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BARRIERS IN THE IMPLEMENTATION OF INDUSTRIALISED BUILDING
SYSTEM IN MALAYSIAN CONSTRUCTION INDUSTRY

KONG XI HAW

A report submitted in partial fulfilment of the
partial requirement for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
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June 2009

I declare that this thesis entitled “*Barriers in the Implementation of Industrialised Building System in Malaysian Construction Industry*” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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to my family and friends

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This paper is successfully completed with the assistance and support of my honourable project supervisor, Professor Dr. Muhd. Zaimi Abd. Majid.

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KONG XI HAW

29th June 2009

ABSTRACT

Industrialised Building System (IBS) were introduced to Malaysia to solve issues associated with dependencies of foreign workers, raising demand of affordable accommodations and improving image, quality and productivity of construction industry. This research is to highlights the current development of IBS in Malaysian construction industry and potential challenges related to the implementation of IBS. The objectives of the research are to identify the readiness of adapting IBS; determine the barriers in the implementation of IBS; and identify ways to enhance it. Questionnaires survey was conducted in order to achieve the objectives. The respondents consisted of architects, contractors, developers, consultants and quantity surveyors. The data were tabulated using Microsoft Excel and then analysed using average index. In conclusion, the barriers of IBS implementation in Malaysia has been identified and discussed. According to this research, technical limitation, lack of standardisation and price of IBS are the main barriers in IBS implementation in Malaysia.

ABSTRAK

Sistem Bangunan Berindustri (IBS) diperkenalkan di Malaysia untuk mengatasi isu-isu yang berkenaan dengan masalah yang berkaitan buruh asing, permintaan yang kian meningkat terhadap perumahan dan juga untuk meningkatkan imej, kualiti serta produktiviti bagi seluruh industri pembinaan. Kajian ini adalah untuk menitikberatkan pengembangan Sistem Bangunan Berindustri dalam industri pembinaan Malaysia dan juga cabaran yang berkaitan dengan pelaksanaan Sistem Bangunan Berindustri. Objektif bagi kajian ini adalah untuk mengenalpasti penyediaan industri pembinaan untuk menerima Sistem Bangunan Berindustri; menentukan halangan dalam pelaksanaan Sistem Bangunan Berindustri; dan mengenalpasti cara-cara untuk mengatasi situasi tersebut. Tinjauan dengan soal selidik dilakukan untuk mencapai objektif yang ditetapkan. Responden-responden terdiri daripada arkitek, kontraktor, pemaju, perunding dan juruukur. Data yang dikumpul dianalisis dengan menggunakan indeks purata dengan bantuan aplikasi Microsoft Excel. Dengan keputusan yang diperolehi, halangan daripada melaksanakan Sistem Bangunan Berindustri telah dikenalpasti dan dibincangkan. Menurut kajian ini, sokongan teknikal yang terhad, kekurangan keselarasan dalam piawai yang berkenaan dengan Sistem Bangunan Berindustri dan faktor harga adalah halangan utama dalam pelaksanaan Sistem Bangunan Berindustri di Malaysia.

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LIST OF ABBREVIATIONS

3D	-	dirty, difficult, dangerous
BAIHP	-	The Building America Industrialized Housing Partnership
BS	-	British Standards
CIDB	-	Construction Industry Development Board
CIMP	-	Construction Industry Master Plan
CREAM	-	Construction Research Institute of Malaysia
dB	-	Decibel
DIN	-	the German Institute for Standardization
GDP	-	gross domestic product
HDB	-	The Housing and Development Board
IBS	-	Industrialised Building Systems
ICT	-	Information, Communication and Technology
JKR	-	Jabatan Kerja Raya
KPIs	-	key performance indicators
LRT	-	Lightweight Railway Train
MC	-	Modular coordination
MIGHT	-	Malaysian Industry-Government Group for High Technology
MS	-	Malaysian Standards
NFPA	-	National Fire Protection Association
NHA	-	National Housing Authority
OBS	-	Open Building System
PCA	-	Portland Cement Association
REHDA	-	Real Estate and Housing Developers' Association Malaysia
PKNS	-	Perbadanan Kemajuan Negeri Selangor
PLPC	-	Precast Large Panel Construction
PTC	-	Prefabrication Technology Centre
UBBL	-	Uniform Building By Law

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Malaysia is well known for its forward looking policies and strategies in the quest for global participation in all facets of industry. Being a global player in construction requires serious efforts towards adopting new systems and technologies par excellence with other developed and developing nations. The success of these efforts will enable us to penetrate the global market and export our professional and construction expertise while improving our own local development and management.

The construction industry plays a crucial role in the Government's efforts to stimulate domestic economic activities and enhance growth. It is therefore important for the sector to continuously undertake measures to increase efficiency, quality and productivity. Towards this end, the use of the Industrialised Building Systems (IBS) is the right step in realising this objective.

IBS promises elevated levels of expertise throughout the industry, from manufacturers, installers, engineers, planners, designers and developers. The benefits of IBS are numerous and far reaching. Reduced construction time, better site management, reduced wastage are but a few of these benefits, that will ultimately produce better products for the population. Undoubtedly, with better productivity, quality and safety, IBS will contribute towards a better construction industry, as well as enhance the global competitiveness of Malaysian builders.

The author is a postgraduate student from Univerisiti Teknologi Malaysia and has chosen barriers in current development of IBS as the area for the research. This research developed a good level of understanding on the barriers in the implementation of IBS in Malaysian construction industry.

1.2 Background

The construction industry constitutes an important element of Malaysian economy. Although it account for only 2.8 percent of the gross domestic product (GDP) in fourth quarter of 2008, the industry is crucial to national development as it has the direct effects to the economy of the country. The construction industry also provides job opportunities for approximately 800,000 people (CIMP 2006-2015). According to Wang (1987), the construction industry can serve as a barometer indicating the nation's economic conditions. Active construction activities generally show that the nation's economy is booming and progressing well, and whereas sluggish construction activities show that the country's economy condition is under depression.

Based on the report by CIDB (2003), it also underlines the contributions from the construction sector are more than just economic; where the products of construction whether directly or indirectly through provision of superior infrastructure and buildings has contributed extensively towards the creation of wealth and quality of life of the population. The activities generated from the construction activities will in turn generate the productivity of other industries, resulting in a well-balance economy in Malaysia.

Construction industry basically consists of various processes, involves many parties and different stages of work. It involves the participation of various parties from various sectors in order to ensure the efficiency of the construction work carried out. The efficiency and success of construction development and activities depends heavily on the quality of managerial and organizational performance plus the effective co-ordination through good teamwork from the different parties. It is

therefore obvious that the development of the construction industry can only be achieved if every team members play effective roles in their work.

Nevertheless, the state of the local construction industry is not in line with future development of Malaysia. The challenges often occur in the area of productivity, efficiency of work and quality of work. Currently, the construction industry is still using labour intensive and low technology methods of construction. The intensive use of foreign unskilled workers and low technology equipment and out-of-dated construction methods, eventually caused low productivity and efficiency of work at construction site. As a result this has lead to unproductive practices and initially contributes to the later delivery of work.

According to Ismail (2001), 800,000 units of houses has been planned and out of that figure, 585,000 units or 73.1 percent were planned for low and medium cost houses in the 7th Malaysia Plan. The disappointing fact is that only 20 percent of completed houses were reported throughout the nation despite numerous incentives and promotions to encourage developers to venture into such housing category.

Waleed et al. (2003) reported that the announcement of the 8th Malaysia Plan with the planning of 600,000 to 800,000 low and medium houses throughout the nation. This is indeed welcoming news to the population of Malaysia especially to the middle and low income groups. However, it is undoubtedly an uphill task to accomplish such target with the current conventional building system currently practiced widely in the Malaysian construction industry.

Therefore, the challenge the Industrialised Building System (IBS) is to create a promising environment with the promise of improving productivity rate, lowering construction costs and meeting the growing demand for affordable housing. In other word, the awareness of current trends and latest construction technology and innovation is essential in order to survive in the competitive market.

1.3 Problem Statement

The main problem in the construction industry is because of dependency on foreign worker in Malaysia (IBS Roadmap 2003-2010). The country is in a difficult situation where most of the foreign workers are usually unskilled labour dominates in the construction industry. This lead to other problems such low quality works, delays, wastages, social problems, diseases and etc. This discourage local workforce is to join the industry because of cheap foreign labour sources. Low awareness in occupational safety and health has created a dirty, difficult, dangerous (3D) image to the construction industry. However, the dependency on foreign workers by the Malaysian construction industry could be reduced by using industrialised building systems (IBS). This is so because the prefabricated IBS components are mechanically installed using cranes at sites using only a minimal number of manpower. Besides requiring minimal labour, IBS offer better quality, increased productivity and faster completion; less wastage with safer and cleaner construction sites. Through IBS, components are prefabricated off-site, leaving the construction sites tidier and cleaner.

Despite all the advantages and support from the government, early effort to promote usage of IBS in Malaysian construction industry is still very low compared to conventional methods. Although the members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent. This is probably due to resistance towards change and insufficient information to support feasibility of change. Local contractors are reluctant to switch to the usage of IBS because they are at ease with the availability and relatively low cost of sourcing for unskilled foreign labour. The adoption in Malaysia is more towards client-driven rather than consumer driven as compared to developed countries.

1.4 Aim and Objectives of the Study

This aim of the research is to investigate and research for barriers in the implementation of industrialised building system in Malaysian construction industry.

Specifically, to achieve to aim of this study, this research has the following objectives:

1. To identify readiness of contractors and designers to adapt IBS in their construction projects;
2. To determine barriers in implementation of IBS in Malaysian construction industry; and
3. To identify ways to enhance the implementation of IBS in construction industry

1.5 Scope of the Study and Limitations

In order to achieve the objectives of this study, the scope of the research only focusing on the development of construction industry in Malaysia. Concentrating on construction industry in Malaysia could give a clearer sight of view of the overall development in local industry. Due to the extent that IBS mainly involved steel structures and precast components, therefore the research are just restricted to the building projects that uses IBS only.

By review on previous researches that focus on the similar area of study, some of the barriers was highlighted and the input is obtained by questionnaires prepared based on it. The respondents are mainly consisted of contractors, consultants, developers, architects and quantity surveyors in Malaysia. This is to survey on the readiness of these construction players to embrace IBS and identify barriers in implementation of IBS into the construction industry.

The analyses are based on respondents' data from questionnaires only. The analysis results do not represent the whole construction industry in Malaysia. However the discussion is based on comparison of the analysed data and information from literature studies. Conclusions were made according to objectives of the study.

1.6 Significance of the study

Currently the main challenges in Malaysia's construction industry is lack of innovation and motivation as the workforce is aging and shrinking as progressively fewer young enter the industry. If this phenomenon continues to go on, the industry will swift to a very unhealthy condition, for example rely heavily on foreign workers, lack of technology and modernisation in construction techniques. Hence, the industrialisation of building construction method and the evolution of construction technology are inevitable and plausible.

The first phase of successive implementation of IBS is the ability to find out the barriers that hinders the development of IBS in Malaysia construction industry. This is very important because if the barriers of implementation of IBS are identified, it enables for finding out solutions by focusing effort to solve the problems.

1.6 Research Questions

It is essential to develop research questions in order to help on focus the area research and the presentation of the report. Followings are some research questions that arise when conducting the research:

- What are the challenges and problems in construction industry?
- What are the issues in current development of IBS in Malaysian construction industry?
- What are the barriers to the implementation of IBS in Malaysian construction industry?
- What type of information to be collected?
- How to carry out the questionnaire?
- Who are the respondents?
- How to make use of the data collected?

1.7 Research Methodology

The research methodology has been carried out to fulfil the objectives of the study which include the method of data collection such as documents study, case study, preparation of questionnaires and data collection. The research procedures are as shown in Figure 1.1.

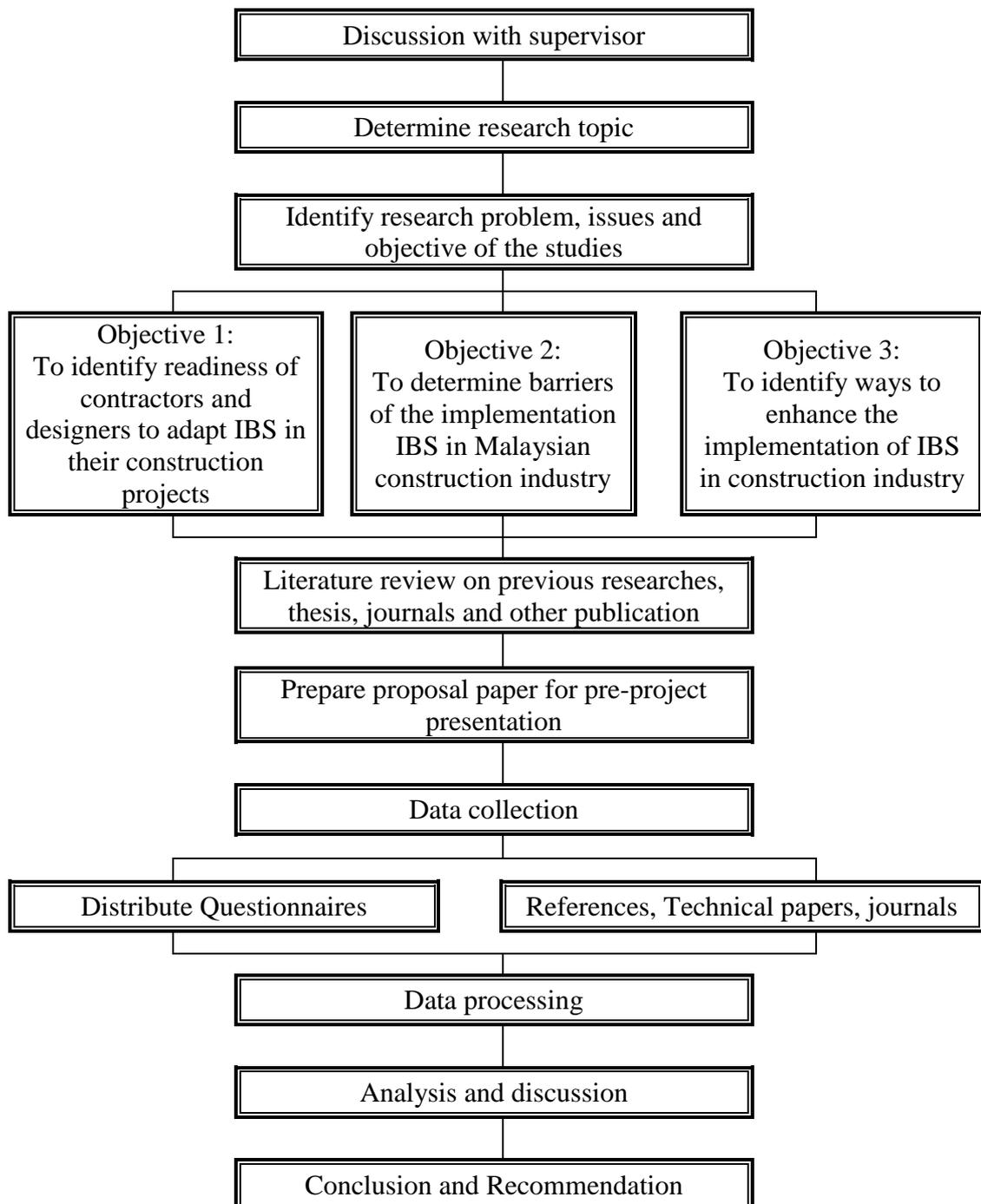


Figure 1.1: Research flow chart

1.8 Structure of Report

The research report is consists of five chapters where the content of each chapter are summarized as follows:

Chapter 1 is the introduction part for the research report. It provides an overall view of the whole report. Chapter 1 includes introduction, problem statement, objective, and scope of the study, significance of the study, research questions, research methodology and the structure of the report.

Chapter 2 is the literature review that based on findings from various different sources of information such as journal, technical papers, books, research paper etc. Chapter 2 includes definitions, classification of building system and IBS, essential characteristic of IBS, benefits and shortcomings of IBS, experiences and implementation of IBS in other countries, IBS in Malaysia, IBS Roadmap, barriers of IBS in Malaysia and Construction Industry Master Plan (CIMP 2006-2015).

Chapter 3 describe in detail the research methodology which covered literature review, questionnaires, preparation of the questionnaires, and method of analysis.

Chapter 4 analysed the data using frequency analysis and average index for the questionnaire survey. Chapter 4 also were discussed in detail the data analysed and the findings were highlighted.

Chapter 5 highlights the findings and concludes the overall study on the subject and evaluate whether the objective of the research are achieved. Recommendations for further studies are also included in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Definitions

Until the present time there has been no single commonly-approved definition of IBS. IBS can be different things to different industry players. However, there are several definitions from other researchers that reflected the concept of IBS which widely accepted by the construction industry.

In early literature, Dietz (1971) defined IBS as “a total integration of all subsystem and components into overall process fully utilizing industrialised production, transportation and assembly techniques”.

Meanwhile Junid (1986) delineated IBS as “process by which components of building are conceived, planned and fabricated, transported and erected at site. The system includes balance combination between software and hardware component. The software element include system design, which is complex process of studying the requirement of the end user, market analysis and the development of standardize component”.

Parid (1997) defined IBS as a “system which use industrialised production technique either in the production of component or assembly of the building or both”. The interpretation from Esa *et al* (1998) is that IBS as “continuum beginning from utilising craftsmen for every aspect of construction to a system that make use of manufacturing production in order to minimize resource wastage and enhance value end users”.

Warszawski (1999) described IBS as “a set of interrelated element that act together to enable the designated performance of the building”. At the same time Trikha (1999) added that IBS is a “system in which concrete components prefabricated at site or in factory are assembly to form the structure with minimum in situ construction”.

Lessing *et al* (2005) explained IBS as “an integrated manufacturing and construction process with well planned organization for efficient management, preparation and control over resources used, activities and results supported by the used of highly developed components”.

Rahman *et al* (2006) defined IBS as “a construction system that is built using pre-fabricated components. The manufacturing of the components is systematically done using machine, formworks and other forms of mechanical equipment. The components are manufactured offsite and once completed will be delivered to construction sites for assembly and erection”.

Almost all the definition of IBS mentioned the prefabrication, off-site production and mass production of building components as a main characteristic of IBS. The scope of IBS focuses the construction of buildings rather than civil structure or engineering projects. For the purpose of this research, IBS is best defined according to CIDB Malaysia (2001) as “construction systems in which components are manufactured in a factory, on or off site, positioned and assembled into a structure with minimal additional *in situ* activities”.

2.2 Classification of Building System

In early stages, Majzub (1977) proposed a concept in classifying the building system. He explains that the relative weight of the components should be used as a basis for building classification which consists of frame system, panel system and box system as presented in Table 2.1. The factor weight has significant impact on the transportability of the components and also influence on the production method of the components and the erection method on site. The main weakness of this