance requires a more strategic approach and comprehensive.

According to Manaf (2005), Ministry of Health (MOH) primarily provided public healthcare in Malaysia and about 53 per cent of the annual budget was allocated for the health sector. However, in 1997 the Government of Malaysia has taken the initiative to carry out a major privatization project for the provision, maintenance, and management of hospital support services (HSS) for public hospitals throughout the country (Ali & Mohamad, 2009). The government has appointed concessionaire (contractor) as the party who manages maintenance of public hospitals. Three concessionaire was involved to manage maintenance of public hospital in Malaysia such as Edgenta Mediserve Sdn Bhd (Northern Region, Sabah and Sarawak), Radicare (M) Sdn Bhd (Pahang, Kelantan, Terengganu, Wilayah and Putrajaya) and Medivest Sdn Bhd (Southern Region).

In order to increase the level of customer satisfaction with hospital facilities, the management needs to review the types of plans according to the facilities needs and maintenance strategy implemented in the past.

### 1.3 Problem Statement

In Malaysia, facilities and public buildings are provided and owned by the federal government (Khalil & Nawawi, 2008). Therefore, to prolong the lifetime of the buildings, the government has allocated a huge amount of money to be spent for any matter related to building maintenance management. For instance, in the 9<sup>th</sup> Malaysia Plan (2006 – 2010), the government has allocated RM13 million for the purpose of facilities maintenance which includes upgrading, renovating and maintaining the government buildings (MoF, 2005). Unfortunately, studies such as Zailan (2001), Deris (2004) and Syamilah (2005) found that the maintenance practices for government buildings were ineffective and at unsatisfactory level. This statement is supported by the case study conducted by Syamilah (2006) which concluded that more than 50 government schools in Petaling Jaya had not been maintained properly while Ismail (2014) found out that poor maintenance management such as poor service delivery, inadequate finance, poor maintenance planning and maintenance backlogs had been adopted for Polytechnics. These findings addressed the need of effective maintenance management for government buildings to ensure the worth of the budget allocated to provide the facilities to the public as well as to prolong the building lifecycle.

Similarly, the Malaysia government had shown their commitment towards providing and delivering the best healthcare services by allocating a huge budget such as RM600 million during the 10<sup>th</sup> Malaysia plan (2011 – 2015) to develop new hospital and clinic facilities. Nevertheless, similar maintenance management issues in the government buildings also occurred for the public hospitals. A study on the maintenance management of public hospitals by Ali and Mohamad (2009) found that the maintenance management

in public hospitals conducted by the contractors were under performance which had been indicated in many areas of weaknesses with regard to the assessment elements, namely: policies; plans and procedures; training and orientation; and service performance. In addition, Rani, Baharum, Akbar & Nawawi (2015) suggested that the current maintenance practice for complicated buildings such as hospitals need to be transformed strategically in order to achieve better performance with respect to facilities and environment.

Besides that, there are still many complaints on hospital building defects and several incidents that are related to the building maintenance. For example, fungal infection incident at Hospital Sultanah Aminah, Johor Bahru in year 2007, collapsed ceiling at Hospital Sultan Abdul Halim, Sg. Petani, Kedah and fungus and spores were discovered on the wall at Hospital Temerloh (HoSHAHS), Pahang. Moreover, Sholet (2010) stated that the maintenance management of hospital buildings is one of the more complex issues in the field of maintenance. This is due to the fact that hospital buildings are complicated facility and involved very critical mechanical and electrical equipment (Looemore & Hsin, 2001; Sholet, 2003) which runs alternately for 24 hours to support the systems in the hospital building (Rani et al. 2015). Therefore, strategic planning needs to be practiced in the maintenance management of hospital buildings with the purpose to achieve the optimum level of effectiveness and successfulness of maintenance management.

Furthermore, Rani et al. (2015) asserted that the management of healthcare facility requires a special touch to improve the effectiveness of maintenance management. Therefore, traditional methods of maintenance practice need to be

transformed strategically to achieve better performance with respect to facilities and environment (Mat, Kamaruzzaman, & Pitt, 2011). According to Ali & Mohamad (2009), the maintenance organization in public hospitals in Malaysia is still lacking to fulfil contractual and regulatory requirements to establish and to put into practice the necessary policies, plans and procedures to facilitate implementation. In the case of maintenance management of public hospitals in Malaysia, this job scope has been privatized to the government appointed independent contractor companies through a special regulatory unit within the engineering division. Therefore, the contractor involved in this job scope have to adapt advance maintenance techniques in running the building maintenance management. As suggested by Cholasuke, Bhardwa, & Antony (2004), the maintenance organization could adopt Reliability Centred Maintenance (RCM) and Total Productive Maintenance (TPM) approaches as they have been proven to be more effective and able to carry out a long term improvement of maintenance management.

This current study attempts to identify the factors which have influenced the effectiveness and successfulness of maintenance management in the public hospitals. As this study is related to the maintenance management, most of the discussions are centred on the theory of maintenance in general view as well as focusing more on building sectors which include the discussion on building maintenance approach, policies on building maintenance, and key performance indicators of effectiveness and successfulness of building maintenance management. Furthermore, this study aims to determine the relationship between the effectiveness and successfulness of maintenance management of public hospitals in Malaysia. Lastly, this study attempts to finalize the factors which contribute to the effectiveness of maintenance management in the public hospitals. This

objective is important as it is tailored to the public hospitals because the conceptual framework is based on the multidisciplinary industries and sectors.

#### **1.4 Research Questions**

A research question functions as a guidance and as the centre of research. It should be clear and focused, as well as to synthesize multiple sources to present your unique argument (Simoes, Lda, & Gomes, 2011). For the current study, the literature review in this study provided essential background knowledge on how to measure the effectiveness of maintenance management and also to describe the key success of maintenance management. In order to address these research gaps, four research questions (RQ) were formulated:

RQ1: What is the key performance indicators for effectiveness of maintenance management in the public hospital building?

RQ2: What is the key success of maintenance management in the public hospital building?

RQ3: How the effectiveness of maintenance management in public hospital building correlate with success of maintenance management in public hospital building?

RQ4: Does the maintenance management in public hospital building have similar variables with other sectors?

In order to answer the above research questions, refer to the conceptual research framework (Chapter 3) was developed based on the previously established theoretical

framework. However, the conceptual research framework leads to the introduction of the hypotheses to show the relationship between two variables.

### **1.5 Objective**

The objectives of this study are as follows:

- i. To identify the key performance indicators for the effectiveness of maintenance management in public hospitals building
- ii. To identify the key successful of maintenance management in public hospital building.
- iii. To evaluate the correlation between the effectiveness of maintenance management and successful maintenance management in public hospital building.
- iv. To factorise the dimension of maintenance management effectiveness in assessing the maintenance management in public hospital building to have similar variables of key performance indicators with other sectors.

### **1.6 Scope of Study**

This study focuses on hospital maintenance by concession companies (contractors) take responsibility for the infrastructure available at the respective government hospital building. The area of study involves 32 hospitals at the northern region of Peninsular Malaysia which under responsibility of Edgenta Mediserve Sdn Bhd that has been appointed as a main contractor to manage and related maintenance

management for the hospital. Therefore, the states which take part in this study are Perlis, Kedah, Pulau Pinang and Perak. However, there are 32 respective maintenance managers for each hospitals.

The scope will focus on maintenance management in the hospital building. This study will focus on government hospitals and maintenance services include civil engineering service, mechanical equipment service, electrical and telecommunication. The total of hospital building is many and it is troublesome to gather the data in a short period of time and with a limited budget. Therefore, this study is expected to be implemented in the maintenance management for the hospital building in this country.

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