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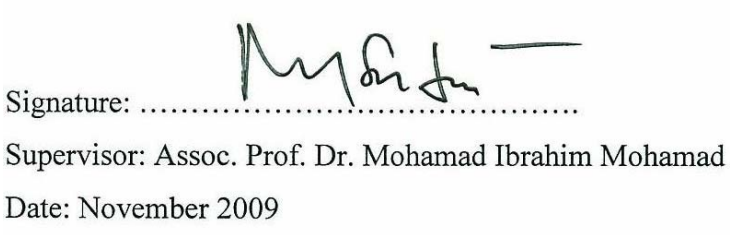

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Date: November 2009

EFFECTIVENESS OF INDUSTRIALISED BUILDING SYSTEM (IBS) IMPLEMENTATION FOR MALAYSIAN CONSTRUCTION INDUSTRY

MARDHIAH BINTI ZAWAWI

A project report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
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To my beloved father and mother

En. Zawawi and Puan Karimah

Thank you for your support..

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ABSTRACT

Generally, the used of Industrialised Building System (IBS) in construction industry throughout the world has positive perceptions on improving the overall construction industry performance. Therefore, Construction Industry Development Board (CIDB) has been actively promoting the use of Industrialised Building System (IBS) in Malaysian Construction Industry since 1998. Unfortunately, the used of IBS for building project in Malaysia is still limited if compared to CIDB's target. In view to this limitation, this study has been carried out to evaluate the effectiveness of current IBS implementation for Malaysian construction industry through the measurement of acceptance level on the current IBS implementation and also determination of the existing problems faced by construction industry related to the IBS implementation. The methodologies adopted for this study are interview with expert panels and questionnaire survey. The result of this study revealed that current promotion on IBS for awareness purposes is effective but unfortunately the application is still very limited since it only covers certain elements. Not all practitioners can accept it implementation especially company and personnel with less experiences in handling IBS project. It is recommended that the relevant institution which produce young engineer for construction sector must provide a syllabus on IBS which cover technical, business process, and all aspect which needed for effective IBS implementation. This can generates wider range of application of IBS product within the industry.

ABSTRAK

Secara umumnya, penggunaan Sistem Bangunan Berindustri (IBS) di dalam industri pembinaan meraih pandangan yang positif dalam meningkatkan prestasi industri pembinaan secara keseluruhannya. Oleh itu, bermula tahun 1998, Lembaga Pembangunan Industry Pembinaan (CIDB) telah mempromosikan penggunaan IBS di Malaysia secara aktif. Walaubagaimanapun, penggunaan IBS di Malaysia masih lagi tidak mencukupi jika dibandingkan dengan hasrat CIDB. Merujuk kepada kekurangan tersebut, kajian ini telah dijalankan untuk menilai keberkesanan perlaksanaan IBS bagi industri pembinaan Malaysia melalui penilaian tahap penerimaan terhadap perlaksanaan IBS dan juga penentuan masalah yang dihadapi oleh industri pembinaan berhubung dengan perlaksanaan IBS. Kaedah yang digunakan dalam menjalankan kajian ini adalah temubual bersama panel pakar dan borang soal selidik. Hasil kajian telah mengesahkan bahawa perlaksanaan promosi ke atas IBS untuk tujuan kesedaran yang dijalankan sekarang adalah berkesan tetapi malangnya penggunaannya masih lagi terhad kerana hanya merangkumi beberapa elemen sahaja. Tidak semua pengamal industri pembinaan boleh menerima perlaksanaannya terutamanya syarikat dan individu yang kurang pengalaman dalam mengendalikan projek IBS. Saranan telah dibuat agar institusi yang mempunyai pengaruh dalam menghasilkan jurutera muda supaya seharusnya menyediakan silibus berkenaan IBS yang merangkumi teknikal, proses perniagaan, dan segala aspek yang diperlukan untuk perlaksanaan IBS yang lebih efektif. Ini bagi menghasilkan aplikasi produk IBS yang lebih meluas dikalangan industri ini.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Through globalisation, so many information, knowledge, and technology can be shared and transferred easily across countries. Industrialised Building System (IBS) is one of the technologies which can be categorised as an old technology in developed country but yet considered as a new technology when reached developing countries such as Asian region.

Although the implementation of IBS in Malaysia has started since 1960's, it is only become popular in 1998 when Cabinet of Ministers endorsed IBS Strategic Plan as the blueprint for the total industrialisation of construction sector. Since the time, Construction Industry Development Board (CIDB) has been actively promoting the use of IBS in Malaysian Construction Industry. First step taken by CIDB was formulating IBS Roadmap which stated several strategies and aggressive steps to promote the used of IBS in Malaysia. The main purposes of introducing IBS at that time were to gradually reduce the dependency on foreign labours and to increase productivity.

Over past decade, the level of IBS usage is still very low even though its implementation has started since early 1960's in Malaysia. Construction industry practitioners seem like reluctant to use IBS as their construction method. In spite of that, Warszawski (1999) highlighted that by adopting IBS, some saving in manual

labour on-site can be achieved, increasing construction speed and providing higher construction quality. Thanoon *et al.* (2003) also underlined cost saving, faster construction time and improvement of overall construction quality as the result of IBS implementation. From evidences provided, it can be concluded that, the used of IBS so far gained a good reputation among the researchers in general, which fulfil the basic goal of construction; time, resources and quality.

Due to this circumstance, several studies have been done. Badir (2002) for example has studied on building system technologies in Malaysia and examined problems and constraints associated with this technology. The study concludes 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.

On the other hand, Chung (2007) has investigated on current awareness of the usage of IBS in Malaysia. Moreover his study has analysed ways to improve the implementation of IBS in terms of the current policy and guideline available to implement the usage of IBS in the local construction industry. The study focused on the usage of 50% of the IBS elements in terms of cost. The Strength, Weakness, Opportunity and Threat (SWOT) Matrix has been used when analysing the current scenario in the local construction industry and therefore the strategic implementation plan has been suggested in his study which stated government need to provide a governing body that is only in charge of the legislations, training, financing, controlling, research and development so that an effective strategy can be formulated and applies to all the parties involved.

Apart from that, critical success factor in adopting IBS for Malaysian Construction Industry has been studied by Noriwani (2008). The study focused on success factors and barriers for IBS adoption in Malaysian building construction industry. The information and data gathered through questionnaire and then processed using average index method. Based on the study, she has determined the most critical success factors in adopting IBS as meeting flexibility in choosing components, meeting client expectancy, and ensures market security for a long term.

Meanwhile, in technical aspect, providing clear design process was the critical factor in successful IBS adoption.

1.2 Problem Statement

IBS appears as the most suitable system to overcome several problems in construction industry especially overused of foreign labour and low productivity rate. Unfortunately, the level of IBS usage in local construction industry is only 15% in 2003 (CIDB, 2003a). In 2006, only 10% which is less than one third of total completed construction project using at least one IBS product (CIDB, 2007).

Moreover, Tan Sri Dato' Ir. Jamilus Hussein has stressed in his speech in Malaysian IBS International Exhibition 2009 that construction industry are still far from achieving the ideal objective as articulated in IBS Roadmap even though almost all activities identified in the roadmap has been implemented. Based on the Roadmap mid-term review, it is clearly stated that one of the most barriers is negative perception by the consumer and the practitioner. Even contractors whom experiences in IBS construction project before, reluctant to use IBS in their next project. Why is this so?

Do Malaysian Construction practitioner acceptances on IBS implementation inline with the researcher studies and government hope? If not, probably there is some gap between the IBS and construction industry which resulted on various problems when IBS is being implemented.

1.3 Research Aim and Objective

The aim of the study is to evaluate the effectiveness of current IBS implementation for Malaysian construction industry. To achieve this aim, the following objectives have been identified:

i. To determine the level of IBS acceptance in construction industry.
ii. To evaluate the problems of IBS implementation in construction industry.
iii. To develop a strategy to promote the use of IBS in Malaysian Construction Industry.

1.4 Research Sampling

The construction industry in Malaysia consists of three main groups namely Client (owners and developers), Consultants (architects, engineers, surveyors), and Contractors (building and civil contractor). Basically, Client as the owner/developer is the organisation that will decide whether to use IBS or not. Thus, Client will appoint Consultants comprising planners, architects, engineers, surveyors who will convert Client intention to a project design by referring the existing IBS tools. The tools comprises IBS catalogues, Modular Coordination guideline, MS1064 standard, and etc. Finally Contractor will construct the building according to the consultants' drawing and specification by applying their knowledge and experiences. As far as IBS work is concern, manufacturer becomes one of the important groups in construction industry as the fabricator and supplier of the component. For the purpose of this study, the sample will be chosen randomly according to the four groups explained above within limitation and scope assigned below.

1.5 Scope of Study

Random sampling will be done in assigned area, whom practicing Conventional Construction Method and Industrialised Building System Method. There are some limitations for this study;

i. The information and data taken only covers projects within 2005 until now
ii. Only covers IBS superstructure using precast concrete systems

iii. Area for data collection confine within states of Johor, Melaka, Negeri Sembilan and Selangor

1.6 Brief Research Methodology

The study was conducted using literature method, interviews with expert panels and questionnaire survey. A literature search was carried out as preliminary study in gaining information about recent strategies, problems and challenges in implementing IBS. It is done by referring to many sources such as published books, articles in books, journals and papers, other published research works, academic and research magazines, newsletter, brochures and information from the internet. Then only followed by interviews with expert panels and distributing questionnaire survey. **Figure 1.1** explains the brief methodologies used in this study.

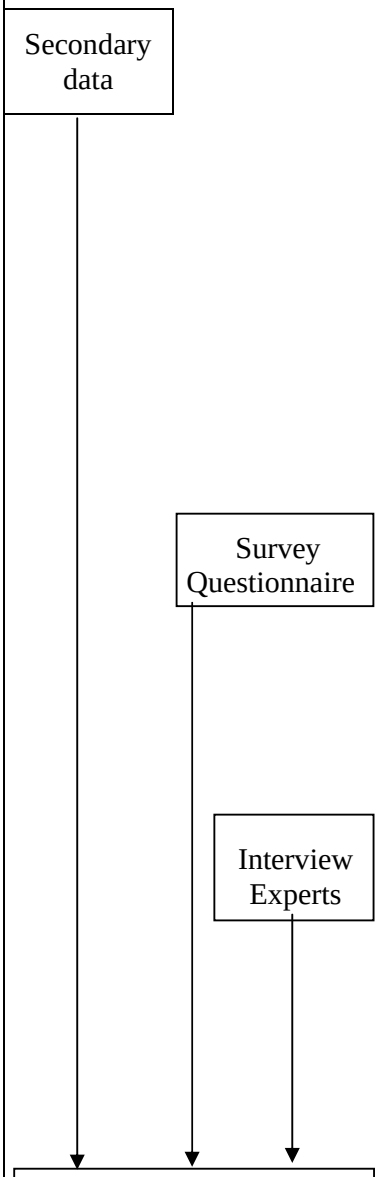
RESEARCH METHODOLOGY	ACTIONS	OBJECTIVES
	**Stage 1: Research tools** 1. Search secondary data - search for IBS and Malaysian construction industry concept in general - review of IBS implementation being practice nowadays - review IBS implementations in other country 2. Survey Questionnaires - Develop survey questionnaires - Select sample frame - Determine the sample size for the survey - Determine the response rate 3. Interview Experts - Develop a structure interview content - Determine which company to interview - Process structure interview - Time schedule and others **Stage 2 : Develop new IBS implementation strategy** - Together with secondary data, survey, and interview findings to develop a new IBS implementation strategy for Malaysian Construction Industry	To understand what IBS and MCI is all about To understand the existing IBS implementation strategy being used To find out any better way to implement IBS To identify IBS level of acceptance To evaluate any problems occur due to existing IBS implementation To evaluate the effectiveness of existing IBS implementation plan To find out any good ideas for better IBS implementation To develop new IBS implementation strategy for Malaysian Construction Industry

Figure 1.1: Brief methodologies

CHAPTER 2

INDUSTRIALISED BUILDING SYSTEM

2.1 Introduction

This chapter will cover basic theories on industrialised building system such as definitions, characteristics, types of IBS, and advantages. This information is important to improve understanding on Industrialised Building System in general.

2.2 Definitions

To date, there are various definitions of IBS interpreted by researchers. Among the earliest one is Junid (1986) who described IBS as process by which components of building are conceived, planned and fabricated at factory, transported, and erected at site. The system combined software and hardware, including system design, which is complex process of studying the requirement of 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.

Rahman and Omar (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. Chung and Kadir (2007) defined IBS as a mass production of building components either in factory or at site according to the specification with standard shape and dimensions and transport to the construction site to be re-arranged with certain standard to form a building.

Nonetheless, IBS Roadmap (2003) defined IBS as a construction process that utilises techniques, products, components, or building systems which involved prefabrication works (off-site of on-site) under controlled environment, transported, positioned, and on-site installation with minimum site works.

2.3 Characteristic of IBS

To date, there are various characteristic of IBS identified by researchers. Among the accepted one is stated by Thanoon *et al* (2003) which consist of closed and open system, modular coordination, standardization and tolerance, mass production, specialization, good organization, integration, production facilities, transportation, and equipment.

According to Warszawski (1999), IBS can be characterised as prefabrication of as much as possible building elements and components offsite, within central facilities through specialised equipment and organization. Then the components will be assemble to site, and involved extensive mechanized handling with minimum task. A part from that, IBS involved integrated design, production and erection work on site which needs to be planned and coordinate accordingly.

Considering the above characteristics, CIDB (2003b) have summarised IBS characteristics as;

i. Industrial production of components through prefabrication or highly mechanised on site processes
ii. Reduced labour usage both at prefabrication stage and onsite work.

iii. Modern design and manufacturing method through Computer Aided Design (CAD) and Computer Added Manufacturing (CAM)

iv. Applying Systematic Quality Control throughout the process of IBS project implementation

v. Open Building system which allows hybrid application, and adaptable to standardization, tolerance and modular coordination.

2.4 Types of IBS

IBS can be classified into five common types based on structural aspects of the system which are;

i. Type 1: Precast Concrete Framing, Panel and Box Systems – includes precast concrete columns, beams, slabs, walls, “3-D” components, permanent concrete formworks, etc.

Figure 2.1: Precast Concrete Framing and Wall Systems

ii. Type 2: Steel Formwork System – includes tunnel forms, tillt-up systems, beams and columns moulding forms, and permanent steel formworks

Figure 2.2: Steel Formwork System

iii. Type 3: Steel Framing System – Steel beams and columns, portal frame systems, roof trusses, etc.

Figure 2.3: Steel Framing System and Roof Trusses

iv. Type 4: Prefabricated Timber Framing System – Prefabricated timber trusses, beam and columns, roof trusses, etc.

Figure 2.4: Prefabricated Timber Framing System

v. Type 5: Block work Systems – includes interlocking concrete masonry units and lightweight concrete blocks.