THE RELATIONSHIP BETWEEN IMPLEMENTED LEAN SIX SIGMA TOWARDS PERFORMANCE OF LOGISTIC

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APPROVAL

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DECLARATION OF ORIGINAL WORK

I hereby declare that all the work of this thesis entitled “The Relationship Between Implemented Lean Six Sigma Towards Performance of Logistic” is original done by myself and no portion of the work encompassed in this research project proposal has been submitted in support of any application for any other degree or qualification of this or any other institute or university of learning.

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DEDICATION

I would like to appreciate the dedication of my beloved family members who educated me and motive me to learn until degree level. And also, I express a deep sense of gratitude to my lecturer whom also my supervisor for my final year project, Dr. Nurhayati Binti Kamarudin and my fellow friends. They have provided me fully support and advice throughout this research. Without their blessing and encouragement, this research is impossible to complete within short period of time.

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ABSTRACT

Lean Six Sigma can be defined as a set of management techniques intended to improve business processes by greatly reducing the probability that an error or defect will occur. It emphasizes cycle-time improvements while reducing manufacturing defects to no more than 3.4 occurrences per million units or events. This study aims to examine the relationship between implemented Lean Six Sigma towards the performance of logistic. A probability sampling approach was used for the study and samples were taken from new groups in Malaysia. A five-point Likert Scale questionnaire will be used to obtain respondent information. The questionnaire was evaluated with the help of the Statistical Package for the Social Sciences (SPSS). The results show that all the independent variables are significantly correlated. The conclusion of this study is expected to provide a good aspect to the new group in Malaysia.

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Keyword: Lean Six Sigma, Technology, Performance, Logistic

ABSTRAK

Lean Six Sigma boleh ditakrifkan sebagai satu set teknik pengurusan yang bertujuan untuk menambah baik proses perniagaan dengan mengurangkan kebarangkalian bahawa ralat atau kecacatan akan berlaku. Ia menekankan penambahbaikan masa kitaran sambil mengurangkan kecacatan pembuatan kepada tidak lebih daripada 3.4 kejadian setiap juta unit atau peristiwa. Kajian ini bertujuan untuk mengkaji hubungan antara Lean Six Sigma terhadap prestasi teknologi logistik. Pendekatan persampelan kebarangkalian telah digunakan untuk kajian dan sampel diambil daripada kumpulan baru di Malaysia. Soal selidik skala Likert Lima mata akan digunakan untuk mendapatkan maklumat responden. Soal selidik telah dinilai dengan bantuan Statistical Package for the Social Sciences (SPSS). Keputusan menunjukkan bahawa semua pembolehubah bebas mempunyai korelasi yang signifikan. Kesimpulan kajian ini diharapkan dapat memberikan aspek yang baik kepada golongan baharu di Malaysia.

Kata kunci: Lean Six Sigma, Technologi, Prestasi, Logistik

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In today's competitive world, enhancing the quality of the products and processes through continuous improvements is one of the prime objectives for any organization. With a focus on customer delight, profitability and reduced cost, "quality" emerged as a central point for the organizations (Sunder, 2016a).

As a continuous improvement approach, the lean concept originated from the TPS, focusing on doing more with less (Prasad et al., 2016). On the other hand, the Six Sigma approach initiated, aiming to reduce variations in the process at Motorola and resulted in dramatic improvement (Kuvvetli et al., 2016). Since the inception of Lean and Six Sigma, the number of the organizations adopted Lean and Six Sigma individually during the last 20 years of the 20th century and successfully achieved the improvements in the organizations and realized a positive impact on the firm's performance (Antony et al., 2017; Sahoo and Yadav, 2018).

Lean and Six Sigma were emerged during the last half of the 20th century and were the field of investigation for the researchers and practitioners. Both approaches were widely adopted in different organizations resulted in enhancement in performance.

However, at the beginning of the 21st century, Lean Six Sigma methodology turned up as a methodology for continuous improvement, got the attention of academicians, researchers and practitioners, and widely adopted in organizations. Lean Six Sigma is reported as a fine blend of Lean and Six Sigma and complementary. (Rodgers et al., 2019; Sunder, 2016b; Yadav et al., 2018a). According to few researchers, Lean Six Sigma helps to reduce non-value-added activities, wastes, defects and nonconformities encountered during various processes, addresses the issues related to waste and process flow with a focus to reduce the variation in product and process as well.

This chapter explains all of the important details about the research topic, which is the relationship between implemented Lean Six Sigma towards performance of logistic. In addition, the Lean Six Sigma concepts result in a potent mix of management and control analytical tools, methodologies and approaches. Using Lean Six Sigma approaches in the logistics and supply chain results in waste reduction due to regulated attempts to understand and reduce variance, while simultaneously enhancing velocity and material flow performance. (Al-Qatawneh et al., 2019) Furthermore, the researcher discusses the research context, the problem statement is that the Lean Six Sigma are consistent and easy to implement to all manufacture, the research problem created based on the problem, the research purpose and scope of study, research limitations, and the significance of the research.

1.2 Background of Study

In recent years, rapid advancements in information technologies have facilitated and broadened access to information. In addition to the concepts, pricing, location where the product is sold, distribution channels, and promotion, or the 4P approach (Product, Price, Place, Promotion), performance and process management have become crucial as a result of technological improvements globally reducing local barriers. Products developed as a consequence of large-scale surveys must also be backed up by well-thought-out tactics in order to obtain the desired market share. (Kasim & Gokhan, 2014)

Companies must be able to supply quality products or services in the face of competition, both in terms of pricing and service speed. Customers who are satisfied with the services given are more likely to remain loyal to the company and not switch to a competitor's service offering. If this is not met, their loyalty will be lost, and they will transfer to buying items or services from competitors. Dissatisfaction will lead to a drop in sales, resulting in lower earnings or even losses for the company.

Lean Six Sigma and Six Sigma are two similar process improvement methodologies. Both can assist businesses in making significant gains in quality, efficiency, and time utilisation by analysing how their processes work. The DMAIC phases/method is used by both (Ubaidillah & Sari, 2020). Both are predicated on fostering a problem-solving culture in the company. Six Sigma, on the other hand, is concerned with minimising faults and process variability in order to increase process output and quality and fulfil customer expectations. Lean Six Sigma is concerned with minimising or eliminating excessive resource utilisation and errors in order to enhance workflow and provide greater value to consumers.

The six sigma DMAIC (Define, Measure, Analyse, Improve, and Control) methodology can be viewed as a road map for addressing problems and improving products and processes. When the corporate culture and experience level allow, most firms start with the DMAIC approach and then add the DFSS (Design for Six Sigma) also known as DMADV or IDDOV techniques. (Krishnan & Prasath, 2013) Lean Six Sigma is a systematic problem-solving strategy as a statistical and scientific process for developing new strategic systems, products, and services with the goal of significantly lowering customers' stipulated failure rates or improving system inputs. (Linderman et al., 2003)

Lean Six sigma is a quantitative indication of the quality of products, services, and processes as a statistical measurement tool. It displays how far the process deviates from the ideal of zero

defects. The measurement unit in the six sigma technique is "Defects per Unit" (DPU). A fault is something that causes a client to be dissatisfied. The best tool for determining the quality of a process or a product is the DPU. The incidence frequency of flaws is represented by the Sigma coefficients three Sigma, four Sigma, or six Sigma. The lower the Sigma value, the lower the defect chance. (Kasim & Gokhan, 2014)

1.3 Problem Statement

This project addresses the problem which is that the Lean Six Sigma can maximise the profit and difficult to implement. Committing to lean six sigma requires the total cooperation of the company. Due to the tightly defined methods for improved communication, inventory control and measures dealing with customer service, if the entire company is not on board, success is not likely.

For effective performance and perception management in enterprises, vertical and horizontal integration is recommended. Vertical integration refers to the compatibility of an organization's levels from the bottom to the top. In other words, the issue the organisation wishes to manage, as well as essential messages to be developed around it, should be presented by a newly hired office employee or, for example, a chauffeur, with the same zeal, diligence, and content as the corporation's top management. Furthermore, horizontal integration is defined as "ensuring the compatibility and cooperation among communication works supervised by social stakeholders, given their close interdependence." Because Lean Six Sigma is applied to all aspects of the production and planning process, it may create rigidity and bureaucracy that can create delays and stifle creativity. (Bozkanat, 2021)

Sales and profitability are typically measured in most organisations. They do not, however, have operational effectiveness metrics. The outputs of the business are, indeed, sales figures and profitability. The inputs must be subjected to measures to improve profitability and efficiency. There have never been any positive results from regulations imposed on outputs. For maximum performance and efficiency, start with input laws that are compatible with the strategy and maintain vertical and horizontal integration from there. (Kasim & Gokhan, 2014)

Lean Six Sigma measurements appear to focus on process performance; nevertheless, the metrics are not aggregated or associated to corporate wellbeing, according to the Lean Six Sigma strategy. Lean Six Sigma is a performance management system that aims to keep track

of all of a company's internal activities. However, in practise, it appears that developing a process/strategy synergy with Lean Six Sigma is difficult. The effectiveness achieved in process management cannot always or directly be mirrored towards the upper echelons of the company. (Kasim & Gokhan, 2014)

Many papers covered the implementation process in a range of business kinds, according to a previous literature study; however, only a handful of these papers reported empirical research, and all of them were single case studies. (Nonthaleerak & Hendry, 2006)

Since its beginnings, the Lean Six Sigma methodology has been linked with huge corporations. Midsize businesses have gradually begun to profit financially from the scheme. Lean Six Sigma projects have resulted in increased savings and improved growth. SMEs are hesitant about the applicability of Lean Six Sigma due to a lack of expertise and education, as well as some misconceptions about the methodology. Apart from this, SMEs face significant technological, organisational, and financial constraints that prevent them from implementing Lean Six Sigma. (Raghunath & Jayathirtha, 2013)

The use of the DMAIC methodology to improve a dairy farm's feeding system is discussed in this example of an empirical single case study. They came to the conclusion that due to issues like limited resources and data accuracy, the implementation procedure in this small business environment is particularly slow. Healthcare and financial services, as well as non-production internal operations within a manufacturing firm, are two examples of non-manufacturing contexts mentioned in the literature. (Tylutki & Fox, 2002)

For instance, a case study on how to enhance procedures within a Human Resources (HR) function utilising the DMAIC methodology is provided. They validated that Lean Six Sigma may be used in non-manufacturing settings, although there are challenges unique to this setting, such as determining the project scope and working with less concrete metrics. They also emphasised that poor data analysis management might be a major contributor to inefficient Lean Six Sigma results. (Wyper and Harrison, 2000)

1.4 Research Question

1. What are the effective way to increase quality performance in logistic?
2. What are the factors that affect the implementation of Lean Six Sigma in logistic?

1.5 Research Objectives

1. To determine the Lean Six Sigma effectiveness toward performance of logistic.
2. To determine the factors that affect the implementation of Lean Six Sigma in logistic

1.6 Scope of Study

This research is focuses on the effective usage of Lean Six Sigma as one of the technology that be implemented in supply chain and logistic which aims to determine either the Lean Six Sigma are easy to apply to all manufacture or not. The data collection will be collected from manufacturer who have experience in Lean Six Sigma. Research will be conducted through interviews as surveys and other references. Thus, with the results obtained from them, researchers can profile the implementation of Lean Six Sigma and the factors influencing the implementation of Lean Six Sigma in logistic. Research will be conducted through interviews as other references. Thus, with the results obtained from them, researchers can profile the implementation of Lean Six Sigma and the factors influencing the implementation of Lean Six Sigma in supply chain and logistic.

1.7 Limitation of Study

The limitations of the study conducted by the researcher must focus on the huge company because they are so many barrier that have to faces by SME if their implement Lean Six Sigma. Through the limitations of this study, through the results of literature concept, data analysis and conclusions use in the companies that running on Lean Six Sigma.

Furthermore, there is also the assumption needed for the researcher to test the theory in the research. The primary assumption that the researcher comes out with is that all the respondents who involve in this research will provide their answers with fully honest based on their capability of the best understanding together with the adequate knowledge and experience they have on the topic studied to provide the best possible responses. Some of the responses

collected during this research may not exactly represent the responses from the respondents in the actual situation. However, the researcher still assumes that those respondents involved in this research have the correct understanding of the research study. The researcher approaches the right respondents to complete this research

1.8 Significant of Study

The importance of this research is to understand the effective way to increase the quality performance by the companies that implemented Lean Six Sigma in logistic. This research also important because to understand the strategies which can overcome the challenge faced by the company that implemented Lean Six Sigma.

Besides, this research also supported the researcher to understand the role of the Lean Six Sigma in logistic. This study intended to explain the factors influencing the implementation of Lean Six Sigma in logistic as well. This is because the researcher needs better understanding on how Lean Six Sigma can increase the performance in manufacture. In addition, this research was able to identify the relationship between the implemented Lean Six Sigma towards performance of logistic.

1.9 Summary

This chapter had covered the definition of Lean Six Sigma and gave the overview of this research which were the background of study, problem statements, research question, research objective, scope of the study.

In brief, this research is aimed to generate knowledge and details on. In this topic, researcher discuss the research background which brings out the problem of research and the barriers. Researcher also issued two research questions that matched the research objectives. Finally, the researcher chose to conduct interviews with manufacturer that have experience in Lean Six Sigma in different departments to obtain information related to the objectives and research questions that have been issued to produce research writing.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, we will discuss past research studies and debates. All studies related to the performance of logistic in implementing Lean Six Sigma in this chapter. Besides, this chapter will also outline the relationship between the dependent variables and the independent variables.

2.2 Lean Six Sigma Methodology

Six Sigma is a quality improvement tool based on the use of data and statistics. The term "sigma" is the Greek letter σ used for the quantity of Standard Deviation or standard deviation in statistics. Six Sigma's basic principle is product improvement by making improvements to the process so that the process produces the perfect product. In addition, six Sigma is oriented towards long-term performance through quality improvement to reduce errors, with zero failure targets (zero defects) on process capabilities equal to or more than six Sigma in standard deviation measures. Six Sigma is a technique or method of controlling and improving quality dramatically that has been implemented by the Motorola Company from 1987. This method was first developed by William B. Smith, Jr. Dan Mikel J. Harry of Motorola in 1981, when Bob Galvin was CEO of Motorola. (Haekal, 2021) Six sigma is a vision of improving quality towards a 3.4 failure of the unity of millions of opportunities for each transaction, whether it is goods or services, and it is an activity aimed at perfection.

Expenses made to cover the former will aid in the avoidance of losses caused by the latter. At the same time, it's important to remember that quality isn't a goal in and of itself. With Six Sigma, all operations should be focused on increasing the process' capability to meet customer requests while also maintaining process stability, which will lead to improved earnings. Furthermore, this applies to both the external client and the internal procedure. Furthermore, the procedure should be done accurately the first time, with any potential errors discovered and corrected as soon as feasible. Continuous measurement and control of the process provides

information on whether or not the process can satisfy the customer's needs, as well as if and where wastage is occurring. Its premise is that if something isn't measured, its performance can't be assessed. Any process irregularities should be used as a starting point for simplifying it. (Lemke et al., 2021)

2.2.1 DMAIC (Define, Measure, Analyse, Improve, Control) Cycles with Six Sigma.

The Six Sigma DMAIC (Define, Measure, Analyse, Improve, and Control) (Figure 1) methodology can be viewed as a road map for addressing problems and improving products and processes. When the corporate culture and experience level allow, most firms start with the DMAIC approach and then add the DFSS (Design for Six Sigma, also known as DMADV or IDDOV) techniques. (Krishnan & Prasath, 2013) This method allows for the integration of Six Sigma's three major areas: customers, processes, and staff. (Lemke et al., 2021)

Figure 1. DMAIC cycle

Table 1. Sample tools in DMAIC (Define, Measure, Analyse, Improve, and Control).

STEP	TOOLS
Define	CTQ (Critical to Quality), VoC (Voice of Client), SIPOC (Supplier Input, Process, Output, Client), 5W2H (5 Why 2 How)
Measure	Data collection plan, histogram, Pareto chart, C_p (potential process capability), C_{pk} (actual processes capability), DPMO (Defect per Million Opportunities)
Analyze	Ishikawa diagram, 5Why, DoE (Design of Experiments)
Improve	Poka Yoke, FMEA (Failure Mode and Effects Analysis), SMED (Single Minute Exchange of Die), 5S
Control	Control Charts, Shewhart Charts, process audit

While the DMAIC methodology outlined below appears to be linear and well-defined, it should be emphasised that an iterative approach may be required – especially for Black Belts and Green Belts who are unfamiliar with the tools and techniques that make up DMAIC. For example, you may discover that you did not collect enough data to determine the main cause of the problem after analysing your data (the Analyze step). Return to the Measure phase at this time if necessary. Furthermore, prior understanding of the tools and processes is required when deciding which tools are appropriate for each step. Remember that when it comes to efficacy, the proper application of tools is more important than correctness, and you don't have to utilise all of them all of the time. (Krishnan & Prasath, 2013)

2.2.1.1 Define Process

The Define Phase of the Lean Six Sigma improvement process is the first step. The project's executives construct a Project Charter, a high-level vision of the process, and begin to understand the demands of the process's consumers during this phase. This is a vital phase of Lean Six Sigma where your teams define the scope of their activities for themselves and your organization's leadership.

Define Phase: Define the project goals and customer (internal and external) deliverables.	**Tools Used**

Define Customers and Requirements (CTQs) Develop Problem Statement, Goals and Benefits Identify Champion, Process Owner and Team Define Resources Evaluate Key Organizational Support Develop Project Plan and Milestones Develop High Level Process Map	Project Charter Process Flowchart SIPOC Diagram Stakeholder Analysis DMAIC Work Breakdown Structure CTQ Definitions Voice of the Customer Gathering

Table 2: Phases and Tools in Define

2.2.1.2 Measurement Process

Measurement is crucial throughout the project's life cycle, and the team's first focus on data gathering is on two things: defining the process's start point or baseline and looking for indications to determine the process's root cause. Because data collecting requires time and effort, it's a good idea to think about both at the beginning of the project.

Measure Phase: Measure the process to determine current performance; quantify the problem.	**Tools Used**
Define Defect, Opportunity, Unit and Metrics Detailed Process Map of Appropriate Areas Develop Data Collection Plan Validate the Measurement System Collect the Data Begin Developing Y=f(x) Relationship Determine Process Capability and Sigma Baseline	Process Flowchart Data Collection Plan/Example Benchmarking Measurement System Analysis/Gage R&R Voice of the Customer Gathering Process Sigma Calculation

Table 3: Phases and Tools in Measure

2.2.1.3 Analyse Process

The Measure Phase is frequently linked with this phase. The team may be made up of multiple people who will collect different pieces of data or more data when the data is acquired. When the team evaluates the data from the Measure Phase, they may decide to change the data collecting plan to include more information. This process continues as the team examines both the data and the process in order to identify and confirm the fundamental causes of waste and flaws.

Analyze Phase: Analyze and determine the root cause(s) of the defects.	**Tools Used**
Define Performance Objectives Identify Value/Non-Value Added Process Steps Identify Sources of Variation Determine Root Cause(s) Determine Vital Few x's, Y=f(x) Relationship	Histogram Pareto Chart Time Series/Run Chart Scatter Plot Regression Analysis Cause and Effect/Fishbone Diagram 5 Whys Process Map Review and Analysis Statistical Analysis Hypothesis Testing (Continuous and Discrete) Non-Normal Data Analysis

Table 4: Phases and Tools in Analyse

2.2.1.4 Improvement Process

It's time to move on to solution creation once the project teams are comfortable with their data and have established that additional analysis would not add to their understanding of the problem. Although the team is likely to collect improvement suggestions throughout the project, a focused improvement effort might result in unique and beautiful solutions.

Improve Phase: Improve the process by eliminating defects.	**Tools Used**
Perform Design of Experiments Develop Potential Solutions Define Operating Tolerances of Potential System Assess Failure Modes of Potential Solutions Validate Potential Improvement by Pilot Studies Correct/Re-Evaluate Potential Solution	Brainstorming Mistake Proofing Design of Experiments Pugh Matrix QFD/House of Quality Failure Modes and Effect Analysis (FMEA) Simulation Software

Table 5: Phases and Tools in Improve