

THE IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM (QMS)
USING DMAIC TOOLS

NG SHU HUI

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SUPERVISOR'S APPROVAL

I hereby declared that the project title was entitled: The Implementation of Quality Management System (QMS) DMAIC Tools

BY

NG SHU HUI

I hereby acknowledge that I have read this thesis and it is adequate in terms of scope and quality for the purpose of conferring the Bachelor of Technopreneurship with Honors (BTech)

Signature :

Supervisor Name : PM. DATIN DR. NORIZAH BINTI MOHAMAD

Date :

Signature :

Supervisor Name : MR. HASOLOAN HAERY IAN PIETER

Date :

THE IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM (QMS)
USING DMAIC TOOLS

NG SHU HUI

Thesis submitted in fulfillment of the requirements for the award of the degree of
Bachelor of Technopreneurship with Honors (BTech)

Faculty of Technology Management and Technopreneurship
Universiti Teknikal Malaysia Melaka

DECEMBER 2019

DECLARATION OF ORIGINAL WORK

“I hereby declare this report is the result of my own, expert certain explanations and passage where every of it is cited with the source clearly.”

Signature:

Name: NG SHU HUI

Date:

DEDICATION

For my beloved supervisor.

For my beloved parents.

For people around me.

For myself.

Thank you.

ACKNOWLEDGMENT

First, I would like to express my sincere gratitude to my supervisor, PM. Datin Dr. Norizah Mohamad for giving me good guidance throughout numerous consultations. Her patience and motivation helped me in all the time of the project.

In addition, I am extremely grateful to my family for mentality support throughout the project. I would like to show my gratitude to my housemate and coursemates which have made valuable suggestions on this project which gave me the inspiration to improve the project.

Finally, I would like to thank all the people who have me either directly or indirectly throughout this project.

ABSTRAK

Kebanyakan organisasi telah melaksanakan Sistem Pengurusan Kualiti (QMS) untuk memenuhi keperluan pelanggan dan peraturan melalui pencapaian sijil ISO. Walaupun QMS memberi banyak kebaikan kepada organisasi tetapi penyediaan dan penyelenggaraan QMS yang didokumenkan adalah mahal dan mengambil masa yang lama. QMS adalah penting dalam pembelajaran tinggi institusi (IHL) dengan piawaian yang ketat. Pengurusan Lean (LM) adalah suatu praktikal penambahbaikan dengan mengurangkan aktiviti yang tidak perlu dari perspektif pelanggan. Kedua-dua QMS dan LM memberi tumpuan kepada kepuasan pelanggan dan penambahbaikan yang berterusan. Oleh itu, pelaksanaan LQMS perlu dipertimbangkan sebagai bentuk pengurusan kualiti yang moden. Objektif utama dalam kajian ini adalah untuk mengkaji pendekatan QMS yang sedia ada dan kemudian menghubungkan dengan pendekatan LM. Selanjutnya, kajian ini akan menganalisis bagaimana konsep LM dan QMS dapat digabungkan dengan mudah dan prosedur Sistem Pengurusan Kualiti Lean (LQMS) dicadangkan. Pendekatan kualitatif melalui kajian mendalam digunakan. Cara wawancara, pemerhatian dan analisis dokument akan digunakan untuk membangunkan pemahaman yang komprehensif dan memastikan kesahihan data. Gabungan LM ke dalam QMS adalah jangkaan yang akan membantu organisasi untuk mengurangkan kos dan mengurangkan masa semasa mengoptimumkan sumber. Selain itu, gabungan ini juga akan memberi manfaat kepada organisasi jika mengintegrasikan QMS dan LM sebagai permulaannya.

ABSTRACT

Many organizations implement a Quality Management System (QMS) in order to meet customer and regulatory requirements through the attainment of an ISO certification. Although, QMS has delivered benefits to companies however the establishment and maintenance of a documented QMS are costly and time-consuming. And in many cases return on investment was not taken into consideration. QMS is an essential necessity in the institution's high learning (IHL) which needs to adhere to strict standards. Lean Manufacturing (LM) is an approach with the main objective of eliminating waste in order to cut out any steps that consider the waste from customer perspectives. Both QMS and LM focus on customer satisfaction and continual improvement. The execution of Lean Quality Management System (LQMS) should be considered as the modern form of quality management. However, LMS has specified tools as compared to QMS. The main objective of the study is to investigate the existing approach of QMS and then to link to the approaches of the LM. An analysis of integrated QMS and LM is conducted. Subsequently, LQMS methodology will be proposed in this research. The qualitative approach via an in-depth study is utilized. To develop a comprehensive understanding and to ensure the validity of the data, interviews, observation and document analysis are adopted. It is envisaged that the integration of LM into existing QMS will help induced lower cost and reduced times whilst optimizing resources. It would also benefit companies if the establishments of integrating QMS and LM are implemented as its infancy.

TABLE OF CONTENTS

CHAPTER	CONTENT	PAGE
	DECLARATION OF ORIGINAL WORK	ii
	DEDICATION	iii
	ACKNOWLEDGMENT	iv
	ABSTRAK	v
	ABSTRACT	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiii
	LIST OF ABBREVIATIONS	xiv
	LIST OF APPENDICES	xvi
CHAPTER 1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Study Background	2
	1.3 Problem Statement	5
	1.4 Research Questions	6

2.4.3 Waste in Lean Manufacturing	31
2.4.4 LSS DMAIC Methodology	33
2.4.5 DMAIC Cycle	34
2.4.6 DMAIC Tools	39
2.4.6.1 Define	39
2.4.6.2 Measure	44
2.4.6.3 Analyze	46
2.4.6.4 Improve	50
2.4.6.5 Control	51
2.5 The Effects of DMAIC in supporting QMS	52
2.6 Institution High Learning (IHL)	53
2.7 Conceptual Framework	54
CHAPTER 3 RESEARCH METHODOLOGY	
3.1 Introduction	56
3.2 Research Design	57
3.3 Research Method	58
3.4 Data Sources	59
3.5 DMAIC Methodology	59
3.5.1 Define	60
3.5.2 Measure	60
3.5.3 Analyze	61
3.5.4 Improve	62
3.5.5 Control	62
3.6 Research Instrument	63
3.7 Research Location	63

3.8 Time Horizon	63
3.9 Conclusion of the chapter	64
CHAPTER 4 DATA ANALYSIS AND FINDINGS	
4.1 Introduction	65
4.2 Interviewees Demographic	66
4.3 Overview of the Organization	67
4.4 Results and Discussion	67
4.4.1 QMS principles implemented in UTeM	67
4.4.2 LM tools implemented in UTeM	69
4.4.3 Define	70
4.4.4 Measure	74
4.4.5 Analyze	76
4.4.6 Improve	78
4.4.7 Control	81
4.4.8 LQMS Methodology	83
CHAPTER 5 CONCLUSION AND RECOMMENDATION	
5.1 Introduction	86
5.2 Results and Research Objectives	87
5.3 Implication	88
5.4 Limitations and Recommendations	88
5.5 Summary	89

REFERENCES

90

APPENDICES

109

List of Tables

Table	Title	Page
2.1	Elements of external and internal factors	20
2.2	Type of party in audit	27
2.3	The improvement and reduction of LM	29
4.1	Demographic of interviewee 1	66
4.2	Demographic of interviewee 2	67
4.3	Internal and external stakeholder	71
4.4	Interest, significant and effect for internal and external stakeholder	72
4.5	The DMAIC phases implemented in QMS	83
4.6	The approached used in each DMAIC phases	87

List of Figures

Figure	Title	Page
2.1	Quality Management System Principles	14
2.2	Standard certification journey	16
2.3	Model of process-based QMS	18
2.4	Planning for QMS	23
2.5	Stages of DMAIC Method	35
2.6	SIPOC Diagram	41
2.7	Conceptual Framework	55
4.1	Stakeholder Mapping	73
4.2	Process Flowchart for Implement ISO 9001	75
4.3	Causes and Effect Diagram	77
4.4	Pareto Chart for NCR	79
4.5	Pareto Chart for OFI	80
4.6	Control Plan	82

LIST OF ABBREVIATIONS

CTQ	: Critical to Quality
DMAIC	: Define, Measure, Analyze, Improve and Control
DPMO	: Defects per Million Opportunity
FKE	: Faculty of Electrical
FKEKK	: Faculty of Electronics and Computer Engineering
FKM	: Faculty of Mechanical Engineering
FKP	: Faculty of Manufacturing Engineering
FMEA	: Failure Modes and Effects Analysis
FPTT	: Faculty of Technology Management and Technopreneurship
FTKEE	: Faculty of Electrical and Electronic Engineering Technology
FTKMP	: Faculty of Mechanical and Manufacturing Engineering Technology
FTMK	: Faculty of Information Technology and Communication Engineering
IHL	: Institution High Learning
ISMS	: Information Security Management System
ISO	: International Organization for Standardization
JIT	: Just-In-Time
KPI	: Key Performance Indicator
KTUKM	: Kolej Universiti Teknikal Kebangsaan Malaysia

KUP	: Senior Librarian Assistant
LM	: Lean Manufacturing
LQMS	: Lean Quality Management System
LSS	: Lean Six Sigma
MSA	: Measurement System Analysis
NCR	: Non-conforming Report
OEM	: Original Equipment Manufacturers
OFI	: Opportunity for Improvement
PDCA	: Plan-Do-Check-Act
PPSKR	: Center for Strategic, Quality and Risk Management
QFD	: Quality Function Deployment
QMS	: Quality Management System
SIPOC	: Supplier, Input, Process, Output and Customer
SIRIM	: Standard and Industrial Research Institute of Malaysia
SMED	: Single-minute Exchange of Die
TPM	: Total Productive Management
UTeM	: Universiti Teknikal Malaysia Melaka
VSM	: Value Stream Mapping
WIP	: Work-In-Process

List of Appendices

Appendix	Title	Page
A	Transcript with Mr. Ahmad	109
B	Transcript with Mdm. Aziana	111
C	Interview Questions	113
D	Chronology Achievement of MS ISO 9001:2015	119
E	Chronology Achievement of MS ISO 9001:2008	120
F	Answer from Mdm. Aziana	121
G	Answer from Mr. Ahmad	122
H	Gantt chart (PSM 2)	123

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter aims to focus on the background, problem statement, scope, objectives of the study and also the approach that conduct in the research. This chapter will provide insight and overview regarding lean manufacturing and quality management system.

1.2 Study Background

In today's competitive business environment companies need to keep up with the demand of the customer by delivering a quality product, at the right price and within the stipulated time. Quality management is concerning the performance of the company to their stakeholders which is enhancing the execution of an operation, products, and services for ensuring the company run the effective and suitable system within the whole company. It also can define as to retain the quest for excellence and continue to improve the capability. Generally, the consumers will give huge attention to the first purchase and after used experience for the products or services. The higher consumer satisfaction then the opportunity to be your loyal customer is higher too. It means that the company should always introduce or produce by achieving the customer's expectation. Other than meeting the customers' requirements, companies also need to adhere to regulatory agencies and their requirements. Companies and organizations have the ability to verify their products and services constantly achieve customer's necessities and expectations with established quality management systems. An effective operation environment, detailed information such as processes and responsibilities should include in QMS. According to International Organization for Standardization (2018), the amount of international standard is 22,000 and it followed by 161 members in the world. The statistics show that most of the countries have awareness about the importance of product and service quality.

Lean manufacturing (LM) also known as lean production, which is based on Toyota Production System involves a variety of principle and techniques, all of which have the same ultimate goal to eliminate waste and non-value-added activities at every production or service in order to achieve high customer satisfaction (Gajendran & Kumar, 2011). The seven or in some circumstances EIGHT waste within manufacturing system includes transportation, inventory motion, waiting, overproduction, over-processing, defect and underutilization of talent. The lean concept needs to be understood and implemented across the entire enterprise. LM intends to reduce waste in human effort, time to market, inventory and manufacturing space while delivering quality products that are demanded by the customer. There are many lean tools and techniques which consist of an integrated

system composed of a wide variety of management practice such as 5s, Heijunka, VSM, SMED, Kaizen, PDCA, Takit Time, and TPM. However, not all the companies can implement the same set of practices, as in will need to depend on the organizational characteristic (Sousa & Voss, 2008) hence, a study on the tools that give better results needs to be conducted.

Nowadays, people are concerning the quality of institution high learning (IHL). The quality model developed to match the aim of students and the customers. The concentration of innovating the idea to enhance the quality is because to achieve the customer's satisfaction. The quality can give huge impacts on the distribution of the resources among the institution and courses they provided.

In the past, there may have been a perception that lean manufacturing was best suited for the automotive industry and was perhaps too challenging to transfer to other sectors, especially when there were major differences between the sectors. There are many industries the began to apply lean principles to achieve outstanding results since the 1990s. Lean principles can be applied in any field of activity, from the industrial to the services field (Mirea, 2013). Thus, it is suited for the high-precision institution high learning (IHL).

Both QMS and LM are continual improvement efforts by companies. Both comprise processes, purpose, and people. LM philosophy enables the continuous improvement of both the quality and robustness of the product or process, whilst QMS defines the set of policies and procedures to adhere the quality. Thus, it is appropriate that companies integrate and synergize these two efforts. The integration can unlock information and functionality in individual applications and turns them into a shared company-wise resource (Gajendran & Kumar, 2011). This can cut production cost, improve quality, speed up, and optimize manpower which can result in staying competitive and saving money. However, the application of LM on presents QMS needs to be properly planned. If not, it can raise resistance and obstacles in the form of reluctance to contribute towards improvement for the

suggestion, lack of knowledge on lean philosophy and tools and also lack of motivation (Hodge, Goforth Ross, Joines, & Thoney, 2011).

The main purpose of the study is to provide a structured approach that integrates the lean philosophy into an existing QMS. A conceptual framework for the study is proposed as shown in Figure 1. The concept of QMS and LM are identified and the strength and weaknesses of each analyzed. The objectives, process and procedures, people involve and output is compared. The QMS will be represented from the information and requirements of ISO certification that the company needs to confirm. Generally, this will include scope, normative references, resource management, and product realization. The LM system is represented by the basic lean concept and the principle, tools and techniques associated with it that are used to combat waste. LM includes the concept of just in time (JIT), elimination of waste, continuous improvement and perfect quality and using tools such as continuous flow, Kanban, Kaizen, Value Stream Mapping (VSM) and standard work. Companies generally utilize Key Performance Indicators (KPIs) to assess and measure the processes. The appropriate key performance index (KPI) of the company is used to target and track the performance of the company. Commonly, it asserted that quality and productivity are an integral part of organization operation strategies.

1.3 Problem Statement

Quality has become a crucial concern in institutions high learning. A company would face the barriers to implement and maintain a Quality Management System (QMS). The ISO audit is a systematic, independent and documented process for obtaining auditable evidence and evaluating it objectively in order to determine the extent to which audit criteria are fulfilled. Institution high learning will perform at least once of the audit program. ISO 9000 is the most popular standard in the world but it also has its weaknesses.

Insufficient documentation is one of the issues that make a company fail to certify its products during the audit program (Hall, 2019). Document review and process review is the actual step that involves in the audit process. Documentation produces data used for auditors in undertaking for certificates. The examples for lack of documentation are unable to make confirmation about the key bank account and debt and also the deficiency of connection from risk assessment to audit plan. The elements of risk assessment contain the organization, operational, human, governance, technological and so on. The company should prepare the supporting documentation to make the process faster.

The lead time in the audit process is too long due to a lack of planning (Chartered Institute of Internal Auditors, 2018). Generally, the time-consuming to run the audit activity is six months. This depends on the size of the firm, the complication of products and processes. The time-consuming is high to gather the audit evidence to understand and expose the problem that may occur. The auditee and auditor should have the experience and knowledge to reduce the time of the audit process because it avoids the auditor take a longer time to do the decision with the equivalent evidence. The beneficial relationship between the company and auditors is important to reduce the lead time of the audit process. This is because a healthy relationship helps the company to receive accurate information that needed that can react to internal audit requirements.

The concept of lean manufacturing is to eliminate waste in the company and earn customer satisfaction (Mirea, 2013). The organization earned the advantages to improve its business by using lean manufacturing tools. The ways of enhancing the business operation to develop the quality system into the workplace and search the trustworthy method to implement the costly new technology with minimizing the cost (Liker, 2004). Lean principle is the best source to provide simple and easy to understand information to the company for the purpose of grow the level of efficiency, effectiveness, and profitability. The integration of lean manufacturing having positive results in supporting quality management system to implement in the company.

1.4 Research Questions

The research questions will investigate to meet objectives and integrate the lean manufacturing and quality management system in the institution's high learning.

1. How is ISO accreditation achieved?
2. How LM concept can improve the QMS?
3. How to integrate LM to support QMS?