UNIVERSITI TEKNIKAL MALAYSIA MELAKA

OPTIMIZE PRODUCT DELIVERY PROCESS BY USING VALUE STREAM MAPPING IN MANUFACTURING INDUSTRY

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BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY WITH HONOURS

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Faculty of Mechanical and Manufacturing Engineering Technology

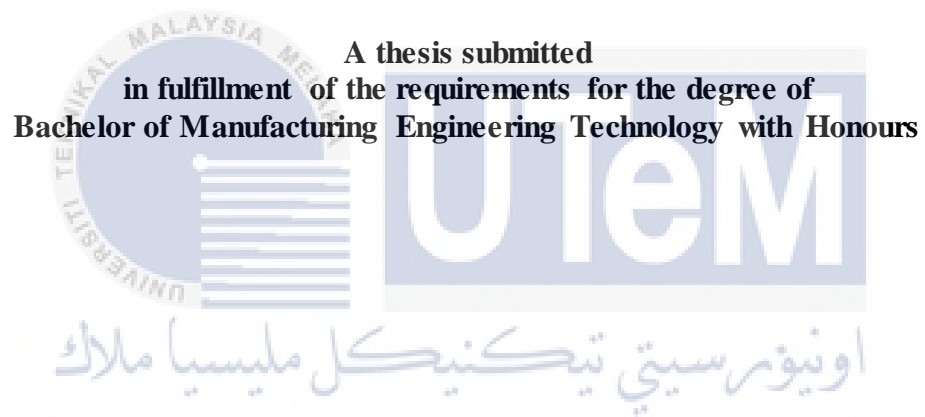**OPTIMIZE PRODUCT DELIVERY PROCESS BY USING VALUE STREAM MAPPING IN MANUFACTURING INDUSTRY**

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SITI NURUL AIN BINTI SULAIMAN

A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology with Honours

Faculty of Mechanical and Manufacturing Engineering Technology

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2023

DECLARATION

I declare that this thesis entitled "Optimize Product Delivery Process by using Value Stream Mapping in Manufacturing Industry" is the result of my research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candid nature of any other degree.

|		
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Date	:	5th January 2023

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology with Honours.

Signature   :

Supervisor Name :   Ts. Dr. Amir Hamzah Bin Abdul Rasib

Date   :   5th January 2023
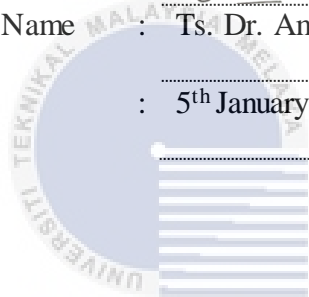
TS. DR. AMIR HAMZAH BIN ABDUL RASIB
Pengurus Pemasaran dan Pembangunan Perniagaan
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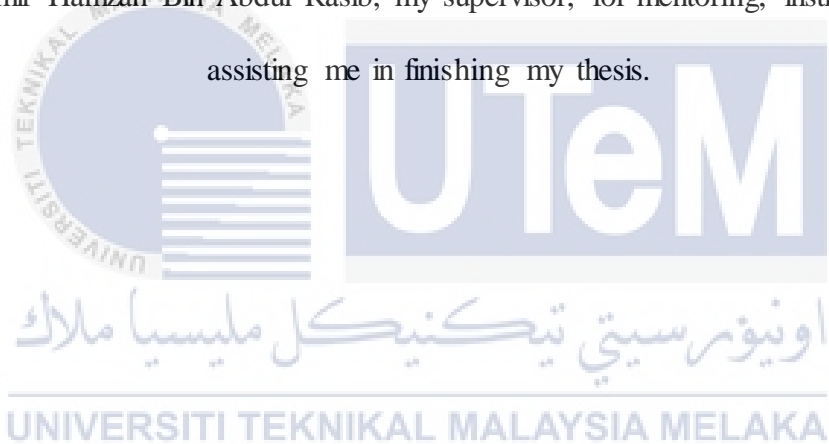Universiti Teknikal Malaysia Melaka

DEDICATION

To my dear father, mother, siblings, and friends, who have always been there for me spiritually and emotionally.

Ts. Dr. Amir Hamzah Bin Abdul Rasib, my supervisor, for mentoring, instructing, and assisting me in finishing my thesis.

ABSTRACT

The manufacturing sector industry needs to constantly increase in terms of productivity and performance because the competitor industries nowadays compete with each other especially competitors in the same sectors. If the lead time in the production line takes a long time, the product will not be finished in time, and the company will not be able to grow with other companies because customers and retailers will look for better companies that produce products faster. This research is more focused on Food and Beverage industries since the company produces a variety of drinks. The objectives of this study are to identify the factors for the long lead time that occurs in the production line. So, Value Stream Mapping can be one of the methods that can be applied to reduce the lead time in the production line and the production control becomes smoother and faster. The technique to reduce the lead time is using the Current and Future State Value Stream Mapping. Furthermore, the second objective of VSM is to apply and measure the VSM technique in production activities. When VSM is applied, the problem that occurs in inventory can be assessed thoroughly such as the takt time does not meet the customer demand because manufacturing processes take a long time to finish. Additionally, a few tools are being used to complete the study. Firstly, the literature review related to VSM was collected to ensure the information in it can be used. Then, the research approach can be done with qualitative and quantitative research to collect the data. The data can be collected with take pictures and interviewing the employees to know the process flow of the production line. Then, the data would be analyzed by using the Why Why analysis to improve. This analysis is being conducted to determine the root cause solution. When the data is analyzed to find the solution to the problem that occurs in the food industry, the results will be accomplished. Lastly, the study can be applied to the Food and Beverage Industry. Other than that, the thesis related to VSM will be useful for minimizing and eliminating waste in production to make some optimization and improvement.

ABSTRAK

Industri sektor pembuatan perlu sentiasa meningkat dari segi produktiviti dan prestasi kerana industri pesaing pada masa kini bersaing antara satu sama lain terutamanya pesaing dalam sektor yang sama. Jika masa utama dalam barisan pengeluaran mengambil masa yang lama, produk tidak akan selesai dalam masa yang tepat, dan syarikat tidak dapat berkembang bersama syarikat lain kerana pelanggan dan peruncit akan mencari syarikat yang lebih baik yang menghasilkan produk dengan lebih cepat. Penyelidikan ini lebih tertumpu kepada industri Makanan dan Minuman memandangkan syarikat mengeluarkan pelbagai jenis minuman. Objektif kajian ini adalah untuk mengenal pasti faktor-faktor jangka masa yang panjang yang berlaku dalam barisan pengeluaran. Jadi, Pemetaan Aliran Nilai boleh menjadi salah satu kaedah yang boleh digunakan untuk mengurangkan jangka masa dalam barisan pengeluaran dan kawalan pengeluaran menjadi lebih lancar dan pantas. Teknik untuk mengurangkan masa utama adalah dengan menggunakan Pemetaan Aliran Nilai Keadaan Semasa dan Masa Depan. Tambahan pula, objektif kedua VSM adalah untuk mengaplikasikan dan mengukur teknik VSM dalam aktiviti pengeluaran. Apabila VSM digunakan, masalah yang berlaku dalam inventori dapat dinilai secara menyeluruh seperti masa takt tidak memenuhi permintaan pelanggan kerana proses pembuatan mengambil masa yang lama untuk diselesaikan. Di samping itu, beberapa alat sedang digunakan untuk melengkapkan kajian. Pertama, kajian literatur berkaitan VSM dikumpul untuk memastikan maklumat di dalamnya dapat digunakan. Kemudian, pendekatan kajian boleh dilakukan dengan kajian kualitatif dan kuantitatif untuk mengumpul data. Data boleh dikumpul dengan mengambil gambar dan menemu bual pekerja untuk mengetahui aliran proses barisan pengeluaran. Kemudian, data akan dianalisis dengan menggunakan analisis Why Why untuk membuat penambahbaikan. Analisis ini sedang dijalankan untuk menentukan penyelesaian punca. Apabila data sedang dianalisis untuk mencari penyelesaian kepada masalah yang berlaku dalam industri makanan, hasilnya akan tercapai. Akhir sekali, kajian ini boleh digunakan untuk Industri Makanan dan Minuman. Selain daripada itu, tesis berkaitan VSM akan berguna untuk meminimumkan dan menghapuskan pembaziran dalam pengeluaran untuk melakukan pengoptimuman dan penambahbaikan.

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LIST OF SYMBOLS AND ABBREVIATIONS

VSM	-	Value Stream Mapping
LM	-	Lean Manufacturing
LT	-	Lead Time
JIT	-	Just In Time
WIP	-	Work In Progress
CT	-	Cycle Time
TPM	-	Total Production Maintenance
NVA	-	Non-Value-Added
VA/T	-	Value Added Time
PLT	-	Process Lead Time
PCE	-	Process Cycle Efficiency
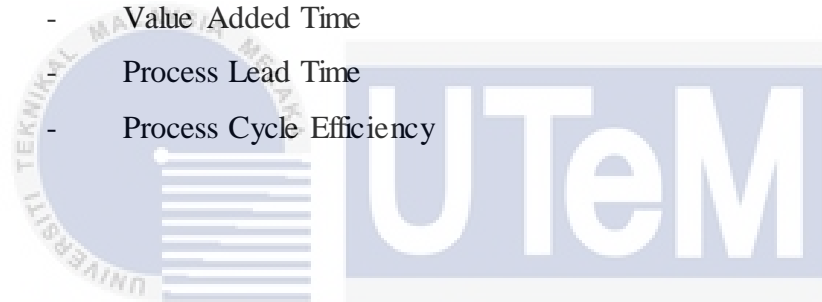
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CHAPTER 1

INTRODUCTION

1.1   Research Background

In this era of globalization, the industry is one of the main sources that can help to demonstrate the Value Stream Mapping (VSM) in the auto-ancillary business in terms of increasing productivity and quality. If the productivity and quality of the industry can emphasize, the organization will get to manage customer requirements as well as the delivery product system. According to Jasti et al. (2016), this is because customers all across the world have begun to demand cutting-edge products and services in short time frames, with excellent quality and low cost. So, manufacturing companies must improve their current industrial method to compete in the global market.

Lean Manufacturing (LM) is one of the most extensively used improvement methods in the world. Negrao et al. (2017) also mentioned that those in industrialized economies have begun to use LM, as have companies in emerging economies. Bhamu et al. (2014) argue that the purpose of LM established is to reduce waste and improve operating efficiency to be extremely responsive to customer demand. The goal of LM is to produce products and services at the lowest possible cost and as quickly as the customer requires. Furthermore, lean techniques reduce lead time and costs while also enhancing warehouse performance and reducing operational time. So, the VSM approach will be utilized in the industry to improve the quality and productivity of manufacturing processes.

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VSM is one of the lean management methods that aids in visualizing the procedures involve from creating a product to delivering it to the end customer. Then, the process will be repeated continuously. It depicts the flow of commodities from the supplier to the customer at all levels of the organization. In the manufacturing industry, lean manufacturing is becoming one of the preferred methods for creating more efficient processes. This research aims to identify the waste by using lean manufacturing approaches, as well as establish the causes and propose the best solution by utilizing the VSM method. It is because VSM is one of the essential elements of lean operations and VSM is one of the most useful and informative ways to make the decision and strategic planning. Any activities and events, including value-added and non-value-added ones that a product or service travels through on its path from manufacturer to customer, are referred to as VSM. Among the manufacturer, the task is including delivery, waiting (in stock, in a queue to be processed), packaging, inspection, rework, and both manual and automated processing at a manufacturing facility.

1.2   Problem Statement

Among the problems encountered in manufacturing industries is the industry's unable to handle inventory. This is because when the inventory is unstructured and poorly planned, it will cause the goods unable to be processed and shipped within the stipulated period. Efficient inventory are very necessary to keep production schedules and meet customer demand.

Next, the most common issue in the manufacturing industry is a long lead time which is due to internal activities or excessive activities such as lack of raw material, breakdown of transportation, labor shortages, stockouts, or human errors. When the lead time is too long, the time required to create a product and deliver it to consumers will become increasingly

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long. The company is likely to suffer losses because the product cannot be sold quickly since the customer might purchase the product from other companies.

Last but not least, not applying takt time in VSM is one of the problems that always happen. Takt time is important as it ensures the amount of manufacturer time is adequate to complete the products and fulfill the customer demand. Takt time is an important tool to ensure that the product flows through each build station, starting from production to delivery as quickly as possible.

1.3   Research Question

Three research questions were identified based on the problem statement.

RQ1: What are the factors for the long lead time that occur in the production line?

RQ2: What is the technique that applies to improve the inventory in production activities?

RQ3: How delivery processes are related to one of the lean manufacturing tools?

1.4 Research Objective

The overall goal of this case study is to improve the efficacy and efficiency of the organization's numerous processes by decreasing waste in operations through VSM. This initiative has several specific objectives which are:

i. To identify the factors for the long lead time that occurs in the production line.

ii. To apply and measure the VSM technique in production activities.

iii. To improve the lead time by using current and future VSM.

1.5 Research Scope

In the manufacturing industry, this study will be more focused on one of the lean tools which is VSM in the production line. The main study is to reduce the lead time in manufacturing to minimize and eliminate waste as well as control the smoothness of production productivity. This strategy is essential for achieving timely delivery to customers as well as company-wide improvement. As a result, all preparations should be made to meet the purpose of the report. So, the K-Chart which is depicted in Appendix A is a method of systematically organizing research.

1.6 Expected Results

The expected outcome of this research is to identify the factors that will affect the lead time in the production line. By applying one of the lean manufacturing tools which is the VSM approach, it can improve the quality and productivity of production. From this study, we gain knowledge by knowing the overall process starts from getting a supplier, raw

material, creating a product to delivering it to the end customer. This research also shows how important the VSM technique and the research help enhance the knowledge of lean manufacturing in the productivity of the manufacturing industry. This study aids in determining the industrial manufacturing process, diagnosing problems, and implementing adjustments based on the findings. Then, the application of VSM to the industry is then predicted as a result of this research. Finally, the anticipated conclusion of this study will aid in the development of a solution that will improve the industry's daily output.

1.7   Thesis Frame

The introduction to this topic takes up the first chapter. This chapter explains the research process that led to the creation of this report essay. Furthermore, the research of problem statements is explored in this chapter. Following that, the research problem is described using the problem statement as a guide. Although the research question is clearly stated in this document, it also includes research objectives and a description of the research scope. The expected outcome of this study as well as the thesis structure will be mentioned and the study's summary will be included.

The second chapter is all about preparing literature review studies. All significant information regarding this study, such as dependability, product, production, and process capability study is discovered and reviewed in this chapter to prepare for the writing of this chapter. The strategy employed to produce this thesis essay was discovering historical publications and articles, as well as gaining knowledge from these recent journals and articles. As a result, this chapter will be divided into multiple subs, each of which is relevant to the research.

In the third chapter, the methods given in this analysis are put to use. This chapter included the research methodologies and tools, as well as the guidelines for doing the study.

The processes and approaches will be clearly described in this research. Individually, learn about significant issue strategies to implement in this chapter. In chapter four, the results and recommendations of this study will be presented.

The techniques and methods mentioned in chapter three will be used in this analysis. There is more information on how to use skills and approaches may be found here. The outcomes of applying these strategies and procedures would be examined in this chapter. The discussion will be centered on the findings which will aid in meeting the thesis requirements and research goals.

Finally, the report's thesis will be applied in chapter five. This chapter will summarize the findings of the overall study. The progress of this report will be visible. The proposal's procedure results were shown as supporting documents to reinforce the framework. the improvement will be proved, and a precise understanding, as indicated in the thesis, will be described in this article.

CHAPTER 2

LITERATURE REVIEW

2.1   Preliminaries

Nowadays, to stay competitive with other companies and endure market challenges, manufacturing industry organizations must constantly improve their efficiency and productivity. Manufacturing industries are those that work with products, materials, or substances to create new things. The products in the industry or the physical goods that we purchase and use every day are produced by manufacturing industries. Furthermore, the delivery process in the manufacturing industry is also an important thing to do to make sure the delivery process runs smoothly. The product delivery process is a sequence of procedures that allows a product to be delivered from conception to end-user and product delivery is one of the key performances in manufacturing.

The implementation of value stream mapping (VSM) is one of the good tools value stream mapping is normally used by certain companies for achieving a good delivery in the manufacturing industry. As identified by Rader et al. (2006), VSM is one of the approaches offered to kick off improvement efforts and support lean principles. This includes everything from the procurement of raw materials to the delivery of the manufactured product. If the industry can apply the VSM tool the right way, the product delivery process can be managed smoothly since a flowchart is used to document each phase of the process. So, this chapter will be more focused on the performance of the product delivery process by applying the VSM.

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2.2 Lean

According to Ratnayake et al. (2015), the term lean refers to a body of knowledge and tools for removing all non-value-added and unneeded times and activities from processes that have been employed in various industries as government agencies, small businesses, or large corporations. In addition, the term lean has been used to refer to lean production or lean manufacturing. However, Aziz et al. (2013) stated that it focuses on a continual endeavor to reach a state defined by minimal waste like over-processing, flaws, delays, and maximum flow. Even though many organizations designate lean as a key goal, the majority of them end up doing lean. Based on the findings of Plenert (2007), it can be argued that a lean approach to administrative and office work provides a systematic approach that allows the entire industrial organization to focus on continuously improving based on quality, cost, delivery, and safety by eliminating waste, creating flow, and increasing the system's ability to meet customer requirements. In manufacturing, management, product development, and services in general, lean has generated significant improvements and gains by discovering customer value.

2.2.1 Lean manufacturing

In today's world, the industrial scene has been confronted with larger difficulties as a result of enhanced international competitiveness which lean manufacturing (LM) has played a critical role in expanding company performance, not only at the operations level but also at the business level. According to Rishi (2012), LM is quickly becoming one of the most popular manufacturing methods in the new millennium. LM is a management technique and approach that analyses and eliminates cost-cutting loss sources, resulting in higher productivity and organizational transcendence. Many industrial and service firms throughout the world are implementing lean strategies to reduce waste, remove non-value-added (NVA)

tasks, and boost efficiency. Mathur (2012) also mentioned that LM also encompasses several tools and methods that are used in cooperation as continuous improvement tools for detecting and reducing waste while maximizing flexibility. Sundar et al. (2014) pointed out that value stream mapping, 5S workplace organization, total productive maintenance, set-up reduction, Kanban and pull production methods, cellular manufacturing, visual signaling, and process standardization are some of these tools and techniques.

Furthermore, LM can be established using various methods, depending on the issues that arise, such as improving industrial structure that does not follow the norms of good facilities. The lean philosophy can help to optimize the layout. So, VSM, which is one of the lean tools, can be applied to reduce waste by increasing value. As a result, firms will be able to decrease operational losses and move toward more value creation for customers by using VSM, which can help identify operational losses.

2.2.2   8 waste of lean manufacturing

LM is one of the essential parts of all industries that can help the company improve and develop great companies. In LM, waste is one of the most significant drains and needs to emphasize in terms of profitability in any business. Among the examples of lean waste is in terms of labour, time, and materials. However, it could be attributed to the lack of skill-set use as well as improper planning. Waste refers to any expenses or effort which does not lead to the processing of raw materials into a product that customers are willing to pay for in LM. According to Koskela et al. (1992), waste is any unnecessary activity that increases production costs without improving the value of the final product, such as long wait times and reworks in the construction and manufacturing processes. The only actual value is added at each stage of production by improving process steps and eliminating waste.

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