UNIVERSITI TEKNOLOGI MARA

SUPPLY CHAIN INTEGRATION IMPROVEMENT ACTION MODEL FOR CONTRACTOR IN INDUSTRIALISED BUILDING SYSTEMS (IBS) PROJECTS

WAN ZUKRI BIN WAN ABDULLAH

Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Civil Engineering)

College of Engineering

February 2023

ABSTRACT

Supply Chain Integration (SCI) was the key to better construction project performance in improving the construction industry's performance to be more integrated. In accordance with National Construction Policy 2030 (NPC 2030), which has outlined some effective measures to improve the delivery system in addition to ensuring the success of public and private construction projects outlined which one of them is to increase awareness and campaign programs to enhance the understanding of quality assessment and utilisation of Industrialised Building System (IBS) technology in construction projects, especially to the Small and Medium Enterprises (SMEs). The Malaysian government has been persuaded to use the innovative approach of the Industrialised Building System (IBS) and Integrated Supply Chain to ensure the development of the construction industry in the right direction. It also found that the fragmentation and adversarial relationships among the stakeholder in the IBS supply chain has been identified as the main hindrance to the IBS construction project delivery. The difficulty in providing cooperation and integration among the IBS stakeholders needs to be addressed to ensure the delivery approach and arrangement in the procurement of current tasks can guarantee work continuity that can drive production excellence as a result of the effectiveness of the supply chain. The objectives of the research are to identify the major factors that affecting disintegration among the contractor that caused IBS construction projects delay; identify the most critical project phase that caused IBS project delay in proposing the completion time; examine the Key Performance Indicators (KPIs) towards successful IBS construction project; determine the Action taken by the contractor for each major factors to achieve the Key Performance Indicators (KPIs) and to develop the IBS SCI Improvement Action Model for contractor that related to KPIs towards successful IBS construction project. The research methodology is divided into 3 phases which are; 1) literature review, problem analysis and questionnaires design; 2) data collection, analysis and proposed Actual Conceptual SCI IBS Framework; and 3) develop the IBS SCI Improvement Model. Phase 1 started with the literature review, referring to a critical and systematic document containing the information required to obtain any relevant factors influencing the IBS Supply Chain Integration. Expert interviews and a pilot study were conducted for the questionnaire design. It aims at exploring and collecting data about a specific field of interest. In Phase 2, a set of questions was prepared to collect information for analysis in answering the research objectives. The data obtained from the main questionnaires were analysed using SPSS 28.0, including Cronbach's Alpha, factor analysis, the mean and standard deviation to achieve objectives one, two, three and four. Phase 2 ends with the analysis and report to propose the Actual SCI Conceptual Framework. In Phase 3, to achieve objective five, PLS-SEM 3.0 was used to evaluate the data, which consisted of two stages; evaluation of the measurement model and evaluation of the structural model to design the IBS SCI Improvement Action Model while also determining how the indicated variable (SCI factors and Action) relates to the KPIs. The model will contribute to a new guideline for the contractor to communicate for better supervision from the initial stage until the completion of the project. It will also provide information to project teams to perform various complementary tasks, visualization, construction and improving documentation accuracy.

ACKNOWLEDGEMENT

"In the name of Allah, Most Gracious, Most Merciful"

Firstly, thank you to the Almighty, ALLAH SWT, for giving me the strength and an opportunity to embark on my PhD and complete this long and challenging journey successfully. My gratitude and thanks go to my supervisor Associate Professor Dr Siti Rashidah Binti Mohd Nasir, who continuously gave great ideas, beautiful thoughts, precious encouragement and inspiration motivational that she had shared to boost me throughout my years of study. Subsequently, my wish of thanks to my co-supervisor Prof. Ts. Dr. Che Khairil Izam Che Ibrahim, for the valued comments on my research.

This thesis is also dedicated to my loving parents, my dearest father, Haji Wan Abdullah Wan Said and my beloved mother, Rakiah Binti Daud, for their vision and determination to consistently give me magnificent support, assistance and endless encouragement.

Also, this thesis dedicated to my amazing wife, Rafizah Binti Mohamed Nordin for her practical and emotional support, to the competing demands of study and personal development. To my children Wan Zarin Rania, Wan Zarin Raisya and Wan Zafri Rayyan, thank you for being so supportive, and hope this will inspire all of you to lead successful lives. It is also dedicated to family members who have supported in whatever aspect during this journey.

Finally, my special thanks to all my colleagues, professional and academia, as well as fellow postgraduates, knowledge-seeking souls, I thank you sincerely from the bottom of my heart. The research could not have been accomplished, and the thesis would not be completed without the help of many individuals and organisations.

May Allah forgives us and confers us with His blessings.

TABLE OF CONTENTS

CHAPTER ONE
INTRODUCTION

1.1 Introduction

The Construction Industry Development Board - Industrialised Building System (CIDB-IBS) was established as a subsidiary of CIDB Malaysia to conduct research and make investments in IBS techniques because the Malaysian government theoretically recognised the advantages of IBS in the construction industry (Kamar et al., 2014). However, in practice, adopting IBS in the private construction sector is lagging behind in delivering one million construction units by 2028 (The Malaysian Reverse Plan, 2020; The Edge Financial Daily, 2017). A recent analysis released in 2019 shows that just 35% of these projects reached this target for construction projects, even though since 2008, all private sector builds in Malaysia are required to obtain a 50% IBS score (Mohd Amin et al., 2017).

For all the stakeholders involved in IBS projects, the IBS database of the CIDB is a valuable resource (CIDB Malaysia, 2022). Potential customers can use the database to find legitimate public and private construction companies following IBS criteria throughout Malaysia. The construction industry's open data, made public by CIDB, includes a variety of IBS categories and a corresponding number of IBS Manufacturers and Suppliers linked with IBS construction processes (CIDB Malaysia, 2022).

In terms of the history of the importance of IBS construction that the construction industry has outlined in Malaysia, IBS was highlighted under Strategic Thrust 5 of the Construction Industry Master Plan (CIMP) and the IBS Roadmap 2003–2010 (1st phase) and 2011–2015 that were developed to assist Malaysia in capitalizing on new technologies and IBS-related issues. In CIMP 2011-2015, a series of support mechanisms and government initiatives have been designed to educate the construction supply chains to improve IBS implementation and performance.

Accelerating the development of the Malaysian construction industry and preparing it to meet the future demands of the economy will, thus, require an industry transformation. The Ministry of Works (MOW), collaborating with its agencies and, more specifically, the Construction Industry Development Board (CIDB), has