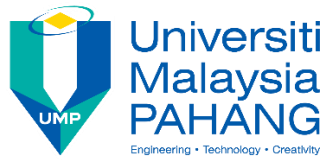


**THE FACTORS INFLUENCE TO REDUCE
THE COST FOR IMPLEMENTING
INDUSTRIALIZED BUILDING SYSTEM (IBS)
IN MALAYSIA**

SITI AISAH BINTI ABU BAKAR

B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG



SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering.

(Supervisor's Signature)

Full Name : MR. ZHRIZAN BIN ZAKARIA

Position : LECTURER

Date : 7 JUNE 2018



STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

(Student's Signature)

Full Name : SITI AISAH BINTI ABU BAKAR

ID Number : AA14235

Date : 7 JUNE 2018

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SITI AISAH BINTI ABU BAKAR

Thesis submitted in fulfillment of the requirements
for the award of the
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ABSTRAK

IBS adalah sistem pembinaan yang menggunakan komponen pra-fabrikasi. Pembuatan komponen secara sistematik menggunakan mesin, formwork dan lain-lain bentuk peralatan mekanikal. Komponen yang dihasilkan di kilang dan setelah selesai akan dihantar ke tapak pembinaan untuk pemasangan dan pemasangan. Walau bagaimanapun, pelaksanaan IBS dalam industri pembinaan masih rendah yang mewakili hanya kira-kira 15-20 peratus daripada keseluruhan projek di Malaysia. Terdapat tiga (3) matlamat utama penyelidikan ini seperti untuk mengkaji kaedah IBS untuk pembinaan di Malaysia, untuk mengenal pasti faktor-faktor yang dapat mengurangkan kos pelaksanaan IBS dalam industri pembinaan Malaysia dan menganalisis faktor paling menonjol yang dapat mengurangkan kos pelaksanaan IBS dalam industri pembinaan Malaysia. Kajian kaji selidik telah dijalankan untuk mendapatkan objektif. Responden untuk menjawab soal selidik terdiri daripada orang yang terlibat dalam projek pembinaan. Data tersebut diukur menggunakan Microsoft Excel dan dianalisis menggunakan kaedah Indeks Purata. Berdasarkan kajian semula penyelidikan dan kesusasteraan yang berkaitan, terdapat lima (5) faktor yang dapat mengurangkan kos untuk pelaksanaan IBS yang dikelaskan sebagai harga bahan binaan, buruh, sokongan kerajaan, produktiviti dan teknologi. Kesimpulannya, faktor yang paling menonjol untuk mengurangkan kos pelaksanaan IBS di Malaysia adalah produktiviti. Pembinaan IBS akan menjimatkan masa berharga dan membantu mengurangkan risiko kelewatan projek dan kemungkinan kerugian kewangan. Reka bentuk dan pengeluaran elemen IBS boleh bermula semasa tapak pembinaan masih dalam tinjauan atau pada fasa tanah.

ABSTRACT

IBS is a construction system using pre-fabricated components. The manufacturing of the components is systematically organized using machines, formworks and other forms of mechanical equipment. The components are manufactured in the factory and once completed will be delivered to construction sites for assembly and erection. However, the implementation of IBS in the construction industry is still low which represents only about 15-20 per cent of the overall projects in Malaysia. There are three (3) main objectives of this research such as to study about IBS method for construction in Malaysia, to identify the factors that can reduce the cost of implementation of IBS in Malaysian construction industry and to analyse the most prominent factor that can reduce the cost of implementation of IBS in Malaysian construction industry. Questionnaire survey was conducted in order to obtain the objective. The respondents for answering the questionnaires consist of persons who are involved in construction projects. The data were tabulated using Microsoft Excel and then analysed using Average Index method. Based on the past reviews of research and related literature, there were five (5) factors that can reduce the cost for IBS implementation that are classified as prices of building materials, labour, government support, productivity and technology. In conclusion, the most prominent factor to reduce the cost for IBS implementation in Malaysia is productivity. IBS construction will save valuable time and help to reduce the risk of project delay and possible monetary losses. The design and production of IBS elements can begin while the construction site is still under survey or at earthwork phase.

TABLE OF CONTENT

DECLARATION	
TITLE PAGE	
ACKNOWLEDGEMENTS	ii
ABSTRAK	iii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF SYMBOLS	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background of Problem	2
1.3 Problem Statement	3
1.4 Objectives	4
1.5 Scope of Study	4
1.6 Methodology	5
1.7 Significant of Study	6
1.8 Expected Outcome	6
CHAPTER 2 LITERATURE REVIEW	8
2.1 Definition of IBS	8

2.2	Classification of IBS	9
2.2.1	Pre-cast Concrete System	10
2.2.2	Steel Formwork System	11
2.2.3	Steel-Framed Building and Roof Trusses	12
2.2.4	Prefabricated Timber Framing System	13
2.2.5	Block Work System	14
2.3	Benefits of IBS	15
2.3.1	IBS Reduces Concrete Mixing Activities at Construction Sites	16
2.3.2	IBS Reduces Construction Duration and Time	16
2.3.3	IBS Increases Productivity at Construction Sites	17
2.3.4	Environmental Benefit of IBS	17
2.4	IBS in Malaysia	18
2.5	Comparing The Various Experiences of Other Countries Concerning IBS Application	19
2.5.1	United Kingdom	19
2.5.2	Australia	20
2.5.3	Germany	20
2.5.4	Singapore	20
2.5.5	Japan	21
2.6	Performances of IBS	22
2.6.1	Cost	22
2.6.2	Training	24
2.6.3	Construction Policies	24
2.7	Economical Attributes of IBS	26
2.8	Barriers for Implementing IBS	27
2.8.1	Cost Issues of IBS	27

2.8.2	Readiness	29
2.8.3	Awareness and Knowledge	30
2.8.4	Planning and Implementation	30
2.8.5	Negative Perception	31
2.9	Factors to Reduce Cost for Implementing IBS in Malaysia	32
2.9.1	Prices of Building Materials	32
2.9.2	Labour	33
2.9.3	Government Support	34
2.9.4	Productivity	35
2.9.5	Technology	36
2.10	Implication of IBS	37
2.10.1	Impact on the Economy	37
2.10.2	Impact on Sector	38
2.11	Summary of Factors Influences to Reduce Cost	38
2.11.1	Prices of Building Materials	38
2.11.2	Labour	39
2.11.3	Government Support	40
2.11.4	Productivity	40
2.11.5	Technology	41
CHAPTER 3 METHODOLOGY		43
3.1	Introduction	43
3.2	Research Methodology	43
3.3	Literature Review	44
3.4	Questionnaire	45
3.4.1	Sampling Data	45

3.4.2	Design of Questionnaire	46
3.5	Methods of Analysis	46
3.5.1	Average Index Method	46
3.5.2	Classification of Average Index	47
CHAPTER 4 RESULTS AND DISCUSSION		48
4.1	Introduction	48
4.2	Distribution and Return of the Questionnaires	48
4.3	Question Structure	49
4.4	Company Respondent Profile and Project Description	49
4.4.1	Type of Work Sector	49
4.4.2	Position of Work	50
4.4.3	Number of Working Years	51
4.5	IBS Method for Construction in Malaysia	51
4.5.1	Experiences with IBS	52
4.5.2	Opinions on the Higher Initial Cost of IBS than Conventional Method	53
4.5.3	Readiness of Respondents Using IBS Method in Every Construction Project	54
4.6	Factors Can Reduce the Cost of Implementation of IBS in Malaysian Construction Industry	56
4.6.1	Factor 1: Prices of Building Materials	58
4.6.2	Labour	59
4.6.3	Government Support	60
4.6.4	Productivity	61
4.6.5	Technology	62

4.7	The Most Prominent Factor That Can Reduce the Cost of Implementation IBS in Malaysian Construction Industry	63
CHAPTER 5 CONCLUSION		67
5.1	Introduction	67
5.1.1	Objective 1: To study about IBS method for construction in Malaysia	67
5.1.2	Objective 2: To identify the factors that can reduce the cost of implementation of IBS in Malaysian construction industry	68
5.1.3	Objective 3: To analyse the most prominent factor that can reduce the cost of implementation IBS in Malaysian construction industry	68
5.2	Recommendations	69
REFERENCES		71
APPENDIX A SAMPLE APPENDIX 1		73

LIST OF TABLES

Table 2.1	Classification of IBS	10
Table 2.2	Prefabricated Housing Market in Japan 1999 (April 1999- March 1999)	22
Table 2.3	Prices of Building Materials	38
Table 2.4	Labour	39
Table 2.5	Government Support	40
Table 2.6	Productivity	40
Table 2.7	Technology	41
Table 3.1	Classification of Average Index	47
Table 4.1	Type of Work Sector	49
Table 4.2	Respondent Position	50
Table 4.3	Number of Working Experiences	51
Table 4.4	Respondent's Experiences with IBS	52
Table 4.5	Opinions of Respondents	54
Table 4.6	Readiness of Respondents	55
Table 4.7	Reasons of IBS Implementation	55
Table 4.8	Sub factors that can Reduce the Cost for Implementing IBS	56
Table 4.9	Ranking of Sub factors	57
Table 4.10	Factor 1	58
Table 4.11	Factor 2	59
Table 4.12	Factor 3	60
Table 4.13	Factor 4	61
Table 4.14	Factor 5	62
Table 4.15	Factors that can Reduce the Cost for Implementing IBS in Malaysian Construction Industry	63
Table 4.16	Ranking of Factors	64

LIST OF FIGURES

Figure 2.1	Pre-Cast Framing, Panel and Box System	11
Figure 2.2	Steel Formwork System	12
Figure 2.3	Steel Framing System	13
Figure 2.4	Timber Framing System	14
Figure 2.5	Block Work System	15
Figure 2.6	HDB Precast Concrete Implementation	21
Figure 3.1	Research Flow Chart	44
Figure 4.1	Percentage of Work Sector	49
Figure 4.2	Percentage of Respondents Position	50
Figure 4.3	Percentage of Working Years	51
Figure 4.4	Percentage of Respondent's Experiences with IBS	52
Figure 4.5	Percentage of Respondents Experiences with Type of IBS	53
Figure 4.6	Percentage Opinion of Respondents on the Higher Initial Cost of IBS than Conventional Method	54
Figure 4.7	Percentage of Readiness of Respondents using IBS Method in Construction	55
Figure 4.8	Ranking of Factors	65

LIST OF SYMBOLS

IBS	Industrialized Building System
CIDB	Construction Industry Development Berhad
MIDF	MIDF Amanah Investment Bank Berhad

LIST OF ABBREVIATIONS

IBS	Industrialized Building System
CIDB	Construction Industry Development Board
MIDF	MIDF Amanah Investment Bank Berhad

CHAPTER 1

INTRODUCTION

1.1 Introduction

In the era of globalization and modernization, the financial development has created a higher demand in construction activities. So to counter the customer's need, the developer needs to receive a cutting edge innovation to adapt this situation without sacrificing the economies of scale. Hence, Industrialized Building System (IBS) was introduced.

Moreover, Malaysian trend in construction industry has changed from Traditional Approach to IBS and similar with the productivity that changed from project to product based. This situation has also occurred in Australia, Hong Kong, Singapore, United Kingdom and United States. Implementation of IBS in construction industry has enhanced the quality and productivity as well as some advantages such as buildability, less wastage, constructability, reduce cost construction, completion of project and maintenance cost.

Furthermore, the Malaysian Government has encouraged the construction industry to change towards IBS which can produce high volume of houses at affordable cost especially low-cost houses. Agencies like Malaysian Public Works Department (JKR) and Construction Industry Development Board (CIDB) have played an important role to educate the contractors, developers, architects and engineers in the form of policies, financial incentives, strategy guidelines, workshops and seminars to increase the awareness among the end users and clients.

1.2 Background of Problem

IBS was first implemented in Malaysia in early 1960's when Ministry of Housing and Local Government of Malaysia visited several European countries and evaluated their housing development program. After their successful visit in 1964, the Federal government built some pilot projects using the IBS such as 3,009 units of flat in Jalan Pekeliling, Kuala Lumpur in 1966 comprising seven blocks of 17-storey flat, and 3,000 units of low cost flat and 40 shops lot and 3,741 units of flat in Jalan Padang Tembak, Pulau Pinang in 1967.

Moreover, wide swings in houses demand, high interest rate and cheap labour cost, make it difficult to justify large capital investment. Most of contractors prefer to use labour intensive conventional building system because it is far easier to lay off workers during slack period. Next, the economic benefits of IBS are not well documented in Malaysia. Past experiences indicated IBS is more expensive due to fierce competition from conventional building system. Furthermore, there is an abandon of cheap foreign workers in Malaysia.

Besides, the construction industry is one of the most significant sectors in the Malaysian economy, accounting for over RM102.2 billion (US\$32 billion) in 2014. The demand for construction in Malaysia is expected to grow even further, especially as the economy continues to expand, as evident in the Eleventh Malaysia Plan (RMK11) that estimates the construction industry to expand by 10.3 per cent per annum over the next five-year period. The industry is critical to national wealth creation as it acts as a catalyst for and has multiplier effects to the economy, with more than 120 other industries relying on construction for their growth and sustainability, (CIDB, 2015).

In addition, the total value of work done in Malaysia, spanning the first to the third quarter of 2015, recorded a growth of 14% year-on-year to 28.8 billion (US\$9 billion), mainly driven by the civil engineering sub-sector. The sub-sector percentage share during the third quarter of 2015 comprises of civil engineering at 32.4%, followed by non-residential buildings at 34.5%, residential buildings at 28.5% and special trades at 4.6%; which reflect the country's expanding economy and increased government spending focus on public infrastructure and residential construction. (Department of Statistics Malaysia, 2015).

For instance, Badir studied the building system technologies in Malaysia and examined problems and constraints associated with this technology. The study concluded that the problems related to IBS technology were the higher initial capital investment and the needs for expert labour to deal with heavily mechanised approach in IBS. Therefore, extra cost was needed to train existing semi-skilled labour to be highly skilled labour.

1.3 Problem Statement

Despite being in the industry for almost 50 years now, the implementation of IBS in the construction industry is still low which represents only about 15-20 per cent of the overall projects in Malaysia. Next, the construction industry contributed 3.9 per cent to the country's gross domestic product in 2014.

IBS Roadmap's mid-term review was conducted in 2007 to evaluate the execution of the IBS roadmap from 2003 to 2010. Based on the surveys conducted in 2003, 2005, 2008, 2010 and IBS Roadmap's mid-term review in 2007, the preliminary takes up for IBS was not as high as predicted at this stage, especially in the private sector. The adoption in some way failed to get private sector buy in. Small contractors are familiar with the conventional system and have the view that the older technology is appropriate to small scale projects and thus, are not willing to switch to a mechanized based system. This is understandable because small contractors have lower levels of financial support and are not able to set up their own manufacturing plants as it involves capital intensive investment. According to the statistics from CIDB, the number of contractors involved in IBS usage is still low despite action steps in Roadmap 2011-2015. Based on CIDB statistics, only 6.14% of contractors use IBS in their building projects.

In particular, past research suggests that various factors, ranging from project estimation to completion, will significantly influence costs. The literature thus far on the factors affecting the overall cost of construction projects include studies by Memon et al. (2010), Stoy and Schalcher, (2007), Chan and Park, (2005) Elhag et al. 2005, Bubshait and Al-Juwairah (2002), all of which identified the factors that significantly influence construction costs in different countries. They assert that these factors are directly related to the construction organizations' responsibilities for managing the cost, socio-cultural, economic and external conditions as well as the technological and political environments within which they operate which in turn, affect the construction costs.

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