



5'S DECISION SUPPORT SYSTEM FOR LEAN PRACTITIONERS

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering (Hons.)

by

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Bachelor of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:

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(Associate Prof. Ts. Dr. Effendi Bin Mohamad)

ABSTRAK

Lean Manufacturing (LM) adalah salah satu kaedah untuk mengurangkan dan menghapuskan tujuh pembaziran dalam industri pembuatan. Kaedah ini telah terbukti membantu industri mencapai kejayaan dalam persaingan global. Mempunyai pengamal LM di dalam industri adalah salah antara langkah terbaik bagi memastikan LM dapat diaplikasi dengan seimbang dan dikekalkan dengan baik. Walau bagaimanapun, sesetengah aspek agak sukar bagi pengamal LM untuk menilai dan membuat keputusan dalam pelaksanaan LM. Matlamat projek ini adalah untuk 5'S DSS telah berjaya dibangunkan dan dinilai di industri dan fakulti dari segi kemudahan, keboleh kendalian, keboleh kepenggunaan dan daya tarikan dimana ia terbukti mengikut matlamat projek iaitu membangunkan dan menyediakan satu platform bagi memudahkan pengamal LM mengaplikasikan sistem 5'S LM. Kesimpulannya, projek ini berjaya membantu pengamal LM untuk membuat keputusan.

ABSTRACT

Lean Manufacturing (LM) has widely known as the method to reducing the seven (7) waste in manufacturing industries. This method has been proved in helping the industries in order to succeed in global competition. Having lean practitioners in the industries is a good way to ensure the LM is balance and maintaining well. Nevertheless, some aspects are hard for lean practitioners to evaluate and making decision the current success of industry in implementation LM and what is the effect. The feasibility study that conducted in the industry and faculty to assessed the application feasibility in terms of understandability, operability, learnability and attractiveness which proving that the 5'S DSS was successfully built and it can help lean practitioners to learnt and experiment with the 5'S LM. Conclusion, the 5'S DSS was successfully of assist the decision making for the LM practitioners in applying 5'S tool.

DEDICATION

I dedicate this thesis to my beloved family.

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TABLE OF CONTENT

Abstrak	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Contents	v
List of Tables	vii
List of Figures	viii
List of Abbreviations	ix

CHAPTER 1: INTRODUCTION

1.1	Background of Study	1
1.2	Problem Statement	4
1.3	Objective	4
1.4	Scope	4
1.5	Thesis Outline	5

CHAPTER 2: LITERATURE REVIEW

2.1	Overview	6
2.2	Waste in Manufacturing	6
2.3	Lean Manufacturing	9
2.4	5'S Lean Manufacturing Tool	12

2.5	Understanding Decision Support System	14
2.5.1	Types of DSS	16
2.5.2	Characteristics and Capabilities of DSS	17
2.5.3	The Benefits of DSS	18
2.5.4	Limitations of DSS	19
2.6	Summary	19

CHAPTER 3: METHODOLOGY

3.1	Introduction	20
3.2	Objective Methodology	20
3.3	Gantt Chart	21
3.4	Project Flowchart	21
3.5	5'S DSS Process Development	22
3.6	5'S DSS Design and Development Process	24
3.6.1	Hybrid Mobile Application	25
3.6.2	Ionic Framework	26
3.6.2.1	Ionic Framework Advantages	28
3.6.2.2	Ionic Framework Limitations	28
3.6.2.3	Ionic GUI Design	29
3.6.2.4	Ionic Lab	30
3.6.3	Hostinger	31
3.7	5'S DSS Testing Process	32
3.8	5'S DSS Deploy Process	33
3.7	Usability Study	34

CHAPTER 4: RESULT AND DISCUSSION

4.1	Introduction	35
4.2	Development of 5'S DSS	35
4.3	5'S DSS Module Graphical User Interface and Ionic Components.	36
4.3.1	5'S DSS Icon	37
4.3.2	Loading Interface	38
4.3.3	Login Interface	39
4.3.4	Registration Interface	40
4.3.5	Home Interface	41
4.3.6	Main Menu Interface	42
4.3.7	Evaluation Information Interface	43
4.3.8	Organization Area Interface	44
4.3.9	5'S Evaluation Checklist Interface	45
4.3.10	Decision-making Interface	46
4.3.11	Save Data Interface	47
4.4	User Guide for 5'S DSS	48
4.5	Usability Study Analysis	49
4.6	Sustainable Application	49

CHAPTER 5: CONCLUSIONS AND RECOMMENDATION

5.1	Conclusion	53
5.2	Future Works	54

REFERENCES	55
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APPENDICES

A	Gantt Chart of FYP I	58
B	Gantt Chart of FYP 2	59
C	Survey Form	60
D	Ionic Command in Developing 5'S DSS	61

LIST OF TABLES

1.1	5'S Lean Tool	3
2.1	The Seven Wastes	7
2.2	5'S Concepts of Lean Principle	11
2.3	5'S Activities	13
2.4	DSS Information	15
3.1	Objective and Methodology	20
3.2	SDLC Activities	23
3.3	Parts in the Stack of Technologies	27
3.4	Interface Part for 5'S DSS	29
3.5	Description for Assessment Criteria	34
4.1	5'S DSS User Guide	48

LIST OF FIGURES

2.1	Big Picture of Lean	10
3.1	Project Flowchart	21
3.2	Software Development Cycle	22
3.3	Android Logo	24
3.4	Mobile Apps Technology Stacks	25
3.5	Ionic Framework	26
3.6	Ionic Blank Lab	30
3.7	Ionic Interface Lab	30
3.8	Life Cycle for Hostinger	31
3.9	Hostinger Database	31
3.10	Android Emulator	32
3.11	Google Developer	33
4.1	Google Play Icon	35
4.2	5'S DSS in Google Play	36
4.3	5'S DSS Icon	37
4.4	Loading Interface	38
4.5	Login Interface	39
4.6	Registration Interface	40
4.7	Home Interface	41

4.8	Main Menu Interface	42
4.9	Evaluation Information Interface	43
4.10	Organization Area Interface	44
4.11	5'S Evaluation Checklist Interface	45
4.12	Decision-making Interface	46
4.13	Save Data Interface	47
4.14	5'S DSS Understandability	50
4.15	5'S DSS Learnability	50
4.16	5'S DSS Operability	51
4.17	5'S DSS Attractiveness	52

LIST OF ABBREVIATIONS

LM	-	Lean Manufacturing
LP	-	Lean Principle
DSS	-	Decision Support System
AI	-	Artificial Intelligence
GUI	-	Graphical User Interface
TPS	-	Toyota Production System
ES	-	Expert System

CHAPTER 1

INTRODUCTION

This chapter explains the background of study, problem statement, project objectives, project scope, significant/ important of study and thesis outline for the proposal of 5S simulation decision support tools for lean practitioners.

1.1 Background of Study

Today, many companies have started applying a Lean Manufacturing (LM) concept as their strategies to sustain in the competitive markets. Global Manufacturing has ranked the top ten company that successful in applying the LM in their organization that was leading by Toyota the world top three car company it is today, follow by Ford and John Deere (Writer, 2014). LM is a management philosophy that most part originated from Toyota Production System (TPS). In 1990s, TPS is known as Lean which reviewed as a systematic method for the waste elimination within a manufacturing system by continuous improvement and effort. It is also explained that waste created through overburden and unevenness in workloads. LM involves use of many tools such as Kanban, Kaizen, Poka-Yoke and 5S (Abdullah, 2003).

Companies considering LM need to understand the tool well. Lean is not simply a manufacturing tool only but also consider as business methodology. It needs total commitment from all company members. Lean does include in manufacturing as well as influences sales, customer service, human resources, research and design, finance, administration, purchasing, scheduling and building maintenance. So that even with small failure make by the one worker or happened at one area of company, it will affect to the company (Clark, 2015).

The failure may cause by lack of understanding of the LM philosophy, low preparation, organization and overemphasis of the LM tools (Aulakh and Gill, 2008). High failure rate shows that so many companies have misused the LM approach. They know the LM will expedite their organization achievement yet they do not take time to prepared and study the ideas, theories and concepts of LM that can make their organization members adapt.

In this project is focusing on the 5S tool that is considered a major LM used by any company. Even this tool is easy to understand but actually needs a lot of actions. 5S is a system for sorting out spaces to ensure work can be performed productively, efficiently, effectively and safety. This tool focused on keeping the workplace clean and putting everything where it belongs that help people to do their jobs easier without wasting time and risking injury. By applying it well with a systematically organized workplace, company will increase the likelihood that production will occur exactly as it should.

The term 5S comes from 5 Japanese words;

Table 1.1: 5S LM Tool (Shaikh, 2015)

Japanese Term	English Term	English Equivalent	Meaning in Japanese Context
Seiri	Sort	Tidiness	Process of sorting of the clutter from the other items within the work area that actually needed.
Seiton	Set in order	Orderliness	Process of taking the required items that are remaining after the removal of clutter and arrange it so things can easily taken and returned in the original place after use.
Seiso	Shine	Cleanliness	Step of cleaning the work area, equipment, machines and other tool.
Seiketsu	Standardize	Standardization	Process to ensure that what have done within first three stage of 5S become standardized.
Shitsuke	Sustain	Discipline	Final stage of 5S tool which to ensure that the organization keep improving in applying 5SLM.

1.2 Problem Statement

LM tool and techniques that have been used widely and the most popular tool implemented by the company is 5S tool. Although 5S is generally seen as the easier tool to apply but not all organizations become completely successful with the philosophy. This matter was mostly caused because of confusion, easily misinterpreted and poorly implemented. Due to lack understandings of LM philosophy by both management and worker, the tool used will become failure.

Other than that, 5S tool become difficult and complex to apply because the tool is measurable. Without the measurement, it is difficult to know the specific level of organization's current success in applying LM tools. The improvement for the tool adopted become harder. The failure will lead to mistakes, slowdowns in production and accident which will interfere operations and negatively affect for organization.

1.3 Objectives

The main goal of this project is to develop 5S decision support system for lean practitioner. There are three objectives that has been set to achieve the project goal.

1. To design and develop 5'S Decision Support System.
2. To verify and validate 5'S Decision Support System.
3. To feasibility study 5'S Decision Support System.

1.4 Scope

This project is concerned on the development of Decision Support System (DSS) for 5'S lean manufacturing tool. This project was developing in order to assist the LM practitioner for easy decision making and to obtain utilization for reducing waste especially in manufacturing production. The design and development will be built using Ionic 3 software. Thus, this 5'S Decision Support System will be used by LM practitioner to measure the effectiveness and efficiency in their identification problem toward implementation of the LM practices.

1.5 Thesis Outlines

This thesis contains five chapters. Chapter one is presenting the introduction of project, highlight the problem statement, containing the project objective, scope and significant. Chapter two is the literature finding that related to the project. It also describes the information and research made by another researcher. This part also consisted the details regarding fundamental of LM including the LM principles, tool techniques and simulation for decision making. Chapter three contains the methodology of project. Chapter four presents result from this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter will describe about the waste, the concept of LM, 5'S lean tool, decision support system and the application in order to develop 5'S DSS. The review discussed based on journals, books, articles, website, conference, thesis and seminar.

2.2 Waste in Manufacturing

One of the most effective way to expand the business profitability is waste elimination. The processes can be the waste or add value to the good or service production. Waste is known as “Muda” in the Japanese word. The seven wastes originally developed by Toyota’s Chief Engineer, Taiichi Ohno from Japan as the core of the Toyota Production System (TPS) which also called as LM. To eliminate waste, it is important to understand and see exactly what waste is and where it exists. Even the product produce between factories is different, the common wastes found is quite similar (McBride, 2003).

Table 2.1: The Seven Wastes (McBride, 2003)

No.	Types of Waste	Explanation
1	Overproduction	<ul style="list-style-type: none"> Means manufacture a product before it is actually order by customers. Solution: Schedule and produce only what can be quickly sold or send.
2	Waiting	<ul style="list-style-type: none"> Happen when items are not moving or being processed. Solution: Linking processes together so that one feeds directly into the next can drastically decrease waiting.
3	Transporting	<ul style="list-style-type: none"> Transporting items between processes is a cost incursion which does not adds any value to the product. Product can be damage if excessive movement occurs. Solution: Create mapping product flows.
4	Inappropriate Processing	<ul style="list-style-type: none"> Use expensive equipment where low cost equipment would be more adequate. Solution: Investing in equipment with low costs and more flexible if possible. Additional, the waste can be reduced by creating manufacturing cells and combining steps.
5	Unnecessary Inventory	<ul style="list-style-type: none"> Excess stock (inventory) tends to hide issues on the plant floor, which must be identified and resolved in order to improve operating performance. This type of waste can affect lead times, delays the issues identification, consumes productive floor space and inhibits communication.
6	Unnecessary / Excess Motion	<ul style="list-style-type: none"> Related to ergonomics where can be seen in all instances of walking, stretching, bending lifting and reaching. Related to safety and health issues in society which become organizations problem.
7	Defects	<ul style="list-style-type: none"> Having an immediate impact to the bottom line, quality defects that result a tremendous cost to organizations in rework or scrap.

Waste is review as anything that does not increase the product value from the client's point of view. The client does not care the amount it expenses to repair any damage, cost for huge inventory and stores or additional overheads. Wastes actually can be avoided however for some reasons few wastes are unavoidable (Amaitik and Elsagzli, 2014).

Waste also present as any movement that creates no value which the client isn't willing to pay for. By decreasing the quantity of wasteful activities will open business chance to enhance their performance. Seven types of wastes in lean has potential and strength to reduce costs, increase profits, improve employee engagement, reduce rework and improve delivery time by eliminating it. The fundamental part to identify and eliminate waste or "Muda" can be done by lean process of plan, do check and act (James P. & Daniel T., 2003).

Toyota Motors is the early example for others by making a large profit in 1976 and 1977 of \$597.4 million and \$716.7 million respectively. At that time, they shocked the world with their achievement since they manage to increase their profit dramatically by eliminating waste in their operations. The company stand on the philosophy "to totally eliminate waste and seek utmost in rationally in the way we make things" for their production system known as TPS. One of the TPS creator, Taiichi Ohno clarified all the organizations or companies contains seven types of waste that is waiting, rework, motion, transportation, overproduction, over-processing and inventory. The seven types of waste have become important tools for applying lean manufacturing. Most common approach to "implementing LM tool" can be success by focusing on waste (Shariful, 2015).