

CRITICAL SUCCESS FACTORS AND BARRIERS OF IMPLEMENTING LEAN  
MANUFACTURING IN PRECAST INDUSTRY

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## DEDICATION

*To my parents, husband and friends I couldn't have done this without you.  
Thank you for your support along the way.*

*Stand on the production floor all day and watch—  
you will eventually discover what has to be done.*

*I cannot emphasise this too much.*

(Ohno, 1988, p. 78)

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## **ABSTRACT**

The aim of this research is to study critical success factors (CSFs) and barriers in implementing Lean Manufacturing (LM) and way forward to overcome the identified critical barriers. To address these findings, a methodological approach was implemented in three (3) tiers. First, a comprehensive review on the literature in terms of LM implementation, CSFs and barriers followed was undertaken. Second, an analytic approach was accessed by using a questionnaire which was distributed to a total of 78 number of respondents in the organisation. Third, interview session with four (4) employees was conducted in order to mitigate the perceived barriers. Upon validation of the analysis, the results revealed most of the respondents agreed Leadership and Management Commitment are the key success factors for the organisation to stay competitive. Whilst for the barrier, it is believed that the obstacle to LM implementation is more towards Managerial barrier (i.e. lack of Lean culture, strict requirement and approval, less personal empowerment). Thus, two (2) general directives have been forwarded by the author to overcome the identified barrier which are initiating learning organisation and simplifying Lean process. It is believed this strategy could create awareness and develop Lean culture, besides that the employee able to set a baseline on any discrepancy that may appear in the shop floor. Overall, these findings present a critical view for the organisations to know factors that could drive and restrain them from implementing LM.

**Keywords:** Lean Manufacturing, CSFs, barriers, implementation

## ABSTRAK

Tujuan kajian ini adalah untuk mengkaji beberapa faktor kritikal dalam menjayakan pelaksanaan Lean Manufacturing (LM), faktor yang boleh menyumbang kepada kegagalan LM serta mencadangkan beberapa solusi bagi menangani faktor yang menghalang pelaksanaan LM. Sehubungan dengan ini, pendekatan metodologi dalam kajian ini telah dijalankan dalam tiga (3) peringkat. Pertama, satu kajian secara menyeluruh mengenai kajian literatur yang mempunyai kata kunci pelaksanaan LM, faktor kritikal yang menyumbang kepada kejayaan dan faktor halangan telah dilakukan secara terperinci. Kedua, pendekatan analisis yang menggunakan soal selidik telah dijalankan dimana soalan kaji selidik telah diedarkan kepada responden di dalam organisasi tersebut yang berjumlah 78 orang. Ketiga, kajian ini diakhiri dengan menjalankan sesi temu bual bersama empat (4) orang pekerja bagi mengenal pasti cara-cara untuk mengatasi faktor halangan yang telah diusulkan daripada dapatan kajian. Oleh hal yang demikian, hasil dapatan menunjukkan bahawa faktor Kepimpinan dan Komitmen Pengurusan adalah menjadi penyumbang utama dalam pelaksanaan LM. Sebaliknya, faktor halangan kepada pelaksanaan LM adalah faktor kerja Pengurusan seperti kesedaran budaya Lean di dalam organisasi, kemahiran dalam pengetahuan Lean dan keperluan dalam memperkasakan kemahiran pekerja. Walau bagaimanapun, dua (2) kaedah telah dikemukakan oleh penulis untuk mengatasi halangan dalam pelaksanaan LM iaitu perlunya organisasi menubuhkan sistem pembelajaran untuk organisasi beserta memudahkan proses pelaksanaan LM.

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## **LIST OF ABBREVIATIONS**

LM	-	Lean Manufacturing
CSF	-	Critical Success Factors
IBS	-	Industrial Building System
GIBS	-	GAMUDA Industrial Building System
JIT	-	Just in Time
ANOVA	-	Analysis of Variance

## LIST OF SYMBOLS

$N$	-	Number of samples
$p$	-	Significant value
$r$	-	Pearson
$\beta$	-	Regression weight

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Lean Manufacturing (LM) is described as a collective term for manufacturing practices that aim to increase the output value and reduce waste (i.e., manpower, material, method and machine). In comparison to traditional manufacturing, LM aims to save money where the manufacturing approach is driven by balancing the output flow in such a way by increasing customer demand and concentrating on manufacturing quality rather than keeping it as a reserve especially when unpredictable or shortages occur. Undoubtedly, as the world has changed drastically, instability such as the economic downturn and the crisis is no longer an exception. Therefore, even when unpredictability is constant and change is inevitable, those companies that implement LM continue to thrive in retaining high profitability, growth and innovation (Ruffa, 2008).

Ideally, LM assist the organisation to maximise the value from the massive investments in technology and other business development by delivering high-quality of products in a short period of time. Apart from that, implementing LM facilitate manufacturing process thereby lead to less material and resources (Cirjaliu & Draghici, 2016). In other words, LM gives positive impact on operations performance in regards to quality, cost, fast response, and flexibility.

Many companies have therefore spent a great deal of time improving their global supply chain and manufacturing models (Cirjaliu & Draghici, 2016) in order to achieve high profitability. A growing body of literature has examined that new manufacturing strategies have been progressively introduced through Lean, which may vary depending on the strategic level of interest of the company (Lucato et al.,

2014). Thus, the main principle of LM is to implement new manufacturing needs and shifting the target quantities quickly by optimising the process efficiency and eliminating waste.

As the implementation of LM has become a necessity for the organisations to compete on a global market, not many companies have gone through the advantages of implementing the understanding of Lean within the organisations. Although its advantages are apparent, again, not many companies have resorted to Lean concepts, although it has been shown that LM was considered the best manufacturing strategy in the 21st century (Cirjaliu & Draghici, 2016). In spite of many manufacturers have recognised LM as a critical method of development, yet only a few have achieved ambitious goals which the LM concept sets out while the majority had difficulties in improving LM performance over time (Ghobakhloo et al., 2018).

In fact, most of the companies fear that implementing LM is costly and time consuming. On top of that many organisations that follow Lean principles in their company concentrate only on the tools and ignore the cultural change. Ideally, implementing Lean actually require Lean culture awareness within the organisation. This is because implementing LM requires a limited number of employees to undertake a wider range of responsibilities that could involve shifting the standard work processes. Nonetheless, using various types of Lean methods, together with making the right cultural changes, is a challenge for every company.

Overall, LM is a continuous improvement strategy that involves a continuous engagement of both management and production employees who worked together to meet customer requirements. Thus, to improve company performance, it is important to identify critical success factors for implementing LM as well as barriers as these factors would affect the profitability of the companies.

## 1.2 Scope of Study

The research study was done in Gamuda Industrial Building System (GIBS), a wholly owned subsidiary of Gamuda Berhad in Malaysia which manufacture precast products for the construction industry such as walls, slabs, bathroom pod, columns and staircase. GIBS is considered as a new subsidiary company as the firm starts to operate since 2016. GIBS is a pioneer on digital IBS adoption in Malaysia with the country's first digital IBS facility in Sepang. The company implements Industrial Building System (IBS) concept where the building components are manufactured in factories and then installed into on-going construction works. Precast concrete is produced in a controlled factory environment using advanced manufacturing techniques where the products are available in a vast range of different sizes, shapes and finishes.

GIBS is undergoing a rapid transition and growth process as the organisation places a premium on a completely computerised system using comprehensive automation and robotics to produce high-quality precast concrete products which meet its tolerances thereby ensuring the products and the quality service it offers align with the standard demand by the customers. In spite of that, GIBS is facing disruptive change as the company arises from the change in technology from conventional processes to digital equipment. In addition, switching to digital has increased competition as it has offered more options to the customers which led the company to higher quality and delivery times for customers. Normally, either doing nothing or trying to improve the company is a common industry approach to these problems.

Regarding the latter, LM principles have been identified as a way forward to ensure continuous improvements in GIBS. Overall, GIBS is based on assembly and highly depends on the suppliers for specific prefabricated parts. As the company seeks to develop its manufacturing processes without losing the quality of the product, GIBS actively seeks simple yet effective solutions that do not require extensive financial investment at the outset. Since the company operates within larger supply chains, it is believed that at a certain stage the company need to



understand LM that has been implemented in the entire manufacturing system with the principal of improving its product quality, cost and time.

### **1.3 Problem Statement**

Resource control, inadequate machinery servicing, front-line workers ' skills, in-process inspection, supply of raw materials and, to name a few, are some of the problems in GIBS that produce waste if it is not handled wisely. Moreover, waste of talent which act as part of knowledge-based waste (i.e. failure to use the talent of workers within the organisation) is also a concern that the company fails to address. In a command-and-control environment, GIBS also tends to operate where the company gives little attention to what employees actually think and what they could contribute within the organisation. Instead, GIBS should aware that employees are the biggest asset and can help the company to stay excel in the market by reducing waste and bringing more value to consumers.

Furthermore, most managers who aim to incorporate Lean in GIBS will usually concentrate on reducing waste such as waste of time, energy, manpower and inventory management rather than concentrating on product quality that results in customer dissatisfaction. Due to this, GIBS needs to think critically on how to maximise their resources without wasting it, for instance, by increasing and providing the employees with additional training as they are valuable assets to the company.

Besides that, as a company with full of digitalisation technology, GIBS frequently face the challenge of insufficient knowledge about the operation methods. Although some Lean framework is being introduced in GIBS, but the company is only concentrating on the techniques and neglecting the required cultural changes. Nevertheless, the implementation of LM without improving the organisational culture will therefore almost never lead to the optimal results. By right, as an organisation with high technology, more educated and trained employees are required in order to maintain the automated production and quality control systems.

Thus, implementing LM processes involves true commitment from all levels of a company, from senior managers to front-line machine operators. Besides that, the identification of factors that could impede LM's performance will give companies the opportunity to assess their own capabilities towards LM which later give GIBS the opportunity to deliver their process more consistent.

#### **1.4 Research Objectives**

This paper outlines a study:

1. To identify the CSFs and barriers of LM implementation in the organisation.
2. To examine the relationship and the impact of CSFs (*leadership, management commitment, organisation culture and skills and expertise*) and barriers (*organisational, managerial and financial*) towards LM implementation in the organisation.
3. To determine solution to overcome barriers that hinder from the organisation to implement LM.

#### **1.5 Research Question**

The present paper calls into the question of:

1. What are the CSFs and barriers that contributes towards LM implementation in the organisation?
2. What is the relationship and the impact of CSFs (*leadership, management commitment, organisation culture and skills and expertise*) and barriers (*organisational, managerial and financial*) have on LM implementation in the organisation?
3. What is the solution to overcome barriers that hinder from the organisation to implement LM?

## **1.6 Research Hypothesis**

H<sub>1</sub>: Leadership factor is positively related towards LM implementation in the organisation.

H<sub>2</sub>: Management Commitment factor is positively related towards LM implementation in the organisation.

H<sub>3</sub>: Organisation Culture factor is positively related towards LM implementation in the organisation.

H<sub>4</sub>: Skills and Expertise factor has positive relationship towards LM implementation in the organisation

H<sub>5</sub>: Managerial barrier has negative relationship towards LM implementation in the organisation.

H<sub>6</sub>: Operational barrier has negative relationship towards LM implementation in the organisation.

H<sub>7</sub>: Financial barrier has negative relationship towards LM implementation in the organisation.

## **1.7 Research Hypothesis**

Understanding what are the most critical success factors motivates companies to successfully implement LM and other innovative methods in continuous improvement. This is particularly important in the prefabrication industry where LM implementation has been limited. It is important to identify potential barriers to the implementation of LM so that the identified barriers can be addressed and resolve which helps to improve the competitiveness of companies. As a result, management

will have a wider, more pragmatic perspective, with the relevant experience of employees and line operators once the relevant factors are effectively being tackled.

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