

CONSTRUCTION DURATION FOR VARIOUS HEALTHCARE FACILITY  
PROJECTS FOR PUBLIC WORKS DEPARTMENT

SITI NURULHUDA AMIRRUDIN

UNIVERSITI TEKNOLOGI MALAYSIA

## UNIVERSITI TEKNOLOGI MALAYSIA

### DECLARATION OF POSTGRADUATE CAPSTONE PROJECT REPORT AND COPYRIGHT

Author's full name : SITI NURULHUDA BT. AMIRRUDIN

Date of birth : 1 JUNE 1975

Title : CONSTRUCTION DURATION FOR VARIOUS HEALTHCARE FACILITY PROJECTS  
FOR PUBLIC WORKS DEPARTMENT

Academic Session : 2008/2010

I declare that this capstone project report is classified as :

- CONFIDENTIAL** (Contains confidential information under the Official Secret Act 1972)\*
- RESTRICTED** (Contains restricted information as specified by the organization where research was done)\*
- OPEN ACCESS** I agree that my capstone project report to be published as online open access (full text)

I acknowledged that Universiti Teknologi Malaysia reserves the right as follows:

1. The capstone project report is the property of Universiti Teknologi Malaysia.
2. The Library of Universiti Teknologi Malaysia has the right to make copies for the purpose of research only.
3. The Library has the right to make copies of the capstone project report for academic exchange.

  
\_\_\_\_\_  
**SIGNATURE**

7500601-10-6066  
\_\_\_\_\_  
**(NEW IC NO. /PASSPORT NO.)**

Date : 10/12/2010


Certified by:  
  
\_\_\_\_\_  
**SIGNATURE OF SUPERVISOR**

PROF. DR. MUHD ZAIMI BIN ABD MAJID  
Executive Director  
Innovative Construction Research Alliance (iCON)  
Universiti Teknologi Malaysia  
**NAME OF SUPERVISOR**

Date : 10/12/10

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

“I hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the degree of Master of Project Management”

Signature :  .....

Name of Supervisor : Prof. Dr. Muhd Zaimi Abd Majid

Date : 10 December 2010

CONSTRUCTION DURATION FOR VARIOUS HEALTHCARE FACILITY  
PROJECTS FOR PUBLIC WORKS DEPARTMENT


SITI NURULHUDA AMIRRUDIN

A capstone project report submitted in partial fulfilment of the  
requirements for the award of the degree of  
Master of Project Management

Faculty of Civil Engineering  
Universiti Teknologi Malaysia

DECEMBER 2010

I declare that this capstone project report entitled "*Construction Duration For Various Healthcare Facility Projects For Public Works Department*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :  .....

Name : Siti Nuruhuda bt Amirrudin

Date : 10 December 2010

*To my beloved family, especially to my husband Ariffin Micky,  
my children Azif and Ariz and my lovely mother.  
Thanks for your never ending love and support.*

## ACKNOWLEDGEMENT

Praise to the Almighty Allah the God of the Universe for guiding me to conceptualize, develop and complete the project report. First and foremost, I would like to convey my sincere appreciation to my project supervisor, Prof. Dr. Muhd Zaimi Abd Majid for his generous advice, patience, guidance and encouragement throughout the duration of my capstone project.

Secondly, I would like to express my gratitude to all participating respondents from the various branches in the Public Works Department (PWD), State PWD and contractors who generously spent their precious time to participate in the questionnaire survey of this project. Their contributions are invaluable to the success of the study which is really appreciated.

Furthermore, I would also like to express my sincere thanks to my superior and friends, who have given me a lot of support and advice on this project.

Finally, I am most thankful to my family for their continuous support and encouragement given to me unconditionally in completing this project. Without the contribution of all those mentioned above, this work would not have been possible.

## ABSTRACT

The construction industry in many countries have increasingly recognized the need for more efficient and timely completion of projects. One of the main issues pertaining to delivery of projects in the Public Works Department (PWD) is the period of the construction duration which is often not realistic. Suitable norms or standard construction duration is currently unavailable in the PWD. The main objective of this study is to establish the construction duration for various healthcare facility projects. In order to achieve the objective, a research methodology was formulated. The research methodology involved literature review, data collection and analysis. In the literature review, extensive information with regards to the factors that affecting the construction duration were identified. While gathering of data is obtained through questionnaire and the data were analysed by using frequency analysis, average index and the Mann-Whitney U Test. In conclusion of the study, the construction duration of various healthcare facility projects were established. From the finding, the ranges of construction duration for the healthcare facility are in between 8 to 17 months for rural health clinic, 14 to 23 months for health clinic type 3 and 20 to 29 months for health clinic type 3 with quarters depending on the project's location and influential factors.



## ABSTRAK

Industri pembinaan di kebanyakan negara semakin menyedari keperluan dan kepentingan untuk menyiapkan projek dengan lebih efisien dan mengikut masa yang telah ditetapkan. Salah satu daripada isu utama berkaitan dengan penyediaan projek di Jabatan Kerja Raya (JKR) adalah mengenai isu tempoh pembinaan projek yang sering tidak realistik. Norma-norma yang sesuai atau tempoh piawaian pembinaan masih belum lagi dihasilkan di JKR. Tujuan utama kajian ini dilaksanakan adalah untuk menghasilkan tempoh pembinaan yang sesuai bagi projek pembangunan kesihatan dibawah seliaan JKR. Metodologi bagi kajian ini adalah meliputi kajian literatur, pengumpulan data dan analisis. Kajian literatur dilaksanakan bagi mengenalpasti maklumat dan faktor-faktor yang mempengaruhi tempoh pembinaan projek. Pengumpulan data adalah melalui tinjauan soal-selidik, manakala analisis data adalah dengan menggunakan analisis frekuensi, *average index* dan *Mann-Whitney U-Test*. Sebagai kesimpulan, tempoh pembinaan bagi projek kemudahan kesihatan telah dapat dihasilkan. Tempoh pembinaan bagi Klinik Desa adalah diantara 8 hingga 17 bulan, manakala tempoh pembinaan yang sesuai untuk Klinik Kesihatan Jenis 3 adalah diantara 14 hingga 23 bulan dan tempoh pembinaan untuk Klinik Kesihatan Jenis 3 dan Kuarters adalah diantara 20 hingga 29. Tempoh pembinaan yang dihasilkan ini adalah bergantung kepada lokasi projek dan faktor-faktor yang mempengaruhinya.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	<b>DECLARATION</b>	<b>ii</b>
	<b>DEDICATION</b>	<b>iii</b>
	<b>ACKNOWLEDGEMENT</b>	<b>iv</b>
	<b>ABSTRACT</b>	<b>v</b>
	<b>ABSTRAK</b>	<b>vi</b>
	<b>TABLE OF CONTENTS</b>	<b>vii</b>
	<b>LIST OF TABLES</b>	<b>xii</b>
	<b>LIST OF FIGURES</b>	<b>xiv</b>
<b>1</b>	<b>INTRODUCTION</b>	
	1.1 Introduction	1
	1.2 Background of the Study	2
	1.3 Problem Statement	3
	1.4 Aim and Objective of Study	3
	1.5 Scope of the Study	4
	1.7 Research Methodology	4
	1.8 Summary	6
<b>2</b>	<b>LITERATURE REVIEW</b>	
	2.1 Introduction	8
	2.2 Overview of the Ministry of Health (MOH) Projects	8
	2.3 Role Function of the Health Clinics	10
	2.3.1 Rural Health Clinic	10
	2.3.2 Health Clinic Type 3	11

2.3.3	Health Clinic Type 3 with Quarters	11
2.4	Project Brief for Health Clinics	12
2.4.1	Rural Health Clinic	12
2.4.2	Health Clinic Type 3	12
2.4.3	Health Clinic Type 3 with Quarters	13
2.5	Current Construction Duration for Healthcare Projects	13
2.5.1	General Construction Period by MOH	14
2.5.2	Current Contracted Duration for Healthcare Projects	14
2.6	Definition of Construction Duration	15
2.7	Importance of Construction Duration	16
2.8	Various Statistical Models in Predicting Construction Duration	17
2.8.1	Time-Cost Relationship	17
2.8.2	Time-Floor Area Relationship	19
2.8.3	Time-Number of Storeys Relationship	20
2.8.4	Multiple Regressions on Time-Related Relationship	21
2.9	Factors Affecting the Construction Duration	21
2.10	Productivity and Its Impact on Construction Duration	26
2.11	Standardization of Projects and Construction Duration	27
2.12	Summary	28

### 3

#### RESEARCH METHODOLOGY

3.1	Introduction	29
3.2	Phase 1: Preliminary Study	29
3.2.1	Literature Review	30
3.2.2	Preliminary Interview	30
3.3	Phase 2: Data Collection Methods	31
3.3.1	Secondary Data Collection	31
3.3.2	Primary Data Collection	32
3.3.2.1	Design of Questionnaire	32
3.3.2.2	Pilot Study	34
3.3.2.3	Survey Questionnaire	34

3.4	Phase 3 : Analysis of Data	34
3.4.1	Frequency Analysis	35
3.4.2	Average Index	35
3.4.3	Reliability Test	37
3.4.4	Mann Whitney U Test	37
3.5	Summary	38

## 4

### DATA ANALYSIS

4.1	Introduction	39
4.2	Distribution of Questionnaire	39
4.3	General Profile of Respondents	40
4.3.1	Company Profile of Respondents	41
4.3.2	Current Position of the Respondents	42
4.3.3	Respondent's Experience	43
4.4	Reliability Analysis	44
4.5	Factors that Influence the Construction Duration of Healthcare Facility Projects	45
4.5.1	Analysis of Project Scope Factor	45
4.5.1.1	Average Index Analysis	45
4.5.1.2	Frequency Analysis	46
4.5.2	Analysis of Project Complexity Factor	48
4.5.2.1	Average Index Analysis	48
4.5.2.2	Frequency Analysis	49
4.5.3	Analysis of Project Environment Factor	54
4.5.3.1	Average Index Analysis	54
4.5.3.2	Frequency Analysis	55
4.5.4	Analysis of Management Related Attributes Factor	56
4.5.4.1	Average Index Analysis	56
4.5.4.2	Frequency Analysis	57
4.5.5	Ranking of Significant Categorization Factor that Influence the Construction Duration for Healthcare Facility Projects	62
4.5.6	Test of Significant Different in Perception	62

4.6	Analysis on Critical Factors that Influence the Construction Duration of Healthcare Facility Projects	65
4.7	Analysis on the Construction for Healthcare Facility Projects	66
4.7.1	Analysis on the Construction Duration for Rural Health Clinic	66
4.7.2	Analysis on the Construction Duration for Health Clinic Type 3	67
4.7.3	Analysis on the Construction Duration for Health Clinic Type 3 with Quarters	68
4.8	Discussion on Findings	71
4.8.1	Findings for Objective No.1	71
4.8.2	Findings for Objective No.2	72
4.8.3	Findings for Objective No.2	73
4.9	Summary	75
<b>5</b>	<b>CONCLUSION AND RECOMMENDATION</b>	
5.1	Introduction	72
5.2	Conclusion	72
5.3	Research Limitation	77
5.4	Recommendation for Future Study	77
	<b>REFERENCES</b>	82
	Appendices A – B	86 - 100

## LIST OF TABLES

<b>TABLE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Federal Government Development Allocation and Expenditure by Sector	9
2.2	Summaries of MOH's projects managed by PWD	10
2.3	General Construction Period given by MOH	14
2.4	Current Contracted Duration for Healthcare Projects	14
2.5	Previously Statistical Models for Forecasting the Construction Duration Projects with Selected Parameters	24
4.1	Response Received from Respondents	40
4.2	Company Profile of Respondents	41
4.3	Current Position of the Respondents	42
4.4	Respondent's Experience	43
4.5	Reliability Analysis	44
4.6	Project Scope Factors that Influence the Construction Duration for Healthcare Facility Projects	52
4.7	Project Complexity Factors that Influence the Construction Duration for Healthcare Facility Projects	53
4.8	Project Environment Factors that Influence the Construction Duration for Healthcare Facility Projects	60
4.9	Management Related Attribute Factors that Influence the Construction Duration for Healthcare Facility Projects	61
4.10	Summary of Factors that Influence the Construction Duration for Healthcare Facility Projects	63
4.11	Mann-Whitney U Test	64
4.12	Ordering Critical Factors by Average Index	65

4.13	Analysis on Construction Duration by Respondents for Rural Health Clinic (Klinik Desa)	69
4.14	Analysis on Construction Duration by Respondents for Health Clinic Type 3 (Klinik Kesehatan Jenis 3)	69
4.15	Analysis on Construction Duration by Respondents for Health Clinic Type 3 (Klinik Kesehatan Jenis 3)	70
5.1	The Construction Duration for Healthcare Facility Projects Managed by PWD	81

## LIST OF FIGURES

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Schematic of Research Methodology	5
2.1	Key Project Stages	15
2.2	Some Factors Affecting Construction Project Duration	25
4.1	Response Received from Respondents	40
4.2	Company Profile of Respondents	41
4.3	Current Position of the Respondents	42
4.4	Respondent's Experience	43
4.5	Average Index for Project Scope Factor	46
4.6	Tabulation of Project Scope Factor	48
4.7	Average Index for Project Complexity Factor	49
4.8	Tabulation of Project Complexity Factor	51
4.7	Average Index for Project Environment Factor	54
4.8	Tabulation of Project Environment Factor	56
4.7	Average Index for Management Related Attributes Factor	57
4.8	Tabulation of Management Related Attributes Factor	59



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The increase in expenditure for development based on the Ninth Malaysia Plan for the various sectors has reflected that more opportunities are available for all sectors in Malaysia, including the construction sector. This is in tandem with the government's mission to improve the standards and quality of life for the people through the provision of better amenities and infrastructures such as improved road and transportation systems, residential and commercial buildings and healthcare facilities.

However, to ensure that the projects are completed and utilized by the owner, the projects must comply with the agreed duration, budget and the quality according to the requirements and specifications. Prior to that, time factor for the completion of a particular project is very crucial.

The importance of the construction duration has been recognized as an important factor within the construction industry as highlighted by Bromilow (1969)

in his study carried out in Australia including other researchers such as Ireland (1985) Kaka and Price (1991), Chan and Kumawaraswamy (1995) and Chan (2001).

## 1.2 Background of the study

Chan (2001) had conducted a study on construction duration for public sector's projects in Malaysia. The study has confirmed that the Bromilow's model (1969), where the contract time and cost has a relationship in the form of  $T = KC^B$ , where  $T$  is the actual construction time in working days,  $C$  is the final cost of contract in millions,  $K$  is a constant characteristic of building time performance, and  $B$  is a constant indicative of the sensitivity of time performance to cost level. The predictor of average construction time in Malaysia is  $T = 269C^{0.32}$ .

The study has concluded that the Malaysian public sector takes 269 days to complete a project with a contract sum of RM 1 million. The time-cost relationship identified serves as a convenient and useful tool for project managers and clients to predict the reasonable time required for the delivery of construction projects in Malaysia. However, this concept has not yet been practiced as a standard in determining construction duration in Public Works Department's (PWD) projects.

In implementing the Ninth Malaysia Plan, PWD as the main technical agency has been entrusted for the implementation of most of Malaysia's government projects. One of the main issues pertaining to the delivery of projects in the PWD is the period of the construction duration which is often not realistic. Chan and Kumaraswamy (2002), reported that realistic construction duration is important because it indicates an essential level for assessing the performance of a project and the efficiency of the project organization.

### **1.3 Problem statement**

Suitable norms or standard construction durations is currently unavailable in the PWD. A preliminary interview with the head of the project monitoring division has revealed that the PWD has yet to establish a norm or standard for the construction duration. The norm is not even available for standard and typical projects such as schools, health clinics, staff quarters, etc.

The current practice being implemented by the PWD in determining the construction duration is based on the project records. Record from the past and planner's own previous experience of similar projects has formed the basis to estimate the duration.

Most of the projects which are undertaken by the PWD, including the Ministry of Health's (MOH) projects are awarded on a competitive basis using the standard form of contract PWD 203. A major issue with regards to MOH projects is that the projects are very often not delivered on time and cost overruns are likely to occur.

### **1.4 Aim and Objectives of Study**

The aim of this study is to establish the standard of construction durations for various healthcare facility projects undertaken by the Public Works Department. In order to achieve the aim, the objectives of this study are outlined as follows;

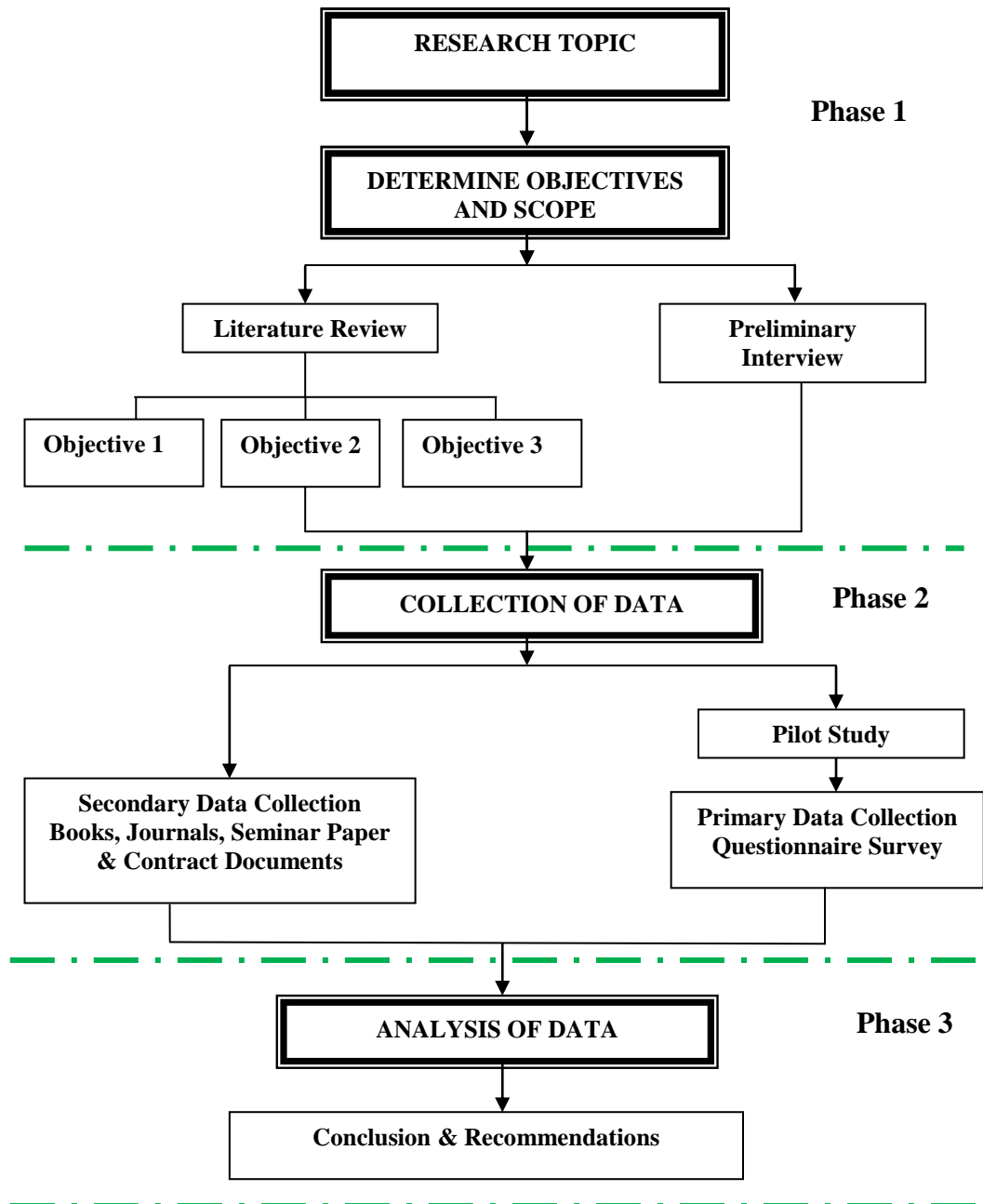
- i) To identify the factors that influence the construction duration for healthcare facility projects.
- ii) To identify the critical factors that influence the construction duration for healthcare facility projects.
- iii) To establish the construction duration for healthcare facility projects.

## **1.5 Scope of the Study**

The scope of the study is confined to standard building projects; such as Rural Health Clinic (*Klinik Desa / KD2G Pudina*), Health Clinic Type 3 (*Klinik Kesihatan 3 / KK3 Cermat 2*) and Health Clinic Type 3 with Quarters (*Klinik Kesihatan 3 Cermat 2 dan Quarters / KK3 & 2D,8F,16G*) undertaken by the Health Facilities Branch of the Public Works Department. The health clinics are located in Peninsular Malaysia and divided into four zones; 1) Northern Zone consists of Perlis, Kedah, Pulau Pinang and Perak, 2) Middle Zone consists of Kuala Lumpur and Selangor, 3) Southern Zone consists of Negeri Sembilan, Melaka and Johor and 4) Eastern Zone consists of Pahang, Kelantan and Terengganu. The method of construction for these facilities are based on conventional construction.

## **1.6 Research Methodology**

The research methodology was divided into three (3) phases; consisting of preliminary study, collection of data and lastly on the conclusion and recommendation. Figure 1.1 shows the outline of the research methodology used for this study.



**Figure 1.1:** Schematic of Research Methodology

Phase 1 comprises of the preliminary study which consists of literature review and preliminary interview with head of the project monitoring division, Head of Project Team (HOPT) and Superintending Officer (SO) in the PWD which are directly involved in the development of healthcare facility projects.

Phase 2 had involved collection of secondary and primary data. Lastly, Phase 3 consists of recommendations and the proposed construction durations for healthcare projects.

## **1.7 Summary**

This study had been divided into five (5) chapters. The first chapter, Chapter One explains the introduction of the study, background of the study, problem statement, aim and objectives, scope of the study and a brief research methodology that being implemented throughout the study.

The second chapter, Chapter Two elaborates on the overview of the Ministry of Health's (MOH) projects, the definition of the construction duration, the importance of construction duration, various statistical models on predicting construction duration, factors affecting the construction duration, productivity and its impact to the construction duration and standardization of projects and construction duration.

Chapter Three explains in detail the methodology used in implementing the study. Generally, it consists of three (3) distinct phases, which are Phase 1; preliminary study, Phase 2; collection of data and Phase 3; recommendation and conclusion.

Chapter Four describes the details on the analysis of factors that influence the construction duration, critical factors that influence the construction duration and the proposed construction durations for healthcare clinics. The data were analysed by using SPSS Version 17.

Finally, Chapter Five concludes the overall study and suggest recommendations for future work.