PRODUCTIVITY RATE FOR INDUSTRIALISED BUILDING SYSTEM PROJECT

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DEDICATION

Especially for

My beloved family and husband

"Thanks for always being there for me".

My beloved sibling
"Thank you for everything".

Greatest Supervisor
Dr. Khairulzan bin Yahya
"I am nobody without your support and encouragement"

May Allah repay all of your kindness greater than what had you given me.

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ABSTRACT

In line with development of the technology, the Government of Malaysia has taken the initiative by emphasizing the application of the Industrial Building System (IBS) in every project implementation in Malaysia. However, the acceptance of this technology in Malaysia is relatively low with few projects being constructed with precast components. Jabatan Kerja Raya Malaysia (JKR) has completed thousands of projects every year for various ministries in Malaysia, but there is still lack of data to refer on the productivity rate of the construction activities especially for IBS project in Malaysia. Due to this, a case study has been carried out to establish the productivity rate of execution of IBS components in construction project. The productivity rate in this study is focused mainly on the installation process. The selected project for this case study is Cadangan Pembinaan Semula dan Menaiktaraf Sekolah Daif Menggunakan Kaedah IBS Di Semenanjung Malaysia (Fasa1) Tahun 2018 Bagi Negeri Sembilan, di Sekolah Kebangsaan Seberang Batu Hampar, Negeri Sembilan Darul Khusus. There are three (3) objectives for this paper where the first one is to identify installation process of IBS component insist of column, wall and roof based on project's record. Second objective is to determine factors that affect the productivity rate of IBS project during construction. Referred to project's monthly report, the factor that affected the productivity rate of IBS project during construction are skills and knowledge of handling IBS project. Cost and finance also contributed to the factor that affected the productivity rate of IBS project. Several counter measure has been proposed to tackle these issues. The third objective is to estimate the productivity rate on execution of IBS components which involved column, wall and roof structure. Collected data were analyzed using a formula consist of total area coverage of IBS component divided by manhour required to complete the work. Based on the findings, the productivity rate by blocks for column, wall and roof are 0.76 m^2/manhour, 1.20 m^2/manhour and 2.36 m^2/manhour. From this case study, the findings can be used as a reference productivity rate study as well as estimation of the IBS projects implementation in the future.

ABSTRAK

Sejajar dengan perkembangan teknologi, Kerajaan Malaysia telah membuat inisiatif dengan menekankan penerapan aspek Sistem Bangunan Berindustri (IBS) di dalam setiap pelaksanaan projek di Malaysia. Walaubagaimanapun, pelaksanaan teknologi masih rendah di mana hanya beberapa projek dilaksanakan menggunakan teknologi ini. Jabatan Kerja Raya (JKR) telah menyiapkan ribuan projek setiap tahun bagi pelbagai Kementerian, tetapi data kadar produktiviti untuk aktiviti pembinaan terutama projek IBS masih kekurangan untuk dirujuk. Oleh sebab itu, kajian kes ini telah dilakukan untuk menentukan kadar produktiviti bagi pelaksanaan kerja IBS di dalam projek pembinaan. Kadar produktiviti dalam kajian ini difokuskan terutamanya pada proses pemasangan sahaja. Projek yang dipilih untuk kajian kes ini adalah Cadangan Pembinaan Semula dan Menaiktaraf Sekolah Daif Menggunakan Kaedah IBS Di Semenanjung Malaysia (Fasa1) Tahun 2018 Bagi Negeri Sembilan, di Sekolah Kebangsaan Seberang Batu Hampar, Negeri Sembilan Darul Khusus. Terdapat tiga (3) objektif bagi kajian ini di mana objektif pertama adalah untuk mengenal pasti proses pemasangan komponen IBS bagi struktur tiang, dinding dan bumbung berdasarkan rekod projek. Objektif ke dua adalah untuk menentukan faktor-faktor yang mempengaruhi kadar produktiviti projek IBS semasa pembinaan. Berdasarkan laporan bulanan projek, didapati faktor yang mempengaruhi kadar produktiviti projek IBS semasa pembinaan adalah kemahiran dan pengetahuan mengendalikan projek IBS. Kos dan kewangan juga menyumbang kepada faktor yang mempengaruhi kadar produktiviti projek IBS. Beberapa langkah telah dicadangkan untuk mengatasi masalah yang telah dikenal pasti. Objektif ketiga adalah untuk menganggarkan kadar produktiviti pelaksanaan komponen IBS yang melibatkan struktur tiang, dinding dan bumbung. Analisis data menggunakan rumus yang terdiri daripada jumlah luas komponen IBS yang dibahagi dengan tenaga yang diperlukan untuk menyiapkan kerja-kerja yang terlibat. Hasil kajian mendapati kadar produktiviti bagi tiang, dinding dan atap adalah 0.76m^2/jam, 1.20 m^2/jam dan 2.36 m^2/jam. Hasil kajian ini akan menjadi sumber rujukan bagi kajian kadar produktiviti dan anggaran pelaksanaan projek IBS di masa depan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Construction is one of the most important and productive sector in Malaysia. As a developing country, this sector plays a major aspect for the economic growth and to upgrade the quality of life and living standard of Malaysian (Khan et al. 2014). In line with the expanding of Malaysian's construction sector, this sector is going through a transitional change to a more systematic system, prefabrication technology and the skills of workers is upgraded compared to the conventional technologies as a trend towards the global competition (Haron, 2005; Chan, 2011).

Industrialised Building System (IBS) is a construction system built by using prefabricated components; where component manufacturing is systematically performed using machinery, molds and other mechanical equipment (Azman, Ahmad, et al. 2012). The produced and completed components off-site or in the factory are directly sent to the site for installation (Rahman, Omar et al. 2006; Azman, Ahmad et al. 2012). Malaysian Government, through Construction Industry Development Board (CIDB), has launched Road Map IBS 2003-2010 and 2011-2015 aimed to encourage IBS usage that can reduce construction industry's reliance on foreigner workforce (Nawi et al. 2012; Azman et al., 2012).

However, the acknowledgement of this technology in Malaysia is relatively low with few projects being constructed with precast components. Due to this, basically this study is to establish the productivity rate of execution of IBS in construction project. Projects sites using IBS method are studied. The selected project for this case study is Pelaksanaan Program Pembaikan Sekolah Daif Menggunakan Kaedah IBS di Semenanjung Malaysia which include school in the district of Rembau, Negeri Sembilan Darul Khusus.

Productivity rate on execution of IBS components will be estimated. The measurements are focusing on three (3) structural components such as column, wall and roof trusses. Data on construction productivity rate are collected from the case study and secondary data collection such as site daily reports, monthly progress reports, project schedules, structural drawings, and other relevant materials.

Later, all data collected are analyzed and the factors that influence the productivity rate were established. Finally, conclusion and recommendation are presented, and it will be used as a guide for improving future similar project for the industry players.

1.2 Problem Statement

Conventional construction technique has been widely practiced globally and locally by the construction players. This technique is divided into two components. Firstly, the structural system which is the cast-in-situ of the frame such as columns, beams, and slab. The cast-in-situ of the frame are going through four operations which are the erection of timber formwork and scaffolding installation of steel bar, pouring of fresh concrete and dismantle of formwork and scaffolding (Aishah and Ali, 2012).

Jabatan Kerja Raya Malaysia (JKR) has completed thousands of projects every year for various ministries in Malaysia by using either conventional or IBS method. In line with development of the technology, the government has taken the initiative by emphasizing the application of the IBS in government projects. This has been supported by an instruction by the Government via Surat Arahan Ketua Pengarah Kerja Raya (KPKR) bil. 10/2018. However, there is still lack of data on the productivity rate of the construction activities involved especially for IBS project in Malaysia to be referred to.

JKR has realized the importance of having a standard productivity rate for activities involved in the building construction. Several construction activities in IBS project has been selected for the productivity study which include only the execution phase of IBS method in the construction project. Hence, preliminary study needs to be carried out in order to determine and establish the productivity rate for execution of IBS components in construction project.

1.3 Aim and Objectives of Study

The aim of this study is to establish the productivity rate of IBS components installation in construction project. The following objectives have been identified to achieve the aim of this study:

i. To identify the installation procedure of IBS;

ii. To determine factors that affect the productivity rate of IBS project during construction; and

iii. To estimate the productivity rates of IBS components installation in construction project.

1.4 Scope of Study

The scope of the study will only be focusing on the ongoing construction project using IBS as listed below:

i. The study involved only at execution phase of IBS method using Steel Framing System in the construction site. The manufacturing of the components and transportation stages are not included in the study;

ii. The study is focusing in on the execution system of IBS components which includes the installation column, wall and roof procedures. The management in adopting IBS such as coordination, resources and waste control, planning and monitoring are not covered in the study; and

iii. The productivity rate execution of IBS components is established based on a case study of selected project.

For the purpose of the study, the selected project for a case study was *Cadangan Pembinaan Semula dan Menaiktaraf Sekolah Daif Menggunakan Kaedah IBS Di Semenanjung Malaysia (Fasa 1) Tahun 2018 Bagi Negeri Sembilan di Sekolah Kebangsaan Seberang Batu Hampar, Negeri Sembilan Darul Khusus.*

1.5 Significant of the Study

The introduction of IBS in Malaysia had started almost forty (40) years ago, but the level of acceptance is not widespread and the pace of implementation of the system is still in low phase (Yahya and Shafie, 2012). To date, there are many improvements done in research into Malaysian IBS construction project but most of the research is still based on promoting the benefits of IBS instead of addressing the inherent problem such as measurement and analysis of productivity rate in IBS building construction, developing a guideline or reference on productivity rate, and many more that will help to increase the level of IBS implementation among Malaysian contractors.

Even though, there are many companies have developed their own productivity tracking system based on their experience and accounting system, they prefer to use internally and not for outsiders due to competition in getting the contract. In fact, none of previous researchers have successful in establishing common definition and developing a survey tool that collect standard productivity data at the appropriate levels (Park, et al., 2005).

As an effort, this paper was initiated to develop a productivity rate of IBS components installation as a standard reference or guidelines for improving government projects in the future. A research by M. Abedi *et al* (2011) mentioned that besides establishing the productivity rate of IBS in future similar construction project as a reference to the industry players, it could also assist professional parties in construction industry by providing better knowledge ground to improve decisions making in order to achieve the success of IBS construction project.

1.6 Structure of the Report

Chapter 1 of the report describe generally about the background and problem of the study. It will be related to the problem statement which being raised by the researcher. This chapter also explain the aim and objectives, scope of study and brief of the research methodology.

Chapter 2 is a literature review pert where the study reviews past researches by other studies that related to the study mainly in the IBS and its productivity rate.

Methodology of study will be explained in Chapter 3. Data collection will be carry out through a case study and secondary data obtained from selected sites.

Chapter 4 present on result and discussion based on data analysis and data collected from the sites and reports are analyzed and the factors that influence the productivity rate were established. The researcher shall relate findings with the objectives of the study as mentioned in Chapter 1.

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