

**SIMULATION OF ASSEMBLY OF COMPONENTS FOR
INDUSTRIALIZED BUILDING SYSTEM**

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SIMULATION OF ASSEMBLY OF COMPONENTS FOR
INDUSTRIALIZED BUILDING SYSTEM

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Specially dedicated to my beloved family

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ABSTRACT

Industrial Building System (IBS) is the construction method that organized as industrial construction process. This system save construction time and workers, provide better quality control, and enhance the productivity. In other hand, the construction method that offers economization of design will provide protection against any change in the cost factors. The aim of this study is to determine the process flow of assembly of components in construction that was (IBS) components for main structural system of the building. For this purpose a study was conducted to analyze ways to improve the implementation of IBS in terms for assembly of components for 80 workshops construction distributed within 6 zones in Dubai Maritime City. The thesis describes the simulation modeling approach by using assembly components simulation process in construction using Arena10 simulator software. An analysis of the research results indicate that there is a way of improving the system process of construction project operations. The result of using simulated (BTA) Model with the existing resources has achieved of completion period of 2 days earlier than actual construction site completion. While (FCFS) model strategy has achieved less completion time compare to (BTA) by 4 days, However by using more number of resources (BTA) could be better than (FCFS) to achieve less completion time.

ABSTRAK

Sistem Bangunan Industri (IBS) adalah kaedah pembinaan yang dianjurkan sebagai proses pembinaan industri. Sistem ini menjimatkan masa pembinaan dan pekerja, menyediakan kawalan kualiti yang lebih baik dan meningkatkan produktiviti. Selain itu, kaedah pembinaan ini juga menyediakan reka bentuk yang ekonomi dan memberi perlindungan terhadap perubahan dari segi kos pembinaan. Tujuan kajian ini adalah untuk menentukan aliran proses pemasangan komponen dalam pembinaan (IBS) untuk sistem utama komponen struktur. Bagi tujuan ini satu kajian telah dijalankan untuk menganalisis kaedah pemasangan dan menambah baik pelaksanaan IBS untuk 80 bengkel pembinaan yang dibahagikan kepada 6 zon di Dubai Maritime City. Ia menerangkan kaedah pemodelan simulasi dengan menggunakan proses simulasi pemasangan komponen dalam pembinaan melalui penggunaan perisian Arena10. Analisis hasil kajian ini menunjukkan bahawa terdapat kaedah untuk memperbaiki proses bagi operasi projek pembinaan. Melalui simulasi yang dilakukan, didapati Model (BTA) dapat mencapai tempoh siap 2 hari lebih awal daripada keadaan pembinaan sebenar dengan menggunakan sumber yang sedia ada. Manakala dengan strategi model (FCFS) jangka siap adalah lebih pendek 4 hari berbanding (BTA). Walau bagaimanapun jika penggunaan sumber dapat ditingkatkan, BTA akan dapat mencapai tempoh siap lebih awal berbanding dengan (FCFS).

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Collaboration among construction companies in management of supply chains has become a topic of increasing importance over the past few years. Researchers and practitioners alike have been trying to raise awareness on the need for the construction industry to incorporate to other sectors in the management of supply chains (Buntrock, 2001).

Supply chain management plays a major role in the growth of companies involved in delivering of a product or service. However, the gains accruable to at most times is not achievable due to conflicting interests among various stakeholders in the supply chain, network complexity, barriers in interactions between various participants which hinders information flow, money and goods (Simchi-Levi et al. 2003).

The application of simulation in construction logistics is as a tool to improve logistic process performance of industrialized building system has gained

prominence over the years. Thus, a high process planning and accurate logistic of IBS (Industrialized Building System) construction process is needed in order to enhance logistic activities of IBS component.

This study examines the logistics in construction process and its effect on construction supply chains for the assembly of components of IBS. Past studies on construction supply chains are reviewed and simulation are used to assemble of components process and examined its implication from research to practice.

1.2 Problem Statement

The supply chain of IBS involves many parts of management. One of the most important processes of IBS is the logistic process. Logistics involve the logistics management, supply chain management, standardization of IBS construction such as sizing, project management, policy and regulation.

In fact, this process is considered as one of the critical factors impacting time, resource, and flow of the operation. The considerable amount of waste is incurred in the industry due to a poor logistics including financial status, project management, manufacturing of components, transportation of components, and assembly of components. The requirements of providing the appropriate assembly sequence enforced the construction to study the information flow in advance. It is essential to reduce time, plan the resources and the activities of the whole processes. The need to adopt an optimized model solution is essential in enhancing the optimization of assembly, reduces the time, and eliminates the complex routine involved in the process.

1.3 Aim and Objectives of Study

The application of Supply Chain Management (SCM) philosophy to the IBS construction has been widely investigated as an effective and efficient logistic process to improving the performance of construction. One of the logistic process that is very important in IBS is assembly process of components. Currently it is fragmented, waste, poor productivity, cost and time overruns, conflicts and disputes since long time ago.

In order to improve the IBS construction industry mode of assembly, the research is to focus and simulate the integration of supply chain management tool through order and demand. Arena simulation tools will be used to create a simulation model to reach to the optimize completion time and appropriate resources.

The objectives of this study are:

- To identify the detail workflow activities and their resources to assemble the components of IBS project.
- To simulate BTA (built to assemble) model for IBS construction method.
- To improve Model process to achieve less completion time.

1.4 Scope of Study

The scope of work through simulation is mainly focused on the installation of IBS walls components for 80 units of workshops in 6 blocks of construction area. The installation process that be highlighted in this study is commencing from transporting IBS components to the site, hoisting, positioning, and grouting IBS

components until finish the whole assembly process. The assumptions that have to be made in this study are the installation will not be interrupted due to any delay, machine breakdown, lack of labours and insufficient supply of IBS components from the supplier. The study will also seek criterion for a good logistics vision statement that is to provide the route map for how these goals are to be achieved:

- Literary study on IBS and supply chain management for logistics of construction process in assembly components process.
- Modeling and simulation of supply chain management to achieving a good overall IBS assembly period, time needed and Alternative models for organization process.
- Data analysis of the results and conclusions.

Making references to relevant books, journals and other sources, as well as conducting literature study on supply chain management for IBS construction and its applications on the assembly process were performed in the first stage of the research. The second stage involved a modeling and simulation using the (Arena) technology. The implementation like this technology allows the users to monitor and reduction on time and cost for supply chain in IBS construction. The third stage of the study was the analysis of the results. The final stage ends with the writing of findings and conclusions, Figure 1.1.

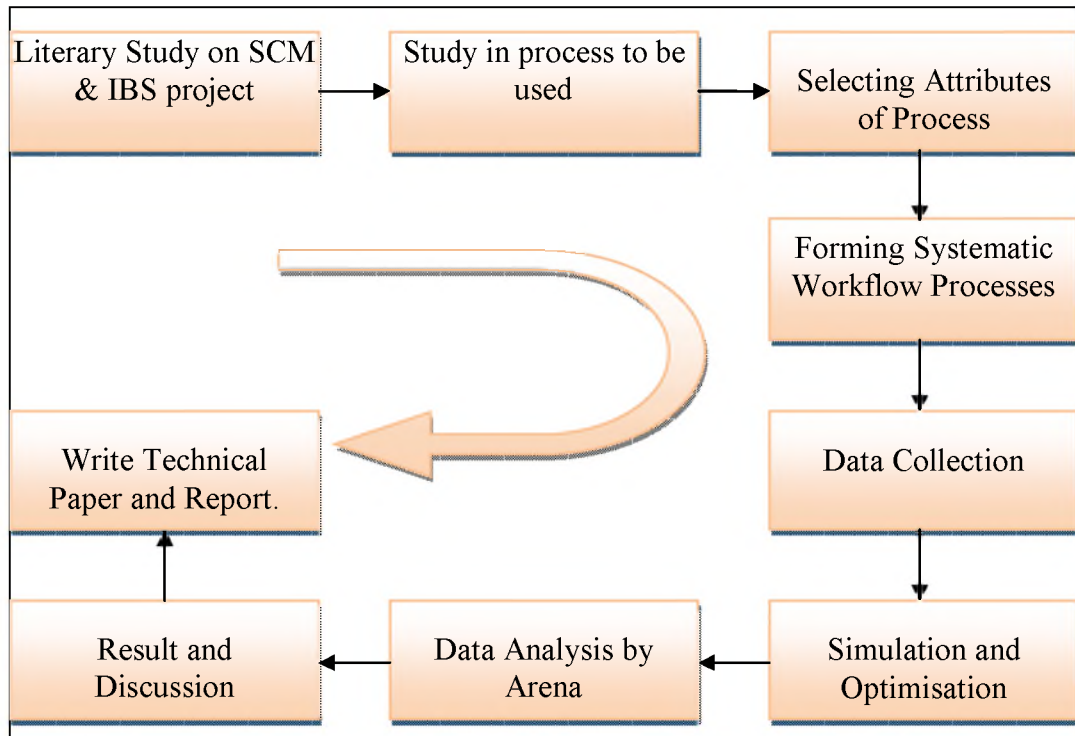


Figure 1.1 Research process

1.5 Significance of Study

The significance of the study are:

- A methodology used in this study can be applied in the planning of IBS projects assembly especially in organization of work flow.
- It also will prevail the best sequence process in IBS assembly.
- It also propose a model for organization and monitor and control the process in IBS assembly.

1.6 Brief Research Methodology

This research was carried out by literature search on logistic process supply chain management in IBS projects and simulation by using Arena software. Furthermore, the model processes also conducted to obtain the data from case study in construction industry and its feasibility in implementing supply chain management through simulation.

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