THE CRITICAL SUCCESS FACTORS OF LEAN IMPLEMENTATION TOWARDS PERFORMANCE IMPROVEMENT IN MANUFACTURING INDUSTRY: A CASE STUDY IN MELAKA

NOR HAFIZA BINTI MOHD ASRI

This report is submitted in fulfilment of the requirement for the Bachelor of Technology Management (Innovation Technology)

Faculty of Technology Management and Technopreneurship

Universiti Teknikal Malaysia Melaka

JUNE 2018

DECLARATION

‘I declare that this report is my own work except the summary and excerpts of everything I have to explain the source’

Signature : .....

Name : Nor Hafiza Binti Mohd Asri

Date : June 2018

DEDICATION

This research is dedicated to my beloved family especially both of my parents who have become my source of inspiration as with their support and motivation, I would able to complete this research confidently. Unforgotten towards my supervisor who has sacrifices the time to lead and guide until I'm able to stand by my own completing the research. For those who directly and indirectly involve in this research, I would like to express my sincere gratitude for all the kindness and help.

ACKNOWLEDGEMENT

I was deeply grateful to Almighty and wish to express my warm sincere appreciation to my supervisor, Datin Suraya Binti Ahmad for her guidance and encouragement throughout this final year project. This would give a great opportunity to be under her supervised as her wide knowledge had given a lot of new fresh ideas.

Besides, I would like to acknowledge my panel of final year project, Dr. Mohd Fazli Bin Mohd Sam for his valuable advice and opinion as this would become a motivation for me to improve for a better.

Last but not least, a sincere gratitude would like to express towards my friends as the difficulties we go through at first finally had worth it.

ABSTRACT

The concept of lean implementation was first introduced by Toyota Production System (TPS) as a first system working correspond with the guidelines of lean manufacturing and it is recognized as successor of TPS. There are many company recognized the significant benefits as a result of lean manufacturing implementation however not all are yet success stories. Thereby, for effective implementation of lean manufacturing in organization, one must clearly blend the critical success factors that will make the implementation successful. This paper aims to determine the initial factors, transformation progress of lean and investigating the relationship between critical success factors of lean implementation and affect towards performance improvement in manufacturing industries. This research outlines the importance of skill and expertise, organizational culture and leadership management as the critical success factors of lean implementation. The significant of study is expected to provide the critical analysis that benefit to both academic and manufacturing industry in order to improve manufacturing sector as one of the major source of economic so that it will provide a way to compete effectively among the others developed countries at the same time can provide innovative solution for better decision making within the organization. The research methodology includes the design of research questionnaire for quantitative and collecting data by mailing and personal visits. The questionnaire survey is constructed based on Likert-scale rating to collect the data among 150 targeted respondents ranging from technical and management personnel of manufacturing companies in Melaka which are implementing or have implemented lean manufacturing. IBM Statistical Product and Service Solution (SPSS) used in order to analyse the data. The research finding indicates that the respondents ranked the organizational culture as the most critical factors for success of lean implementation.

Keywords: lean manufacturing, critical success factors, performance improvement, quantitative

ABSTRAK

Konsep pelaksanaan Lean pertama kali diperkenalkan oleh Toyota Production System (TPS) sebagai satu sistem pengeluaran pertama yang berjaya dilaksanakan berdasarkan garis panduan pembuatan Lean. Terdapat banyak syarikat pembuatan yang mengiktiraf manfaat menggunakan lean dalam proses pembuatan namun tidak semua dari mereka mencapai kejayaan. Oleh itu, untuk pelaksanaan yang efektif dalam Lean, sesebuah organisasi mestilah memahami dengan jelas faktor kejayaan yang kritikal yang boleh menyumbang kepada kejayaan pelaksanaan Lean dalam industri pembuatan. Kajian ini dijalankan bertujuan untuk mengenal pasti faktor yang memacu organisasi melaksanakan Lean, prestasi Lean terkini dan mengenal pasti hubungan antara faktor- faktor yang menyumbang kepada kejayaan dalam perlaksanaan Lean kearah peningkatan prestasi sesebuah syarikat. Kajian ini menggariskan kepentingan kemahiran dan kepakaran, budaya dalam organisasi dan pengurusan kepemimpinan sebagai faktor kejayaan kritikal pelaksanaan Lean. Kepentingan kajian adalah dijangka dapat menyediakan analisis yang kritikal yang bermanfaat untuk akademik dan industri pembuatan. Dengan kajian ini, industri pembuatan dapat mencari jalan untuk bersaing secara efektif dengan negara membangun dan pada masa yang sama dapat menyediakan solusi yang inovatif untuk sebarang keputusan dalam organisasi. Kajian ini menggariskan beberapa kaedah iaitu reka bentuk soal selidik untuk data kuantitatif dan kaedah pengumpulan data dengan cara email dan lawatan peribadi. Soal selidik dibina berdasarkan penilaian berskala Likert untuk mengumpulkan data dalam kalangan 150 responden yang disasarkan kepada kakitangan teknikal dan pengurusan organisasi syarikat pembuatan di Melaka yang melaksanakan atau telah melaksanakan Lean. IBM Statistical Product and Service Solution (SPSS) digunakan untuk menganalisis data. Tinjauan penyelidikan menunjukkan bahawa responden memilih budaya dalam organisasi sebagai faktor yang paling kritikal untuk kejayaan pelaksanaan Lean.

Kata Kunci:

Lean dalam proses pembuatan, faktor kejayaan yang kritikal, peningkatan prestasi, kaedah penyelidikan kuntitatif

LIST OF CONTENTS

CHAPTER	TITLE		PAGES
	DECLARATION		**ii**
	DEDICATION		**iii**
	ACKNOWLEDGEMENT		**iv**
	ABSTRACT		**v**
	ABSTRAK		**vi**
	LIST OF CONTENTS		**vii-x**
	LIST OF TABLE		**xi-xii**
	LIST OF FIGURE		**xiii**
	LIST OF ABBREVIATIONS		**xiv**
CHAPTER 1	**INTRODUCTION**		
	1.1	Background of Project	1-2
	1.2	Problem Statement	3
	1.3	Research Question	4
	1.4	Research Objective	5
	1.5	Scope	5
	1.6	Limitations	6
	1.7	Significant of Study	6
	1.8	Summary	7

CHAPTER 2 LITERATURE REVIEW

2.1	Introduction	8
2.2	Introduction to Lean Manufacturing	9-10
	2.2.1 Lean Tools	11-13
	2.2.2 Lean As Waste Reduction	13-14
2.3	Successful Lean Implementation	14
	2.3.1 Performance Improvement	15
2.4	Critical Success Factors	
	2.4.1 Skill And Expertise	16-17
	2.4.2 Organizational Culture	17-18
	2.4.3 Leadership Management	19-21
	2.4.4 Summaries For Each Factor (Supported By Previous Research)	22-26
2.5	Theoretical Framework	27-28
2.6	Hypothesis	29
2.7	Summary	30

CHAPTER 3 RESEARCH METHODOLOGY

3.1	Introduction	31
3.2	Methodology Choices	
	3.2.1 Quantitative Research Method	32-33
3.3	Research Strategy	33
	3.3.1 Primary Data	33
	3.3.2 Survey	34
	3.3.3 Secondary Data	35
3.4	Sampling Method	35-36
	3.4.1 Stratified Sampling Techniques	36
3.5	Research Design	37
	3.5.1 Location Of Research	38
	3.5.2 Time Horizon	38
	3.5.3 Pilot Testing	39

3.6	Data Analysis		39
	3.6.1	Statistical Product And Service Solution (SPSS)	40
3.7	Scientific Canon		40
	3.7.1	Reliability	40
	3.7.2	Validity	41
	3.7.3	Internal Validity	41
	3.7.4	External Validity	42
3.8	Summary		43

CHAPTER 4 DATA ANALYSIS

4.1	Introduction		44
4.2	Pilot Test		45
	4.2.1	Reliability Analysis	45-46
4.3	Descriptive Statistic		46
4.4	Frequency Analysis		47
	4.4.1	Gender	48
	4.4.2	Work Experience	49
	4.4.3	Department	50-51
	4.4.4	Position	52
	4.4.5	Lean Tools and Techniques	53-54
	4.4.6	Duration of Lean Implementation	55
	4.4.7	Initial Factors of Lean Implementation	56-57
	4.4.8	Current Lean Progress	57-58
	4.4.9	Department versus Position	59
	4.4.10	Department versus Type of Lean Tools Implemented	60-61
	4.4.11	Lean Tools versus Current Progress	62
4.5	Descriptive Statistic		
	4.5.1	Descriptive Analysis on Success Factors of Lean Implementation	63

	4.6	Inferential Statistic	64
	4.7	Validity Test	64
		4.7.1 Correlation Analysis	65-68
	4.8	Reliability Analysis	69
		4.8.1 Cronbach's Alpha	69
		4.8.2 Regression Analysis	70-74
	4.9	Hypothesis Test	75-77
	4.10	Summary	78
CHAPTER 5	**CONCLUSION AND RECOMMENDATION**		
	5.1	Introduction	79
	5.2	Summary Of Main Finding On Demographic	80-81
	5.3	Scale Measurement On Validity And Reliability	
		5.3.1 Validity	82
		5.3.2 Reliability	83
	5.4	Discussion Of Research Objective And Hypotheses Test	
		5.4.1 Objective 1	84-85
		5.4.2 Objective 2	86-87
		5.4.3 Objective 3	87-91
	5.5	Limitation	92
	5.6	Suggestion To Improve The Lean Implementation	93
	5.7	Recommendation For The Future Study	94
	5.8	Conclusion	95
	REFERENCES		96-104
	APPENDICES		105-114

LIST OF TABLE

TABLE	TITLE	PAGES
4.2.1	Cronbach's Alpha for Pilot Test	45
4.4	Statistic Analysis of Respondents	46
4.4.1	Statistic Analysis of Respondents by Gender	48
4.4.2	Statistic Analysis of Respondents by Work Experience	49
4.4.3	Statistic Analysis of Respondents by Department	50
4.4.4	Statistic Analysis of Respondents by Position	52
4.4.5	Statistic Analysis of Respondents by Lean Tools and Techniques	53
4.4.6	Statistic Analysis of Respondents by Duration of Lean Implementation	55
4.4.7	Statistic Analysis of Respondents by Initial Factors of Lean Implementation	56
4.4.8	Statistic Analysis of Respondents by Current Lean Progress	57
4.4.9	Descriptive Analysis on Department versus Position	59
4.4.10	Department versus Type of Lean Tools Implemented	60
4.4.11	Customized Table on Type of Lean Tools versus Current Lean Progress	62

4.5.1	Descriptive Analysis on Success Factors of Lean Implementation	63
4.7	Guideline for interpreting correlation analysis	65
4.7.1	Descriptive statistics	65
4.7.2	Correlation Analysis between Skill and Expertise and Performance Improvement	66
4.7.3	Correlation Analysis between Organizational Culture and Performance Improvement	67
4.7.4	Correlation Analysis between Leadership Management and Performance Improvement	68
4.8.0	Reliability Analysis I (Source: Data Analysis of SPSS)	69
4.8.1	Reliability Analysis II (Source: Data Analysis of SPSS)	69
4.8.2	Regression Analysis of the Relationship between Independent Variable and Dependent Variable (Sources: Data analysis of SPSS)	70
4.8.2.2	Regression Analysis on ANOVA (Sources: Data analysis of SPSS)	71
4.8.2.3	Regression Analysis on Coefficients (Sources: Data analysis of SPSS)	72
4.8.2.4	Finding on Reliability Analysis	73
4.8.3	Regression Analysis on the Multiple Regression Equation (Source: Develop by Researcher)	74
4.9.1	Guideline for Interpreting Hypothesis Test	76
4.9.2	Summary of Finding for hypotheses testing	77

LIST OF FIGURE

FIGURE	TITLE	PAGES
2.2	Timeline Of Lean Management Usage In Various Industries	9
2.5	Research Framework	27
4.4.1	Frequency Analysis of Respondent by Gender	48
4.4.2	Frequency Analysis of Respondent by work experience	49
4.4.3	Frequency Analysis of Respondent by Department	51
4.4.4	Frequency Analysis of Respondent by Position	52
4.4.5	Frequency Analysis of Respondent by Lean Tools and Techniques	54
4.4.6	Frequency Analysis of Respondent by Position	55
4.4.7	Frequency Analysis by Initial Factors of Lean Implementation	56
4.4.8	Frequency Analysis of Respondent by Current Lean Progress	58
4.4.10	Frequency Analysis of Department versus Type of Lean Tools Implemented	60

LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
IF	Initial Factors
LT	Lean Tools
CP	Current Progress
DL	Duration Lean
SE	Skill And Expertise
OC	Organizational Culture
LM	Leadership Management
PI	Performance Improvement
5'S	Sort, Set In Order, Shine, Standardize, Sustain
PK	Poka Yoke
JIT	Just-in-time
TPreM	Total Preventive Maintenance
TProM	Total Productive Maintenance
VSM	Value Stream Mapping
CM	Cellular Manufacturing
Acc/Fin	Accounting/ Finance
s.R&D	Senior Research & Development
Sof	Software
Tech.Ser	Technical Service
W eb.Dev.&Ds	Web Developer And Design
QA/QC	Quality Assurance And Quality Control
Prq/Inv&St	Procurement/Inventory And Store Department
S/Mark	Sales /Marketing

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

The growth of Malaysian industry in manufacturing sector becomes the second largest contributor to the GDP and remain as the main sector of economic growth (Ismail, Razak and Lazim, 2015). The globalization and competitive market drive the manufacturing firm to keep in track with the technological changes and new process in order to harvest high productivity with maximum quality of the product produced. Likewise important is for a company to be able to manufacture a diverse range of product to meet the high demand. However, producing a product with optimum quality at a competitive price is becoming the most challenging issues for the manufacturer. The firm has to incur a high manufacturing cost such as direct materials, direct labor and factory overhead to keep up-to-date with the growing technology (Edwards 2009).

Somehow the recent economic downturn has forced firms to look for better ways to increase the overall effectiveness, including cut the possible costs and reducing lead time in work-in-process to achieve customer satisfaction. The Straight Times (2017) reported that according to BMI Research, Malaysia's Ringgit becoming one of Asia's worst-performing currencies over the past year has further to fall. Despite the further weakness in the global bond market, it has put Ringgit under pressure.

As a result, the Ringgit is likely to drop back some losses over the long term, supported by rising prices of commodities such as oil as well as improving terms of trade. Despite of Ringgit value keeps dropping in tough economic factor, the firm start to focus on how to enhance the manufacturing capabilities and efficiency in order to gain higher competitive advantages. It is important for a company to look at every area that can save money as time is considered as money thereby wasted time is considered wasted money. The implementation of Lean strategy is believed to have capabilities in improving the standard of method and materials, interchangeability of parts, specialization of labor and dedicated machinery (Carroll, 2008). Lean adopted in manufacturing sector helps in enhancing value added along the operational process and optimizes the productivity and performance through the elimination of waste thereby minimize the overall cost of operation.

The lean strategy is a business model that focuses on systematic identification and elimination of waste from the process and involves changing and improving processes at the same time delivering the quality product to the manufacturer and consumer at the lowest cost (Shams, Tritos and Amrik, 2010). In other words, Lean is the elimination of everything that does not add value to the product. The firm needs to take into account the cost of waste such as overproduction, faulty product, unnecessary waiting, movement and transportation as well as excess inventory to restore the systems in the form of lean. The lean strategy plays an important role in reducing waste for the continuous improvement. The success of lean strategy could not be argued as according to Moeuf, Tamayo, Lamouri, Pellerin and Lelievre (2016), lean manufacturing is an approach that has been used by large corporations for several years and this method was successfully implemented in the Toyota Production System (TPS).

There are many firms that have already implemented lean in their operation as well as the organization and familiar with the lean principles, tools and practices. Most of them able to achieve superior performance by integrating and combining information-based process and physical process into lean strategy and the successful level can't be achieved without the continuous practice and never-ending lean adoption. The decision of firm to go for lean actually requires everyone's

participation in the adjustment of thinking, attitudes and behaviour and it is not all about implementing a set of tools and practices itself. Carroll (2008) in his book Lean Performance ERP Project Management stated that lean performance is a management strategy that recognizes and leverages the fundamental strength of business people and processes.

1.2 PROBLEM STATEMENT

Due to globalization and advance technological changes, firm strive to achieve industry 4.0 in which all the operation starts to implement autonomous machine in order to optimize the production rate and quality at a lowest possible cost yet still the firm could not avoid from producing non added value lead to added costs. Even the principle of eliminating all forms of wasted value has been tested in large corporation resulted in the increase of 40% productivity, 20% reduction of defect material and able to reduce 50% of lead time (Panizzolo, Garengo, Kumar and Gore, 2012), yet despite these efforts, the majority of companies that test lean techniques have not achieved the gains they expected whether it's in quality, cost, or productivity (Harbour, 2012). Thereby the lean transformation within industries is still at the bottom of success (Yamamoto and Bellgran, 2010; Bhasin, 2012; Chay, Xu, Tiwari, & Chay, 2015)

It comes to several firms that have a doubt minded to implement lean strategies as thinking they are unable to manage the risk if fail in implementation. Even though lean is used to improve productivity, yet the situation is not that simple, hence it is not an easy journey with a guaranteed successful end. The firm has come into perspective if lean capable to improve overall effectiveness, then why not all companies implement lean production in the operation and why do some fail during implementation. Clearly, no proof of research has been able to compromise that firm can reach the excellent performance of lean. Therefore, many businesses have found themselves in a disappointing cycle of start-stop-start-again, bring in a lean initiative

only to see it flunk, and then struggling repetitively to make it work. The worst is the price the company should repay in time and money spent in lean transformation. The secret lies not in which lean principles and practices an organization adopt but in how it executes them (Harbour, 2012). Thereby, the purpose of this research is examining the factors influencing the firm to implement lean and how this factor influence lean implementation towards performance improvement.

1.3 RESEARCH QUESTIONS

This research explores the keys finding derived from the research problem in order to focus on the research objectives. The research aim is directly addressing the issue of difficulty in lean implementation as there are several firms which unable to achieve superior performance in lean strategy. The purpose of the finding is to identify the critical success factors in lean implementation within the manufacturing industry so that the difficulties and challenges issue in lean hopefully could bring the definite solution in performance improvement.

Therefore, the research comes out with several key questions to address the issue as following:

- What are the factors that drive lean implementation in the various departments within the firm?
- What is the status of lean implementation in the firm?
- What are the most critical factors affect the performance improvement, thereby contribute to the success of lean?

1.4 RESEARCH OBJECTIVES

The main objective conducting this research is to identify the gap between successful of lean implementation and difficulty to achieve performance improvement as well as provide a suitable research framework for a clear definition of lean production and the role of the organization towards lean strategy. Here are the key objectives to be focused on this research:

- To investigate the factors that drive lean implementation in the various departments within the firm.
- To determine the current status of lean implementation in the firm.
- To identify the factors that influence the successful lean implementation in the firm.

1.5 SCOPE

The scope of this research is covered on various measures factors that influence the adoption of lean in production and accessing the current level of lean achievement thus lead to the finding of the success factors of lean implementation. This research will be conducted under manufacturing industry in Melaka in which the respondents will be targeted among management employees that assist in the operation, production control, quality control, financial, human resources and technicians as well as engineer. In order to get the required information to simplify the objectives, the structured questionnaires will be distributed within the targeted respondents in order to test the reliability and validity of research framework used and hypothesis. Therefore the research will only focus on performance improvement in implementing lean strategy.

1.6 LIMITATIONS

The most concern issues that would limit the research study is the compatibility of the respondents' knowledge towards the research topic. The research is expected to gain the data that able to fulfil the requirement yet the lack understanding of respondent towards lean and transparency in answering the survey questions would be the barriers in proving the accurate answer to the objectives. Besides, the cross-sectional survey conducted cannot provide the strong result to achieve objectives as there is the limitation of time and cost, the research unable to cover all manufacturing companies in Melaka. Therefore, the research is tested only on the manufacturing industry in Melaka thus the result is not generalized to other industry. In addition, the full cooperation of respondents will benefit in the research survey.

1.7 SIGNIFICANT OF STUDY

The significant of study would be the solution to the problem statement in which the finding of the study will benefit to researcher and firm organization in terms of providing the practical and knowledge view. As the researcher explores the critical success factors in lean implementation towards performance improvement, and will go through the previous research covered in international studies, it will give benefit to the researcher to understand the relationship between success factors of lean implementation towards performance improvement and try to relate by giving suggestion to improve manufacturing industry in Malaysia regarding the success of lean implementation so that the industry and firm able to learn about the appropriate lean strategy to improve performance in term of generating high productivity without affecting the quality and cost at the same time can provide innovative solution for better decision making within the organization.

1.8 SUMMARY

The company will achieve superior performance improvement in lean implementation if they focus on solving the barrier that will impede the successful lean operation. This study is not focused on identifying the problem that becomes the barrier of lean adoption in the company, but to trigger the company on their current lean status and facilitate them to identify the core problem by suggesting them to look into factors that can influence the success of lean. So that they would have the initiative to improve their organization instead of focusing on lean tools. In the next chapter will discuss the development of a research framework with the support from previous research views on the topic discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In the previous chapter explain the brief introduction of background research and key reasons for researcher preferring to study this topic. The research questions, as well as research objectives, are constructed from the detailed problem statement. The researcher clarifies the scope up to certain limitation and states the possible significance of this topic for further study.

Correspond to the previous chapter, this chapter outlines the definition of theory and discussed the research framework as well as concepts on the topic based on the reviews from previous researchers. In this section, the researcher will highlight the measurement of variables with reference to the others opinions and articulates model research advocated in previous studies. The reference material such as journals, books, a student's dissertation and others published academic medium used as a guideline to strengthen the factual understanding in this research.

2.2 INTRODUCTION TO LEAN MANUFACTURING

The first to coin lean manufacturing in previous 1991 is James P. Womack, Daniel T. Jones and Daniel Roos in their book The Machine That Changed The World (Dekier, 2012). They discover Toyota Production System (TPS) as a first system working corresponds with the guidelines of lean manufacturing and it is recognized as the successor of TPS.

Lean manufacturing is widely utilized in various sectors. If the previously lean implementation is recognized in the automotive industry yet currently the lean is being broadly applied across a mass of industries, ranging from hospitals and pharmaceuticals to electronics and aerospace and the latest being tested in service sector worldwide (Harbour, 2012). Other than that, Kadarova & Demecko, (2016) claim that lean implementation in automation industry has been achieved the improvement in progress in term of production operation and cost reduction followed by slowly penetrating in service lean implementation and in advance lean is being used to manage healthcare, IT services as well as public administration.

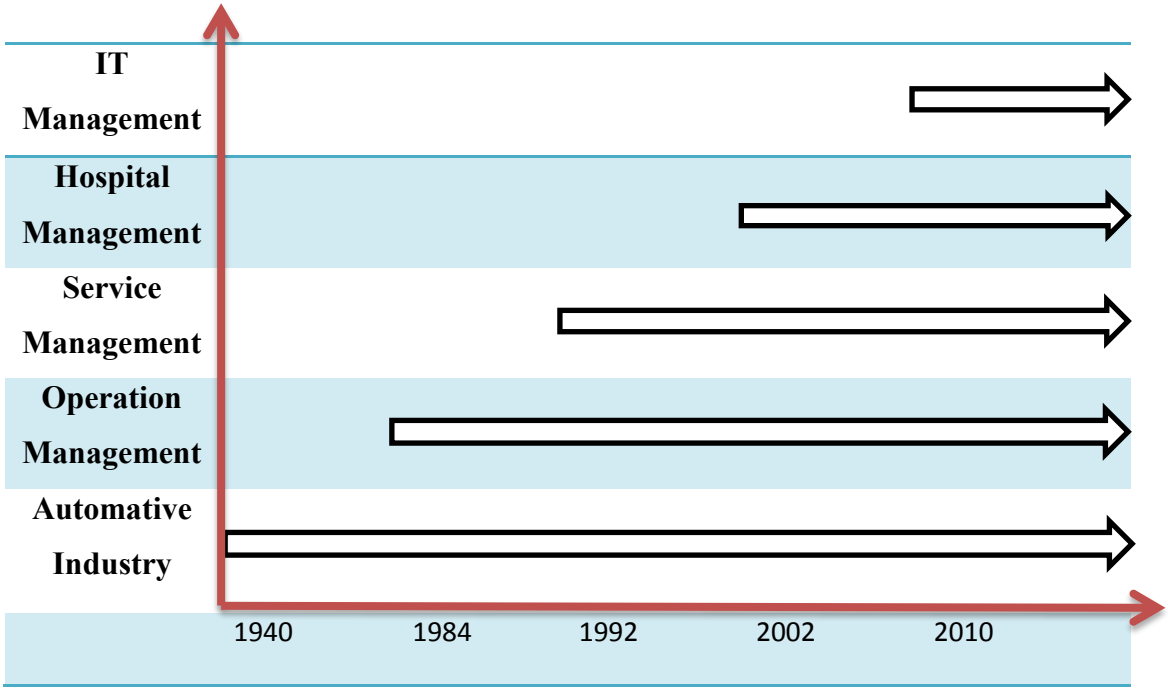

Figure 2.2: Timeline of Lean Management usage in various industries
Sources: Stohr 2013; cited by Kadarova & Demecko, 2016)