

Japanese 'Lean'
in the Philippine Manufacturing Industry:
How do companies in the Philippines
perceive such processes?

by

DUTERTE Andrea Kristina Ranon

52114004

March 2016

Master's Thesis

Presented to

Ritsumeikan Asia Pacific University

In Partial Fulfillment of the Requirements for the Degree of

Master of Innovation and Operations Management

Table of Contents

Certification of Originality.....	iv
Acknowledgements	v
Abstract.....	vii
CHAPTER 1 Introduction.....	1
1.1 Research Background.....	3
1.2 Research Objectives	4
1.3 Research Questions	5
1.4 Theoretical Framework	5
1.4.1 Organizational Culture.....	7
1.4.2 Management Role	7
CHAPTER 2 Review of Related Literature.....	9
2.1 Lean Manufacturing and the Toyota Production System.....	9
2.2 Definition of Lean Manufacturing	10
2.3 Lean Manufacturing Tools and Methods	14
2.3.1 Cellular Manufacturing.....	14
2.3.2 Kaizen	14
2.3.3 Total Productive Maintenance (TPM)	16
2.3.4 Just-in-Time Manufacturing (JIT)	16
2.3.5 SMED (Single Minute Exchange of Dies).....	17
2.3.6 Value Stream Mapping (VSM).....	18
2.4 Lean Manufacturing as compared to other known management practices	18
2.4.1 Total Quality Management (TQM).....	18
2.4.2 Six Sigma Quality	19
2.4.3 Lean, TQM and Six Sigma	19
2.5 Lean Manufacturing Implementation and its execution outside of Japan.....	21

2.6	Global Trends in Lean Implementation	23
2.6.1	Lean Enterprise (Manufacturing Excellence)	23
2.6.2	Integration Models	24
CHAPTER 3 Research Methodology		25
CHAPTER 4 Japanese Manufacturing Practices		27
4.1	Characteristics of Japanese Management.....	27
4.2	Manufacturing Practices.....	29
4.3	Japanese Lean Manufacturing	30
CHAPTER 5 Case Study: Lean Manufacturing in non-Japanese owned corporations in the Philippines.....		32
5.1	Productivity Improvement Schemes	35
5.2	Quality Improvement Schemes	36
CHAPTER 6 Findings		38
6.1	‘Best Practice’ model in the Philippine manufacturing industry	38
6.2	Similarities and Differences of Lean Implementation between Japanese and Philippine practices	40
6.3	Major Gaps observed – Decision making and discipline.....	42
CHAPTER 7 The Future of Lean Manufacturing and Quality Control in the Philippines.....		44
7.1	Workforce Training.....	44
7.2	Review of existing policies and procedures versus related production processes	45
CHAPTER 8 Conclusion		46
References.....		50
Appendix.....		54

List of Tables and Figures

Table 2.1 Similarities and Differences of TQM, Six Sigma and Lean	20
Table 5.1 Company Characteristics	32
Table 5.2 Productivity Improvement Schemes	35
Table 5.3 Quality Improvement Schemes	36
Table 6.1 Similarities and Differences of the Japanese and Philippine practices	40
Figure 1.1 Lean implementation prescription	6
Figure 2.1 Essential elements of lean production	11
Figure 6.1 Best Practice diagram in the Philippine manufacturing industry	38

Certification of Originality

I, **DUTERTE Andrea Kristina Ranon**, hereby declare that this research is my own work and has not been submitted in any form for the award of another degree at any university or institute of tertiary education. Any information derived from the published or unpublished work of others has been properly cited or acknowledged appropriately.

March 2016

DUTERTE Andrea Kristina Ranon

Acknowledgements

To begin with, I would like to express my sincere gratitude to my supervisor Yokoyama Kenji sensei for his continuous support in my Master's study and related research, for his patience and motivation. His guidance helped me in all the time I was researching and writing this paper. I could not have a better advisor and mentor for my MBA studies.

Besides my supervisor, I would like to thank the rest of the research committee, for their insightful comments and encouragement, but also for the tough questions posted which motivated me to widen my perspective in my research.

My sincere gratitude also goes to Francisco Fellizar, Jr. sensei, Lailani Alcantara sensei, and Haidar Ali sensei who provided me the most insightful classes and conversations related to my research writing. Without their precious support, it would not be possible for me to finish this paper.

I thank my fellow GSM Spring 2014 batch mates, especially to those who extended help when I needed them the most, for the all-nighters we were working *together* before report deadlines and for all the silly conversations and fun we had in the last two years. Short as it may, we were able to form a bond I will treasure for the rest of my life.

I also thank my friends in the industry, without their help it would be impossible to even start my research. In particular, I am grateful to Sir Elhner Jimenez, Ma'am Michelle Angelo and Sir Luis Santos for their insightful responses to the research.

I would like to take this opportunity to express gratitude to RCAPS for supporting researchers and providing subsidy for my field research.

I wish to express my sincere thanks to my fellow Filipino scholars and the Filipino community in Beppu and Oita, for the help and support I received during my two years in Japan. I would not have done it without your help.

Most importantly, I would like to express my utmost appreciation to my family and

friends for their undying support in my journey towards my dream. I would have given up long before, if not for them. Lastly, I would like to pay homage to my dad who died while I am writing this paper. He would have been a really proud father.

I thank all the people who directly and indirectly have lent their hand in this journey.

Finally, I thank GOD the Almighty, for the guidance and blessings He has showered me throughout this journey. The little miracles, from the people I have met to the ‘Eureka’ moments which have guided me and directed me to the completion of this paper, have been overwhelming. Without Your help, I wouldn’t be here.

Abstract

This research aims to describe the current manufacturing practices in the Philippines through the lean perspective, determine the gaps between Japanese practices and that of the Philippines specifically in terms of production management and quality control improvements while gaining knowledge on the perception of quality in terms of manufacturing through different ownership perspectives. Lean manufacturing have been a revolutionary Japanese innovation in manufacturing systems. Globalization also forced many organizations and its managers to make use of various manufacturing systems from outside their own countries. In the Philippines, the manufacturing sector is experiencing growth which gives rise to increased interest to improvement schemes such as lean manufacturing. However, there are difficulties noted in the implementation of lean outside Japanese companies. Thus, this study looks into the effects of organizational culture and management role in the lean implementation in the Philippines. In order to achieve this, a descriptive case study which focused on two (2) of the most successful non-Japanese owned companies in the Philippines. In the research, it was noted that the Philippine manufacturing industry is currently experiencing a shift in production mindset, from mass production to lean thinking.

Keywords: lean manufacturing, Philippine best practice, quality management systems, Philippine manufacturing practices

CHAPTER 1

1 Introduction

Today's international business environment indicates increased competition from many foreign companies. Because of this, there is an absolute need for fresh ideas on innovation and ways to improve quality. In order to achieve operational excellence, a company must regulate constant and familiar processes, and improve process efficiency. Thus, manufacturers around the globe have adapted new and varied concepts in manufacturing practices. Globalization has forced many organizations and its managers to make use of manufacturing capabilities from countries other than their own. This trend towards globalization shifts the mind-set of manufacturers into improving quality. The increased competition brings forth product discrimination where quality cannot be underestimated and in fact has become a marketing weapon (Russell, 1998). As business organizations produce goods and services to meet customer needs, quality is fast becoming a major consideration in a customer's choice. With increased consumer quality, manufacturers in emerging economies are now compelled to put more importance on fostering technological competencies, creating supply networks and improving quality management systems.

For at least the past twenty years, manufacturers are constantly striving for and are focused on improving the quality of their processes as a means to achieve operational excellence. Wave after wave of new breakthroughs keep companies busy as they learn to adapt and keep ahead (Augustin, 2008). Essentially, the significance of adopting process management practices increases as well as the pressure of enhancing reliability, flexibility, speed, and cost effectivity of performance without sacrificing product quality while searching for better methods to improve processes. Adopting models of excellence in companies, even small or medium-sized, will certainly lead to a decrease in costs and a performance

improvement of the product or process, helping them to stay competitive in the future (Chiarini, 2013). Lean manufacturing, which radically revolutionized manufacturing and brought immense benefits to the world, has helped businesses remain competitive. Thus, lean manufacturing and other management systems are an absolute essential for the time to come.

From Ford Motor's popularization of mass production, the global manufacturing sector has seen countless changes in the way they conduct and systemize their processes in order to attain optimized efficiency. Through lean principles, the competitiveness of many manufacturing companies and the value they provide to customers are significantly boosted. Lean is a production philosophy which attempts to combine the principles of craftsmanship and mass production (Dahlgaard J. D.-P., 2006). In practice, craft production should be focused on the customer's needs and satisfaction; hence no production shall start without the specific order of the customer. On the other hand, these attributes are lost in mass production as it focuses on quick and identical production. Currently, Lean Manufacturing has become a global phenomenon (Mehta, 2012) and has been applied worldwide in systems for business excellence. Furthermore, organizations immensely benefit from lean manufacturing by the elimination of wastes - to anticipate, respond to, fulfill, and serve customers' needs, making it more feasible for them to align to the unmet needs of their customers in the process (Columbus, 2008). However, many manufacturers have struggled again and again to gain the advantages of the lean manufacturing system.

In this context, this research will attempt to determine the success in terms of adaptation and implementation of lean manufacturing practices in the Philippines. In addition, this research will further explain the similarities and differences between the Japanese manufacturing practices (origin of lean manufacturing) and that of the Philippine manufacturing practices.

1.1 Research Background

From 2010, the Philippine manufacturing industry has experienced an increased growth rate, reaching to at least 23.16% of the GDP (Data Source: Philippine Statistics Authority). Moreover, studies show that the Philippine's manufacturing sector grew faster than that of the average growth rate of the ASEAN manufacturing sector and double than that of the world's growth, in general (Data Source: United Nations Industrial Development Organization). In fact, with rising foreign investment flows, the Philippine manufacturing is among the emerging Southeast Asian countries that can overpower China's manufacturing market share. Professionals in the Philippines argued that manufacturing continues to be an important engine of growth (economies of scale, technical progress and learning) and as an "escalator" sector (high-productivity catch-up) despite the emergence of the service industry nowadays (Bernardo, 2015). Food and drugs manufacturing is by far the largest manufacturing subsector followed by electronics, semi-conductor and chemical products. This strong growth is seen to offer the Philippines a great potential to generate more and better jobs requiring high-skilled, semi-skilled and low-skilled workers.

Meanwhile, Japanese firms have been widely known for pulling off a superior level of manufacturing efficiency as demonstrated by the Toyota Production System (TPS) and later on adapted as Lean Manufacturing worldwide. The Japanese achieved enhanced product quality by combining and adapting many of the principles of quality management, originally developed in the United States, with their own management philosophies (Russell, 1998). The process was a sensational contribution to society and the manufacturing sector in particular. Through these management systems, the Japanese were uniquely able to establish the concept of value – the combination of price plus quality – and change their product-design philosophy such that the cost of achieving

better quality was not prohibitive (Russell, 1998).

In the Philippines, Japanese-style practices are becoming more and more popular as the manufacturing sector grows. Increasing pressure from global competition is the main reason why both multinational and local firms in the Philippines tend to adopt what managers consider as the 'best approach' to a productive and competitive workforce, alongside a "cheap wage, high skills' policy (Amante, 1997). To date, the Philippine workplace hosts a mixture of influences, both foreign and local, in their practices. Local work values are a product of the historical blending of ideas, beliefs and customs of the ethnolinguistic groups (Indo-Malayan groups scattered over the many islands), along with more than 330 years of Spanish colonial dominance and 45 years of American rule (Amante, 1997). Thus, the success or failure of selectively adapting practices from other work systems like Japan's, depends greatly upon how local managers are able to harness and interpret these various influences into a strategy suited to the Filipino work temperament (Amante, 1997).

1.2 Research Objectives

Japanese-style practices have been increasingly popular in the Philippines. In particular, lean manufacturing have been gaining popularity in the country because of the increased global competition prompting manufacturers to acquire the best techniques in doing their businesses. Such manufacturing strategies or management systems are now being adopted by companies from small-medium enterprises to big corporations. However, there is limited literature regarding the status of such practices in the Philippines although implemented in various organizations. In order to address the issue, this research intends to contribute to the manufacturing sector and academe by assessing the current situation of lean manufacturing principles in the Philippines and consequently identify key practices beneficial to companies which they could use to improve their own.

Primarily, this research aims to achieve the following:

- 1.2.1* Describe the current manufacturing practices in the Philippines through the lean perspective;
- 1.2.2* Determine the gaps between Japanese practices and that of the Philippines, specifically in terms of production management and quality control;
- 1.2.3* To know how quality is perceived in the Philippines in terms of manufacturing through different ownership types i.e. MNCs and Filipino-owned.

1.3 Research Questions

In order to achieve the aforementioned objectives, this research aims to answer and will focus on the following questions:

- 1.3.1* Which production management and quality improvement practices are currently being implemented in the Philippines?
- 1.3.2* How are the Japanese lean manufacturing practices actually implemented in the Philippines?
- 1.3.3* Which practice works within the Philippine manufacturing industry?
- 1.3.4* What are the similarities and differences of Philippine practices from that of the Japanese practices?

1.4 Theoretical Framework

Lean implementation in a non-Japanese company is perceived to be difficult because of the societal and organizational culture of the Japanese embedded in the concept. Programs such as lean are most probable to work if the predominant organizational culture is well-suited to the values and basic assumptions put forward by the discipline.

Further, it also requires management commitment and discipline in fostering the suitable work environment for the program. Thus, lean implementation outside the Japanese system is grounded in two areas simplified in **Figure 1.1**. In some of the few cases determined in the literature, scholars believe in the importance of **Organizational culture** and **Management role** in the successful implementation of lean manufacturing outside Japan. *Systems Theory* suggests that whenever a system changes, it is important that other aspects of the system be able to adjust otherwise it will breakdown (Wilson, 2010). Thus in the lean manufacturing system, the effect of cultural change and management commitment shall be important factors to consider when implementing outside the Japanese environment.

Hence, this research shall focus on the effects of the aforementioned areas in the success in implementation of lean manufacturing in the Philippines.

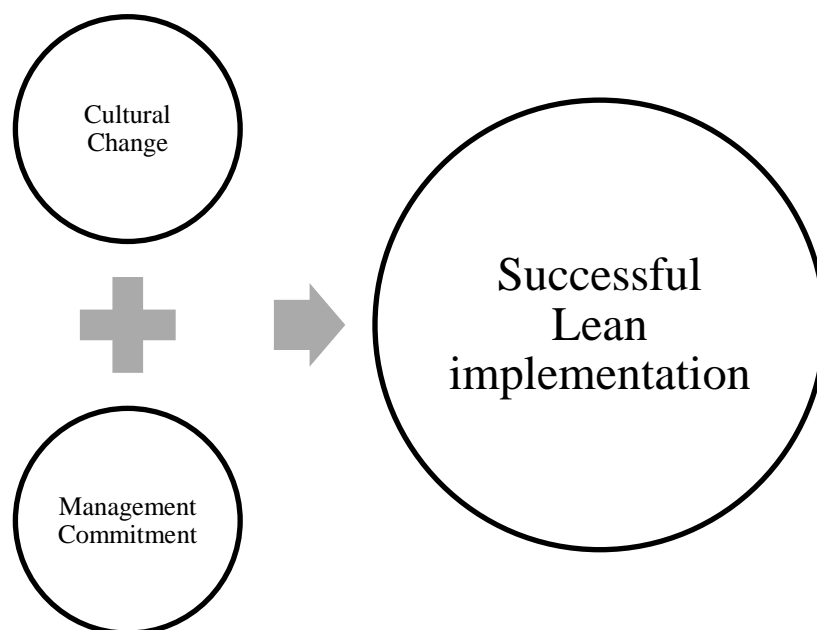


Figure 1.1 Lean implementation prescription

1.4.1 Organizational Culture

T1: The implementation of Lean is directly affected by the organization's culture.

The nature of lean manufacturing, scholars believe, has always been profoundly connected to the Japanese business environment. Since lean manufacturing's roots can be traced from the Japanese company called Toyota, scholars believe that the Japanese manufacturing traits and culture are embedded in the lean principles. Thus, the implementation of the lean approach often becomes problematic outside Japan. Scholars suggest that this is due to the nature of work environment and hierarchical structure that disagree with the lean system's culture of team effort and cooperation which is very common in the Japanese social and business environment.

Since the Japanese culture is believed to be strongly embedded in the lean principles, the transferability of the system on other organizations seems to be impossible. Nonetheless, globalization has enabled organizations to adopt practices such as lean manufacturing onto their own systems. The extent and effectivity, however, still depends on how well the organization accepts the change brought about by the adaptation.

1.4.2 Management Role

T2: Management commitment plays a definitive role in the success of Lean implementation and quality management practices.

Lean manufacturing culture works around the recognition of the management and the employees of their responsibility in upholding the principles of lean in the workplace. Thorough acceptance of responsibility from the management to train and respect the ability of their employees in implementing the principle is vital in the lean culture. Also, thorough acceptance of employee responsibility in the shop floor helps increase the efficiency of decision-making ability for everyone.

Moreover, change comes from the initiative of the management. More so, lean initiatives are motivated by the need of a company to survive. In situations like these, it is easy for the management to get people to follow. Then again, efforts are generally slow and unsuccessful unless faced with the issue of survival. Thus, in order to facilitate the success of any change in the organization or “cultural” change as they call it, the role of the management is most important. Leadership is very crucial. Most of the time, the failure of a company can be attested to the failure of the leaders or management to adapt to the change. Leaders must prepare their people for the change and maintain it.

CHAPTER 2

2 Review of Related Literature

2.1 Lean Manufacturing and the Toyota Production System

As a result of World War II, many of the Japanese companies were challenged by the difficulty of material, financial and human resource shortages. Further, many of the American companies at that time were already surpassing its Japanese counterparts including Toyota. In order to overcome the crisis, high ranking officials from Toyota (owner Eiji Toyoda and his production genius Taiichi Ohno included), went to the US to study how automobiles were manufactured in the world's largest and most efficient manufacturing plant – Ford's rough plant in Detroit (Dahlgaard J. D.-P., 2006). However in the process of gathering information, they concluded that Ford's mass production approach cannot simply be replicated in Japan. They realized in their observations that they (Japan and Toyota) were too poor to have wasted manpower, efforts, materials, space and time in the production line. After much experimentation, the Toyota Production System was developed and refined between 1945 and 1970 (Abdullah, 1996). This new production system implemented the earliest versions of "quality circles", JIT or Kanban system and Kaizen among others. The system then became so competitive that US manufacturers started to realize the importance of adapting when Toyota and other Japanese car manufacturers steadily boosted their market shares worldwide. Documented in the book *The Machine that Changed the World* (Womack J. J., 1990), the term "lean production" was coined by an International Motor Vehicle Program (IMVP) researcher after a benchmarking study established at Massachusetts Institute of Technology in 1985. According to Womack et al. (1990), the reason the term "lean" was suggested was because the most competent assembly plants in Japan that was included in the

benchmarking “uses less of everything compared with mass production – half the human efforts in the factory, half the manufacturing space, half the investment into tools, half the engineering hours to develop a new product in half the time. Also it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products”.

2.2 Definition of Lean Manufacturing

Among the several quality management concepts that have been developed, the lean concept, as in lean manufacturing, lean production, etc., is one of the more wide spread and successful attempts (Andersson, 2006). For the purpose of this research, the term ‘Lean Manufacturing’ or simply ‘Lean’ will be used for the rest of the paper.

Lean is a production practice that considers the outflow of resources for any goal other than the creation of value for the end customer to be wasteful and thus a target for elimination; basically, more value with less work (Anvari, 2011). Andersson et. al. (2006), simply puts it as controlling resources in accordance with the customer’s needs and to reduce unnecessary waste including the waste of time. Essentially, Lean is a business discipline that is fundamentally built around or driven by customer value while eliminating wastes anywhere in the supply chain: from marketing to production processes, from administrative processes to strategic ones. Its key principles are perfect first-time quality, waste minimization by removing all activities that do not add value, continuous improvement, flexibility and long-term relationships (Anvari, 2011). In lean, the definition of value added is slightly more precise; value added must be created at the lowest cost possible while maximizing the value the customer recognizes on that particular output (Chiarini, 2013). This evolving dynamic production process covers the total enterprise; from product development, marketing, manufacturing organization and

human resources, customer support and customer-supplier networks administered through a systematic set of methods and practices. The essential elements as mapped out by Katayama and Bennett (1996), illustrated in **Figure 2.1** further explains that fewer resource input requirement by the manufacturing system plus higher pressure for output performance ensues better customer satisfaction which successively provides opportunity for the lean company to gain higher market share than those of its competitors.

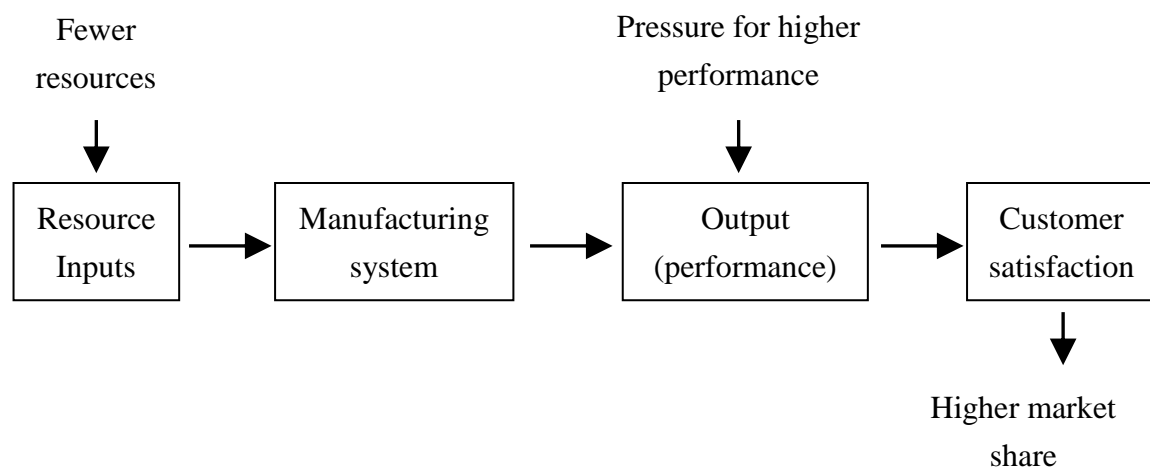


Figure 2.1 Essential elements of lean production

Source: (Katayama, 1996)

Related literature suggests that lean manufacturing is a management practice which focuses on the elimination of wastes in order to optimize productivity. As manufacturing frequently experiences unexpected and unnecessary processes in everyday operations caused by variable components generated by the product design, excessive inventories or wrong purchasing contracts, wastes are being generated as a result. Hence, wastes are any activity in the process which adds costs but not adding value for the customer. In Japanese, wastes are defined as *Muda*, *Mura* or *Muri*. *Muda* is a situation wherein the volume of production is more than the workload (real waste) while *Mura* is the volume that swings around the fixed target (waste that is not stable) and *Muri* is having more workload than the volume (wherein workers and machines are too busy). Lean's main

theme revolves around the elimination of the seven defined types of Muda namely: **Overproduction, Inventory, Motion, Defectiveness, Transportation, Over-processing and Waiting.**

- **Overproduction** refers to producing too much, too early or too late to meet the customer's demand. Overproducing also occurs when products are made without the customer order. Consequently, overproducing may lead to various (negative) impacts in manufacturing such as: increase in inventories as second waste, slowdown in production process, planning flexibility reduction and increase in indirect costs. In most cases, overproduction is a result of producing before or after the demand. In this case, the inventory of products is often higher than what is expected as the production that ensued does not meet customer needs. Other reasons for overproduction include: slow machine setup, too many or too fast machines that sometimes also causes defects, creating more to make up for these defects, unnecessary workforce in the process and production of oversized economical lots.
- **Inventory** is the raw material, work in process (WIP) or finished products stored. Chiarini (2013) further defines inventory as any product or raw material that has accumulated within or outside the organization for a certain period of time. Common reasons of inventory in manufacturing are long changeover times, early production and bottlenecks in the production flow wherein excessive inventories are produced. However, having excessive inventories only means problems in manufacturing are concealed and not solved.
- **Motion** is the unnecessary movement of the body. In simpler terms, motion is the waste created due to the movement of the workers. Wastes in motion can be caused by poor layout design of the shop floor. Furthermore, workers lacking in skills or training plus poor staff involvement, additional staff hours and lack of order and

cleanliness can also add to the wastes being generated.

- **Defectiveness** is generally defined as the non-conforming products and services which do not satisfy a customer requirement. Frequently, defects are generated whenever there are poor working methods, instruction and procedure, unaware and unqualified workforce; and ineffective machines and equipment.
- **Transportation** is the unnecessary movement of products between processes. As compared with motion, transportation is mainly concerned with the conveyances or the movement of products from one warehouse to another warehouse, a crucial activity in the manufacturing process. Wastes generated through transportation are usually caused by poor layout design in manufacturing, poorly trained workforce and too large site for production. Typically, wastes generated from transportation are inevitably a part of the process.
- **Over-processing** is processing beyond customer requirement. As compared with overproduction, over-processing refers to wastes generated by the activities within the process that could be unrequested by the customer. These wastes can be caused by inefficient process designing, activity analysis, tools, machines, automations and materials. Furthermore, incomplete standardization of activities can also be seen as a reason for having such wastes.
- **Waiting** is the waste generated by downtimes or the time of having to wait before starting the next activity. In the manufacturing industry, it is quite common that workers become stationary while waiting for the operation to finish, as with documents, reports and meeting delayed. This is frequently caused by the lack of balance between activities, order and cleanliness, procedures and instructions, and huge production lots. Poor preventive maintenance can also be a major reason for such waiting time.

2.3 Lean Manufacturing Tools and Methods

In the reduction or elimination of wastes, lean uses a variety of available approaches and tools which includes value stream analysis, total productive maintenance, kaizen costing and cost analysis, engineering and change management, document management, Kanban and just-in-time system among others. Lean tools are designed to help emphasize a problem within the system which then has to be solved and eliminated through its application.

2.3.1 Cellular Manufacturing

Cellular manufacturing refers to a technique in which facility layout is designed according to optimum operational sequences (Pojasek, 2003). Essentially, people and equipment are arranged into cells wherein each product moves through the process one unit at a time without sudden interruption, at a pace determined by the customer's need (Abdullah, 1996). The "cells" work area layout enables workers to easily move from one process to another with little effort being in such close proximity. Further, the configuration of work cells is determined by the needs of the product. Thus, the work cell helps maximize product throughput with the minimal use of space.

2.3.2 Kaizen

In various literatures, Kaizen is defined as 'continuous improvement'. Lean organizations are based on the principle of continuous improvement which applies to every process and leads to performance increase and economical / financial crisis (Chiarini, 2013). In manufacturing, the objective of Kaizen is to find and eliminate wastes in machinery, labor or production methods. In the long run, Kaizen adds value and reduces wastes in the entire value stream when implemented.

One of the most effective and popular tool used in Kaizen is **5S**. 5S is a workplace organization method which standardizes daily management defined by the words *Seiri*, *Seiton*, *Seiso*, *Seiketsu* and *Shitsuke* in Japanese.

The first of the five is **Seiri** (choosing and separating) which means sorting out and removing unnecessary things from the area and unnecessary activities within a process. Second, is **Seiton** (tidying up) which deals with organizing of tools, equipment and everything else that was used in the process including unfinished products. Third, **Seiso** (clean up) means maintaining the process area clean. Fourth will be **Seiketsu** (standardize), which deals with the standardization by making instruction and applications easy and simple enough for all the people in the area to understand. Last of the five is **Shitsuke** (sustain) which means to preserve and improve the order achieved through the aforementioned S's. At present, the lean model introduced a 6th S in the methodology which stands for *Safety*. **Safety** (zero incidents) focuses on the elimination of hazards while ensuring that every action and each area are reviewed so that potential hazards are not overlooked.

The 5S method, now 6S, is applied to achieve improvement in quality and productivity while obtaining order and cleanliness at work. Scholars claim that this method is the best suitable method to apply when the organization is determined to implement continuous improvement. Organizations benefit from the method by: increasing productivity, improving quality, safety and security, reducing costs, ensuring delivery on time, increasing morale and introducing the basic principles of visual management and control (Chiarini, 2013; Ho S. C., 1996).

2.3.3 **Total Productive Maintenance (TPM)**

Total Productive Maintenance (TPM) utilizes the practice of preventive maintenance and total quality to reduce machine failure and other similar problems into increasing efficiency of production processes and services. TPM requires employee involvement – machine operators maintaining their own machines and decisions based on data to achieve zero defects in the operations. In addition, TPM requires management to take on a strategic view in maintenance which means that products have to be designed based on existing machines for easier production; machines have to be designed for easier operation, changeover and maintenance; workers have to be trained and retrained to operate and maintain their machines properly; machines have to be purchased in order to capitalize on the productive potential and to design a preventive maintenance plan that spans the entire life of each machine. Ultimately, the objective of TPM is to carry out operations with zero breakdowns.

2.3.4 **Just-in-Time Manufacturing (JIT)**

As inferred in the name Just-in-time, items are not produced in anticipation of need but rather, items are only produced in necessary quantities at necessary times. Inventory is viewed as one of the relevant wastes in lean manufacturing and in JIT, anything in excess of the “standard in-process stock” becomes unacceptable. Just-in-time manufacturing reduces wastes by replacing the “push” dynamic of make-to-sell production with the “pull” dynamic of make-to-order production (Shimokawa, 2009). It should be noted, however, that not all types of operation is appropriate to implement JIT. For example, mass production is still the best option for high volume, repetitive items. Essentially, for JIT to be successful there must be some

stability in demand (Russell, 1998).

In order to achieve JIT, a scheduling system called **Kanban** is used to minimize inventory and follows the pull system rule in order to reduce waste. Through Kanban, the amount and the type of products needed to be produced by a different process can be defined. Furthermore, so as to keep the process flow tight, Kanban has to “pull” products. Most organizations have benefited from the Kanban system in terms of elimination of overproduction along with the production in smaller mixed lots. In addition, the response flexibility to customer demands improved because of the process integration from supplier down to the customer. Lastly, the production information system is also simplified as a result of scheduling. Overall, Kanban through the pull system pulls the value stream flow with orders and links all the processes from start to finish (Chiarini, 2013).

2.3.5 **SMED (Single Minute Exchange of Dies)**

The Single Minute Exchange of Dies (SMED) is a quick changeover methodology largely used in most factories so as to avoid large batch production. It reduces WIP and improves lead time in production processes. Organizations benefit from this through the improvement of ergonomics and safety in the plant. The process of SMED starts from the identification of internal and outer set-ups and preparation. When the set-up is identified, it seeks to convert as many internal ones to outer set-ups as possible. Then the improvement of these set-ups sets in. Finally, having completed the stages, Kaizen teams are supposed to repeatedly implement the improvement in order to effectively improve changeover times.

2.3.6 Value Stream Mapping (VSM)

Value Stream Mapping (VSM) identifies opportunities for elimination of waste, increase value added activities and enhance the main stream flow through the analysis of activities that make up a process in more detail. VSM also enables the measurement of wastes such as motion, transportation and over processing (Chiarini, 2013). There are many advantages in executing VSM which includes the establishment of a common language when manufacturing processes are taken into consideration (Pepper, 2009). In most cases, VSM must be used as a tool to evaluate the process flow into achieving organizational goals.

2.4 Lean Manufacturing as compared to other known management practices

2.4.1 Total Quality Management (TQM)

Tracing its roots partly from the US and partly from Japan, Total Quality Management (TQM) was generally adopted by various Japanese companies in the years immediately following World War II (Kaluarachchi, 2010). The term QM (Quality Management) also refers to QC (Quality Control) in which the latter is a term predominantly used in Japanese context (Shimokawa, 2009). Many years after, it has still become a world-wide topic along with other management systems that emerged. Thus, to be able to compete in the global marketplace, quality management continues to be a fundamental and vital business strategy. Through the implementation of quality management, the organization can improve the quality level of their products and services thus achieving competitiveness in a globalized context. TQM is exemplified by the increased customer satisfaction through business processes and continuous improvements in which employees actively participate in. Activities such as improvement, statistical control, supply control and quality engineering are

ingredients of TQM (Anvari, 2011). The aim of this management philosophy, therefore, is to change corporate cultures from a passive and defensive culture to a pro-active and open culture where the basic TQM principles - increased customer satisfaction, continuous improvement and everybody's participation - are applied everywhere in the organization (Dahlgard J. D.-P., 2006).

2.4.2 **Six Sigma Quality**

Six Sigma could be described as an improvement program for reducing variation which focuses on continuous and breakthrough improvements (Andersson, 2006). It is a quality management approach for which it is essential that management commitment and open communication are accessible for successful implementation as with any attempt at continuous improvement (Pepper, 2009). In principle, if a process reaches a six sigma quality, this process will produce 3.4 defect products or service per million which is an exceptional quality when related to clothes while unacceptable when airplane landings or surgery success is discussed. According to Chiarini (2013), Six sigma improvement programs are strictly carried out using the DMAIC five steps: Define, Measure, Analyze, Improve and Control.

2.4.3 **Lean, TQM and Six Sigma**

Despite the fact that the definitions of the three concepts (TQM, six sigma and lean) differ, their objective seems to be similar - continuous improvements and minimizing waste and resources while improving customer satisfaction and financial results (Andersson, 2006). The following table (**Table 2.1**) summarizes the similarities and differences of the three concepts.

Table 2.1 Similarities and Differences of TQM, Six Sigma and Lean

Concepts	TQM	Six sigma	Lean
Origin	The quality evolution in Japan	The quality evolution in Japan and Motorola	The quality evolution in Japan and Toyota
Theory	Focus on customers	No defects (<i>variation reduction</i>)	Remove waste (<i>waste reduction</i>)
Process view	Improve and uniform processes	Reduce variation and improve processes	Improve flow in process
Approach	Let everybody be committed	Project management	Project management
Methodologies	Plan, do, study, act	Define, measure, analyze, improve (or design), control (or verify)	Understanding customer value, value stream, analysis, flow, pull, perfection
Improvement projects	Continuous improvement and problem prevention	DMAIC pattern Use of certified Black and Green Belts Certified savings	Kaizen week, quick and operative Improvement and maximum involvement first of all
Tools	Analytical and statistical tools	Advanced statistical and analytical tools	Analytical tools
Primary effects	Increase customer satisfaction	Save money	Reduce lead time
Secondary effects	Achieves customer loyalty and improves performance	Achieves business goals and improves financial performance	Reduces inventory, increases productivity and customer satisfaction
Criticism	No tangible improvements, resource-demanding, unclear notion	Does not involve everybody, does not improve customer satisfaction, does not have a system view	Reduces flexibility, causes congestion in the supply chain, not applicable in all industries

Source: (Andersson, 2006) (Chiarini, 2013)

The major difference between the three concepts is their precision in defining wastes (Pettersen, 2009). Also, quality does not receive the same amount of attention in lean (Anvari, 2011) and instead focuses its literature on JIT production. Furthermore, lean principles are different compared to the methodologies in TQM and Six sigma as they are not cyclical in nature and are not focused on how to perform improvements and innovations (Andersson, 2006). Moreover, lean tools are more analytical in nature rather than statistical that is more preferred in TQM and Six sigma. Lean concentrates on the process mapping, on understanding the process as a whole and on the tools to eliminate waste while the other two focuses on problem solving and improvement based on customer requirements.

2.5 Lean Manufacturing Implementation and its execution outside of Japan

Lean is a quality control system whose purpose is to reduce cost by the elimination of wastes. Through lean, organizations that employ the system define short-term goals and KPIs which are then developed into improvement projects. These results are checked, standardized and then reported to management, thus allowing analysis which is then used to set new targets (Chiarini, 2013). Moreover, Chiarini (2013) also noted that the aforementioned indicators should easily be shared and measured which is quantifiable in real-time. Thus, lean principles are based on the fact that problems must be solved whenever they occur without postponing them. Subsequently, in order to implement a system like lean successfully, management requires a strategic planning process. Basically, lean implementation stability starts with a well-trained workforce (Smalley, 2005).

In lean literature, scholars consider a set of characteristics which they believe that lean processes follow so as to guarantee successful lean implementation (Lacksonen,

2010) such as:

Low Power-Distance Index culture: In lean processes, employee empowerment is an essential factor in the implementation. Scholars believe that lean processes are more suited to the Japanese culture as standardized tasks and level workload matches their sense of equality which then supports lean principles. In practice, all employees in lean are encouraged to stop lines to fix problems as they occur and to uphold continuous improvement. The Managers' role, in contrast, is to lead through guidance, coaching and teaching to provide direction and knowledge to the employees.

Collectivity: Since lean processes such as continuous process flow, level workloads and pull systems require team effort and cooperation, lean encourages team incentives rather than individual. Moreover, lean processes require consensus decision making which follow slow decision making in problem solving.

High Uncertainty Avoidance: According to Lacksonen (2010), precision, punctuality and standardized tasks with high uncertainty avoidance coincides with continual high quality work which lean processes encourage. In addition, the goal of lean processes to minimize variability will work well with the culture as employees follow rules and maintain consistency. It also requires clarity, unambiguous, certain and detailed instructions in implementation which gives comfort to employees.

Feminine traits: Lean processes, as being a team effort, promotes trust, respect for the network of partners and employment security.

Keeping these characteristics in mind, the implementation of the lean concept outside Japan is believed to be often problematic since the lean system aligns itself with the culture of cooperation and team work common to the Japanese social and business environment in which it was born and developed (Dominici, 2012) which often contrasts

with the work environment and structure of Western firms. In the US as illustrated in the study of Lacksonen et. al (2010) for example, most of the companies are initially focused on a short-term financial orientation which makes it difficult to allow time for lean implementation to reach its full benefits. Also, the independence of the employees makes it hard for them to accept standardization, kanban, one-piece flow processes and to reach consensus decisions during the problem solving process. Thus, when implemented in different nations, there is also a high probability that lean will not work and may require different managerial issues due to cultural differences.

2.6 Global Trends in Lean Implementation

2.6.1 Lean Enterprise (Manufacturing Excellence)

Womack and Jones (1994) define lean enterprise as “a group of individuals, functions, and legally separate but operationally synchronized companies”. More than an extension of lean manufacturing, the lean enterprise concentrates on the firm, its employees, partners and its suppliers to bring value to the customer (Abdullah, 1996). It tends to improve supply chain agreements as it encompasses all aspects of a company’s system. Otherwise known as Manufacturing Excellence, this organizational model’s mission is a focused analysis of the value stream so that processes from development to sales and maintenance as well provide maximum value to the customer. In order to accomplish this, companies need to encompass the whole enterprise, concentrating on the front end – design, procurement, packaging and customer service, extending the definition of excellence while applying lean techniques along the entire value stream. Womack and Jones (1994) believed that linking lean activities is difficult. Hence, creating lean enterprises will entail profound changes on employment policies, roles and relationships within companies of a value

stream. More importantly, a company aiming to create a lean enterprise should be able to understand the conflicting needs of individuals, functions and the companies.

2.6.2 **Integration Models**

Pepper (2009) argues that the improvements attained through the practice of lean principles become limited when implemented independently. He further suggests that the lean approach must integrate the use of targeted data to make decisions and also adopt more scientific approach to quality within the system. And, given the popularity of different management philosophies, it is inevitable that organizations find themselves merging these. Thus, the term Lean Six Sigma evolved. Lean, when used in combination with other complimentary continuous improvement techniques such as Six Sigma, provides leverage for comprehensive strategies and therefore provides a more integrated, coherent and holistic approach to continuous improvement (Pepper, 2009).

Besides Lean Six Sigma, an Integrated Lean TQM Model is being endorsed as a driving force for sustainability among scholars. Ho S. (2010) explores the Integrated Lean TQM model in order to help organizations worldwide to reduce global resource wastage hence sustaining growth and development.

CHAPTER 3

3 Research Methodology

This research was carried out through a DESCRIPTIVE Case Study. A descriptive case study is one that is focused and detailed, in which propositions and questions about a phenomenon are carefully scrutinized and articulated at the outset (Tobin, 2010). Information in such kinds of case studies is collected without changing the environment. Moreover, descriptive case studies aims to extensively evaluate (in detail and in-depth) a sample based on the articulation of a phenomenon.

For the purpose of this research, both primary and secondary data were exploited. For its empirical evidence, it draws on the experiences of two (2) prominent Philippine manufacturing plants. In order to comprehensively describe and determine the current manufacturing practices in the Philippines, interviews with key management and employees involved in lean manufacturing and plant visits were conducted on-site. In addition, in order to gain perspective on the effects of organizational culture in lean implementation, two (2) companies of different ownership types were selected to conduct the interviews with. Because of time constraints, these firms were chosen by reason of availability, ease of contact and openness to the research. Moreover, the companies selected are two of the most prominent, biggest and advanced in terms of manufacturing in the Philippines. Given these circumstances, it is but suitable to benchmark these two companies in terms of their manufacturing processes.

Interview questions were developed so as to directly point out the significance of the research. It seeks to describe manufacturing practices in the Philippines and the effects of lean manufacturing in the companies and inquire about the effects of culture in lean implementation. Interview questions were divided into seven (7) categories which included: the Company Background, Production, Quality Control, Cost Accounting, Leadership,

Strategic Planning and their take on Lean Manufacturing.

Moreover, secondary data was used with the intention of comparing Philippine practices with that of the Japanese. Since literature attest to high technological/process transferability within Japanese corporations and their subsidiaries, the study of Japanese-owned corporations in the Philippines was omitted. In addition, there has been a lot of available literature that reviews Japanese lean manufacturing practices. Instead, this research only focused on literature discussion of the Japanese practices in terms of lean manufacturing and management.

CHAPTER 4

4 Japanese Manufacturing Practices

Japan's economy is Asia's most developed and its second-largest (Hasegawa, 2014). Also, its contributions in management have been a major impact in businesses worldwide. In fact, literature suggests that the Japanese' strength rely on their manufacturing process strategies. Japanese firms stands out in industries where 'incremental innovation' occurs (Hasegawa, 2014) wherein the development of products is high through continuous improvement (kaizen). Typically, in other manufacturing countries, final results are emphasized more than the process and effort. In Japan, emphasis on process leads to the principle that quality should be built into the process (Lillrank, 1989). Thus, the concept of quality holds a central role in the Japanese management strategies which has expanded from a narrow production-management to a more general concept. Many Japanese manufacturers realize how important quality management is, and they have transferred these management methods to their overseas plants to successfully improve the quality level of their products as well (Miyagawa, 2005).

4.1 Characteristics of Japanese Management

Japanese firms do not see maximization of shareholder value as their ultimate purpose (Hasegawa, 2014). Instead, they aim to serve society, employees in particular, by creating benefits subject to the constraint of keeping their shareholders from revolting. This value to society may involve the almost total inclusion of the employee into the work organization so that the superior concerns himself or herself with the personal and family life of each subordinate; a collective, non-individual approach to work and responsibility; and extremely high identification of the seniority promotion with the company (Ouchi, 1978). Practices such as lifetime employment, seniority promotion, consensual decision making, continuous on-the-job training and enterprise based unions

encouraged the incorporation of employees into enterprise culture which led to strong employee identification with the firm and a high commitment to improved productivity (Moore, 1987).

The Japanese have relatively collectivist sense of identity that puts the interest of the group above those of the individual (Hasegawa, 2014). This is most evident in their *Keiretsu*. The keiretsu of Japan are controlled by groups of professional managers and are more decentralized and connected by cross-shareholdings. These firms are connected through a set of relations either by business or social nature with a common goal of succeeding using their combined resources and mutual help. Furthermore, its society is fairly hierarchical which is structured along the Confucian lines. Therefore, decision making in Japanese firms is collectivist which makes changes typically slow because of high level of societal coordination. However, once change is agreed, implementation can be quick and universal (Hasegawa, 2014).

Further, Japanese organizations tend to concentrate primarily in production (Gemba) and subsequently to other functions rather than using a top-down approach because it may halt the group's harmony and create conflicts in the long run. Japan is clearly the leader where the employees are regarded as their greatest asset (Dahlgard J. K., 1998).

Key principles of the Japanese management are enforced on their people through their educational system which includes personal discipline with high levels of tolerance and endurance, the role of the teachers who are held in great respect and the importance of working as a group (Dominici, 2012). At an early age, students are prepared not only academically but ethically as well, nurturing their ability to work with others and helping them keep out of trouble outside of school (Dominici, 2012).

4.2 Manufacturing Practices

Total Quality Control (TQC) is a management orientation prevalent in major Japanese manufacturing corporations. TQC builds a corporate culture of quality and continuous improvement into the organization. The system regards quality while aiming to satisfy customers as its core principle and applies systematic, scientific methods to this end. As Dominici (2012) points out, TQC can be considered as a useful tool in the constant pursuit for quality within the organization as it pulls together the entire system into utilization of resources. It is a philosophy that encompasses all the elements of an organization, creating a synergy, in order to motivate both the management and employees to practice higher levels of quality. Quality circles are the most efficient tool in TQC as means to foster harmony in an organization. Product line employees are organized in small groups (QC circles) who take responsibility for continuous improvement of the quality of work process, products and services (Hasegawa, 2014). Through quality circles, operators may be aware of problems existing and ways to resolve it. As with quality, continuous improvement (kaizen) have had a commanding influence in the management objectives and policies of a Japanese organization.

Moreover, so as to improve business processes, other production practices most Japanese organizations use are process simplification and cycle-time analysis. This has provided them much advantage in many industries. Not only has Japan been effective at reducing development cycle time, they have been equally effective at reducing the cost to develop a new product (Harrington, 1996). Additionally, Japanese firms tend to perform well wherever parts and processes are standardized to provide high product quality.

In terms of strategic planning, the traditional Japanese way puts emphasis on being customer-oriented which considers customer satisfaction. Businesses places importance on incorporating customer research into product designing and services. Further, Japan

places heavy emphasis on including competitor comparisons as an important consideration during the planning process (Harrington, 1996).

4.3 Japanese Lean Manufacturing

The Japanese lean manufacturing system has been the most studied and known across the world (Dominici, 2012). Post World War II, Toyota and other Japanese automakers were forced to alter processes in order to deal with the shortage of material and financial resources. This led to the development of the “Toyota Production System” which was then later adopted in other countries, especially in the US, as Lean Manufacturing. This system in Japan encompasses various management and operation approaches essential for its implementation such as Kaizen, Just in Time (JIT), Kanban, Jidoka, production smoothing, lead time reduction, Cell Manufacturing, standardization of tasks and often incorporating Total Quality Control (TQC). Toyota’s approach for instance, as a pioneer in the system, is a combination of TQC and the Toyota Production System (Shimokawa, 2009) putting TQC as a valuable factor in the Japanese lean manufacturing. Further, the company focused on the implementation of Kaizen and JIT in their processes.

Dominici (2012) also argues that Kaizen immensely influences the establishment of goals and policies of a Japanese manufacturing company. He then states that the feasibility of the lean production system is based upon which Kaizen are generated within the company which makes it a major influencer in company policies. And as previously mentioned, Japanese educational system directly motivates the kaizen thinking in the workplace. For instance, students are trained at an early age on the subject of kaizen basics such as 5S along with the value of group work. In the workplace, in order to encourage a consensus and employee participation, quality circles are put together. In

lean manufacturing, quality circles with the formal and informal management participation, plays an imperative role on the company's competency in carrying out lean objectives. Even in small and medium enterprises in Japan, it should be noted that the effects of lean manufacturing, Kaizen in particular, noticeably helps the companies with their productivity and efficiency (Austenfeld, 2005).

Additionally, the *Keiretsu* can be considered an important aspect in the success for lean production in Japan as it ensures long-term stable relations while the lean approach involves formidable and stable relations with suppliers with the aim of creating a unified and established network of supply chain.

CHAPTER 5

5 Case Study: Lean Manufacturing in non-Japanese owned corporations in the Philippines

As the manufacturing sector in the Philippines grows, Japanese-style practices are becoming widely known in the country. Accordingly, there have been movements that emphasize ‘total quality commitment’ programs and productivity improvements focused on cost-cutting, cost efficiency and total quality management (TQM). The following case studies show the extent to which Japanese-style practices or Lean manufacturing influence companies in the Philippines in their processes.

The two firms included in this study represent the largest sectors on the Philippine manufacturing industry: food and pharmaceutical. By far, these sectors have been the most advanced in terms of production improvement schemes. They include the utilization of a range of production technologies from the most advanced materials processing in the country to manual assembly. They also cover domestic and international markets while meeting different demand patterns. Thus, the cases can be considered to be fair representative of the Philippine manufacturing industry.

The companies were selected on the basis of their industry leadership and availability of information. **Table 5.1** provides details of the companies included in the study. For the purpose of this research, the companies were given fictitious names.

Table 5.1 Company Characteristics

	Ownership status	Industry	Years of Operation	Market Share
Firm A	Filipino-owned	Pharmaceutical	8	20%
Firm B	Multinational Subsidiary	Food	25	76%

Source: Company interviews, Website

Firm A is a subsidiary of one of the leading and largest Philippine pharmaceutical companies with a market share of 20 percent which they have sustained for more than three decades. Actual company shares are 60% of the mother company. Established in 1945, the owners are of Filipino-Chinese roots. This firm stands as a testament to the commitment of its late founder to provide affordable healthcare to all Filipinos and to be a firmly established industry leader noted for its corporate culture. It is the company's response to the rapidly changing landscape due to globalization and harmonization of regulatory standards in pharmaceuticals. The firm produces some of the leading prescription, consumer healthcare and personal care brands. Their plant is designed to manufacture a variety of products including prescription medicines in major therapeutic categories such as tablets, capsules, powders, ointments, and non-steroidal cream formats as well as liquid products in syrups, suspensions and drops format. Their corporate mission is to "provide quality and affordable healthcare products and services that promote and enrich life for all communities that we serve by working together as one united family." Their corporate culture revolves around family and community, cooperation and sharing. Because of their commitment and dedication to constantly raising the standards in the pharmaceutical industry, numerous respected professional groups have cited and recognized this company. And, equipped with a profound understanding and awareness of the customer needs, the firm strives to ensure quality products and services in every step they take. Thus, in pursuit of the most advanced techniques to deliver quality products, the company sought management practices which enable them to maximize efficiency and increase profits.

Firm B operates as a subsidiary of a multinational fast-moving consumer goods corporation which started in 1990. The firm was originally a Filipino family owned company founded in 1948. It eventually entered into a joint venture with a multinational company which is said to be the world's largest ice cream company. Now on its 25th year of operations, the firm continues to be a serious contender in the ice cream market, retaining 76% of the ice

cream market share with the closest competitor at 16%. The firm has launched various ice cream innovations which can attract both the mass market and high-end consumers with their value platforms, with supreme flavors that can excite the consumer's imagination and taste. Coined as a *GloCal* (Global + Local) company, the firm prides itself as the only subsidiary with core competencies that comes from both its global and local companies.

The multinational company being:

- The global ice cream leader
- Has rigor systems and processes
- World-class technologies handed down to its local businesses
- Outstanding ability to communicate to people worldwide with an impressive marketing arm
- Ability to work in multi-sectoral partnerships
- Experts in influencing public behavioral change
- Global logistics network
- Strong out-of-home business

And the local corporation as,

- Close to Filipino consumers
- Strong entrepreneurial spirit
- Speed to market
- Strong at-home business

Without a doubt, the firm exhibits and benefits from the business expertise of both companies. In fact through their core competencies, they were able to claim the leadership in the ice cream category.

5.1 Productivity Improvement Schemes

Table 5.2 summarizes the improvement schemes for productivity noted for both Firm A and B.

Table 5.2 Productivity Improvement Schemes

Firm A	Follows manufacturing network lean enterprise model which is based on lean concepts such as Value Stream Mapping (VSM), Single Minute Exchange of Die (SMED), Total Productive Maintenance (TPM), Standardized work, and Kaizen Suggestion System
Firm B	Implementation of Total Productive Maintenance and Kaizen

Source: Company Interviews

All schemes were initiated by the management wherein the employees are given consideration and value in all the decisions within the manufacturing site.

Firm A devotedly follows lean concepts through the manufacturing network lean enterprise model wherein the emphasis is to create a “culture of improvement.” Lean was introduced by a newly hired factory manager which was a trained lean manufacturing expert. The adaptation of the principle was initiated by the top management in response to the tight competition in the pharmaceutical sector in addition to increasing pressure from regulating agencies. Through the establishment of the program, employees were trained on the foundation tools such as 5S/6S and Lean Management Principles (LMP) and were later on introduced to much advanced tools such as SMED, VSM, TPM and Standardized work. In order to implement the program successfully, various departments are involved in the training which included different groups from Production, QA/QC, Engineering, Finance and HR. Through this, all of the personnel are involved in building the lean enterprise which they later impart to the contractual employees. In the shop floor, in order to create a continuous cycle of improvement, the firm implements the Kaizen Suggestion System (KSS). This is also a part of their lean implementation. Through this

program, people can suggest improvements on their assigned tasks. Subsequently, these ideas become learnings employees acquire from the different tasks. Thus, the management’s responsibility is to review and take actions on the suggestions.

Firm B employs a global policy of “World Class Manufacturing” wherein the emphasis is on accounting every cost involved in the operation. In the implementation of the program, the organization is spearheaded by the different “pillars” of the plant which is led by its different leaders namely: cost deployment, autonomous maintenance, focused improvement, professional maintenance, logistics, safety, environment, work place organization, quality maintenance and professional development. Strategies regarding production efficiency, quality and safety are in place and implemented in the plant such as the Factory Operating System which monitors the overall equipment efficiency and production volume. In addition, quality and safety huddles are conducted weekly so that employees are aware of the defects, downtimes and safety issues which occurred in the plant. In terms of employee role, operators and mechanics are responsible for performing the tagging of their own machine defects in maintaining their machines.

5.2 Quality Improvement Schemes

Table 5.3 summarizes the quality improvement schemes implemented by both firms.

Table 5.3 Quality Improvement Schemes

Firm A	Follows Kaizen suggestion system, 6S, Poka-Yoke (mistake proofing) in order to achieve “Zero Defects”
Firm B	Implementation of Quality matrix in the application of Autonomous maintenance step 4, Quality at Source, JIT and Kaizen

Source: Company Interviews

Quality improvements from both firms are categorized under a productivity scheme in the organization. In both firms, the emphasis is to maintain customer satisfaction and

loyalty by using schemes which produce the least possible defects as possible.

Firm A focuses its practices on employee empowerment. Since their quality improvement is tied up with KSS (Kaizen Suggestion System), all employees are involved in the strategy wherein they can give suggestions. In KSS, an improvement can be classified as follows: Muda (waste) elimination, 6S or Poka-Yoke (mistake proofing). The suggestions in KSS are reviewed by line leaders who will subsequently identify action items to implement the idea. Since the employees in the production line are the ones who identify the defects, their opinion is highly regarded as vital. Thus, decision making takes a while. Nevertheless, a good foundation for the implementation of quality initiatives is built by considering the employee feedback during the decision making process.

Firm B incorporates its quality improvement schemes in their Autonomous maintenance application. Step 4 of the autonomous maintenance focuses on the standardized work, training and inspection practice of all employees involved. Also, quality-matrix is very vital in the daily operation of the plant. By applying AM step 4, each operator understands the function of each unit of the assembly and how it affects the outcome of the product. In doing so, each machine operator has the responsibility for any defect or waste generated during operations. Noting the defects from the previous operation, this becomes learning for every employee in improving machine efficiency and productivity. In addition, the firm applies quality at source by implementing JIT (just-in-time) of material which means any raw material freshly delivered can be used immediately by the shop floor. This reduces waiting time for the movement of materials which in turn reduces stock inventory. Continuous improvement of processes is also encouraged through the implementation of Kaizen projects.

CHAPTER 6

6 Findings

6.1 'Best Practice' model in the Philippine manufacturing industry

The Philippine lean manufacturing practice is best described by Manufacturing / Operational Excellence implemented and adopted from multinational and local influences alike. **Figure 6.1** represents the “Best Practice” model of the Philippine manufacturing industry.

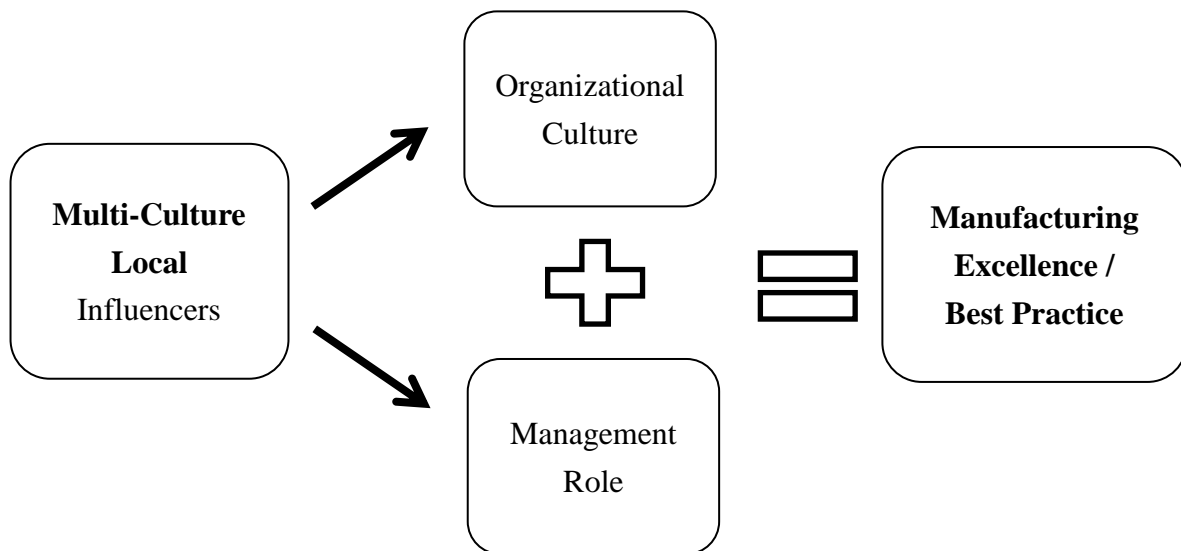


Figure 6.1 Best Practice diagram in the Philippine manufacturing industry

Due to historical circumstances, work practice influences in the Philippines have resulted to varied practices. Furthermore, a variety of ownership have exhibited varied strategies and mechanisms to promote productivity and variations in the degree of success to which management strategies fit local institutions as well as the attitudes and values of the Filipino workforce (Amante, 1997).

In terms of lean, Philippine implementation also exhibited varied ownership and management practices and policies. The impact of organizational culture and

management role varies from the combination of multinational and local influences within the organization. As a result, companies in the Philippines (demonstrated by the case studies) tend to adopt practices that best fit their processes as in hand-picked lean tools and methods. Hence, the “Best Practice” model in the Philippine manufacturing industry refers to the tendency of companies to select lean tools and methods best fitting their policies and processes depending on the governing organization and management culture of the company.

Local companies are capable of dedicated lean principles implementation although resistance to change is apparent and inevitable. On the other hand, multinational firms, although capable of dedicated lean implementation, prefer to implement selected tools and methods and excel in it. **Firm A** exhibits the potential of Philippine companies to successfully adopt new tools with lean implementation. The program has enabled the company to reduce product lead time and the conversion cost of manufacturing. Through quality improvement initiatives via lean, cost of quality related to rework and scraps was also reduced. In fact, the program is being benchmarked across the manufacturing network of the company. While in **Firm B**, by implementation of Total Productive Maintenance (TPM) Excellence, the factory reduced its loss to machine breakdown from 6.4% to 1% in a year. In addition, it simplified processes and reduced non-value adding activities in the plant. Both firms nonetheless follow the Manufacturing or Operational Excellence model of the lean manufacturing enterprise.

Hence, lean principles are known and are keenly implemented in the Philippine manufacturing industry. Lean tools and methods such as 5S, TPM, SMED, JIT, Poka-Yoke (mistake proofing) and Kaizen are the most popular tools implemented in the Philippine companies. The extent, however, still depends on influences overseeing the management policies. Implementation can vary from a devoted implementation of lean

principles to cherry-picked implementation of tools and methods which they think will work best in the company processes.

6.2 Similarities and Differences of Lean Implementation between Japanese and Philippine practices

The implementation of lean principles in the Philippine manufacturing industry is one way or another different from that practiced in Japan. Because of the varied workplace influences and cultural background in the Philippines, there are a number of similarities but mostly differences in the practices of both countries. **Table 6.1** summarizes the observed similarities and differences of Japanese and Philippine practices.

Table 6.1 Similarities and Differences of the Japanese and Philippine practices

	Japanese Practices	Philippine Practices
Organization and Leadership	Gemba (production) first – consensus decision making	Top - down decision making
	Emphasis on team work	Importance of employee feedback
	Keiretsu	
Strategic planning	Emphasis on customer satisfaction	Emphasis on customer satisfaction
	Competitor comparison	Competitor comparison
Manufacturing process	Lean thinking	Mass production mindset
	Emphasis on process (process simplification)	Emphasis on cost reduction
	Value in Kaizen	Involves Kaizen
	TQM	
Quality Control	Total Quality Control	Quality Assurance
	Quality is built in the process	
	Quality First	

In terms of organizational structure, the Japanese employ a consensual type of decision making wherein they emphasize teamwork while in the Philippine practice, top-down decision making is employed. Decisions in the Japanese process gives importance to employee feedback with emphasis on the Gemba (production) first and makes sure that the team is involved in the decision making process. Although they honor employee feedback in the Philippines, decisions are still made by top management and followed by all.” One decision influences each employee to follow that one decision” as stated by a manager from Firm B.

Customer satisfaction is important in both practices in strategic planning. Furthermore, competitor measurement is given weight in the Philippine practice as an alternative to looking for other strategies and innovations. Putting emphasis of the Philippine manufacturing industry on costs aside, the foothold for strategic planning on both countries are basically the same.

In manufacturing, the Philippine mindset is still at the stage of shifting from mass production to lean thinking. The manufacturing culture is still influenced by mass production and economies of scale, which means making more and faster is better. Mass production followed the very simple equation of “quality equal to costs” (Chiarini, 2013). While the Japanese emphasize process simplification in all its activities through lean implementation, lean tools and methods are used primarily in the Philippines to reduce costs.

Heavily influenced by the western culture, the Philippine manufacturing industry is still trailing with regards to quality policies. Western companies are behind their eastern counterparts in terms of formulation of quality policies and in communicating its content to all employees in the organization (Dahlgard J. K., 1998). While the Japanese has a culture of quality built in their processes and through continuous improvement, the

definition and practice of quality in the Philippines is still unclear. Taking into account costs, profit and productivity, quality in the Philippine manufacturing industry is yet trapped within the confines of “making more and faster is better”.

6.3 Major Gaps observed – Decision making and discipline

In order to successfully implement lean principles in the Philippines, two of the major gaps observed in the practices are discipline and decision-making or organizational structure.

One of the challenges that the industry has to overcome, and the whole nation for that matter, is the discipline in sustaining the program. A characteristic that the Filipinos have yet to learn from the Japanese is discipline from all the employees in the organization which is a key ingredient in lean implementation. In order to successfully implement 5S and standardized work, the Filipinos have yet to break free from the cultural work influences of the past.

Moreover, team (employee) empowerment and collectivity have a vital role in the continuity of the processes and policies in lean implementation. Collective decision-making, in particular, plays a critical role in upholding quality and productivity in the organization such that decisions, although slow, is concrete when made. One notable example in Firm B is that since final decisions are made by the top management alone, there is difficulty in maintaining continuity in everyday production. In troubleshooting, quality control personnel are not given enough power to stop the line whenever problems that mainly affect the quality of the products occur. Subsequently, more wastes are produced as the line continues with its operation while there is a major gap in decision making between quality personnel, line supervisors and the top management. By the time a decision is made, its products are bound for rework due to poor quality or turn to wastes as by-products of poor production. As a result, production

costs are increased instead of reduced. Obviously, making more and faster in this case is not better and that lean principles of lean have somehow failed in the program.

CHAPTER 7

7 The Future of Lean Manufacturing and Quality Control in the Philippines

As mentioned earlier, the production mindset in the Philippine industries is still influenced by mass production and economies of scale. Lean manufacturing, on the other hand, is customer-oriented. Products are produced by considering what the customer wants and delivers it on time and in full. This can be achieved through the elimination of wasteful activities throughout the entire organization. Thus, the challenge for the Philippine manufacturing industry is to change its traditional mindset of mass production to lean thinking. However, with cultural change comes resistance. Consequently, top management leadership has become necessary (Lillrank, 1989).

7.1 Workforce Training

The shift from the traditional mindset to lean thinking, however, can be tested by the resistance to the change in corporate culture. Since one of the essential elements in lean manufacturing is employee empowerment and team work, it is but necessary that all workers are trained from the top management to staff. Implementing lean is a very challenging task that the top management should recognize and deal with accordingly. As the whole organization goes on a journey requiring a new mindset, top management should make their own people realize that this radical change will benefit not only the company but the employees as well. Supportive training programs and seminars for the reorientation of work values should be emphasized. To make the transformation enjoyable and memorable, boot camps mimicking the line assembly should be organized with different groups from various departments joining the activities. Experience has shown that people learn best by doing and that participants are more likely to retain the knowledge they gained when they practice it in the workplace. In order to promote a

culture of improvement where people are empowered, the involvement of everyone accountable to the particular system improvement should be an essential element of training. Employees should feel that they are important and that their ideas are valuable and accounted for. Management should recognize that their people especially those in the shop floor who are manufacturing the company's products are the most important source of process improvement. This should demonstrate that lean implementation is a shared responsibility of the Management and the people.

7.2 Review of existing policies and procedures versus related production processes

Some lean tools are sometimes too advanced for implementation in an organization. Most of the time, tools are inappropriate for using in some processes that it ends up creating more wastes than what it is used for. Just-in-time (JIT), for instance, is very critical to use in raw materials for sensitive processes and that which requires meticulous inspection of quality people. Otherwise, once these raw materials are used and found with defects during the operation, more wastes will be generated due to probable waiting time of replacement, defective products and reprocessing. The challenge therefore lies on how the company can adapt some of the lean principles that are applicable to their respective processes. They can also use the lean system as a strategic weapon to beat its competition but they should know how to apply it in the best way that will help their organization.

CHAPTER 8

8 Conclusion

To answer the questions posted in the beginning of this paper, a descriptive case study was conducted in two (2) of the major companies in the Philippines. Along with the case study, the objectives of the research is to describe the current practice in the Philippine manufacturing industry in terms of lean implementation and its effects on the companies and to inquire about the effects of culture in their lean implementation. In addition, this research aims to understand the effect of organizational culture and management's role in lean implementation.

Japan continues as an important source of technology – both hard and soft – and of market competition (Sohal, 1998). One of the major contributions of the Japanese in the business world is a system that revolutionized manufacturing practices. At present, international markets are rapidly changing and moving away from the organizational structures of mass production (Chiarini, 2013). The role of quality has also expanded itself from an operational to a strategic issue in the competitive marketplace. In order to improve quality in the process and productivity, businesses are adopting varied management practices from countries other than their own. Lean manufacturing is no exception. However, implementing lean in a non-Japanese company is difficult because the societal culture differences increases the magnitude of the organizational culture change required for success (Lacksonen, 2010). Programs such as lean are most likely to work if the predominant organizational culture is well-suited to the values and basic assumptions put forward by the discipline. As Wu (2010) pointed out, organizational culture as well as quality culture is influenced by the national culture. Subsequently, it requires change in employee behavior which is still driven by the company's dominant organizational culture. In effect, employees get scared of doing things in contrast to a deeply rooted company culture which results in

resistance to change.

Although the Philippine workplace is a variation of influences through history, the system is still heavily influenced by the western culture. Various literature claims that in western companies, there are few investments and resources on education and training in quality per employee compared to their counterparts in the East, including Japan. Scholars believe that from a western point of view, if top management takes an active interest in placing quality processes in their organization then quality takes on a strategic role in the marketplace, otherwise it is only seen as an engineering concept and that top management would not see it as something important to waste time on. Quality motivation is not enough to ensure quality culture (Dahlgaard J. K., 1998). A quality culture should also encompass other methods ensuring the active participation of everyone in improving the quality of products, services and processes. Also, quality management practices need to be embedded in a supportive quality culture which consists of three core elements: doing the right thing the first time, striving for continuous improvement and fulfilling customer needs (Wu, 2010). Unfortunately, the Philippine manufacturing industry has yet to learn from the quality culture of the Japanese. Although existent in the current Philippine manufacturing framework, the practice is yet to experience a successful shift in their mindset. This change of culture from mass production to lean may take time and may not happen at the same speed as the establishment of the quality management practices. Naturally, the new approach seems fundamentally distinct from what the management team and the employees are accustomed to. It would simply be difficult for the people, including the management and employees, to rise above earlier cultural influences and completely recognize the essence of new quality and production philosophies. Top management leadership becomes necessary to initiate and sustain cultural change (Lillrank, 1989). However, leadership must go beyond knowledge and the implementation of technical management practices. Management programs should get the support of organizational members for change in culture and attitude (Wu, 2010). As an illustration, an organization

wanting to apply management practices but lacks the culture to support i.e. lack of empowerment of employees will only result to failure of the program as employees will be too intimidated to stop the production line whenever defects are seen. The success in implementing programs such as TQM, six sigma and lean production depends on the need of a company culture where everybody is proactively functioning to reduce waste. Everybody understands that everybody's participation and contribution is essential to the team.

Additionally, the implementation of quality management programs that prescribe specific policies and procedures (e.g. total quality management, ISO 9000, lean systems and six sigma) facilitates the development of learning processes (Mellat-Parast, 2012). Its implementation is subject to a balance between control and learning, between accomplishing stability and reliability goals and that of innovation and discovery. Furthermore, achieving effective management requires understanding, development and inter-organizational learning enhancement. Overall, the strategic planning process of quality management practices which includes plans on improving customer satisfaction will result to improved competitiveness and increased market share for companies. On the other hand, common reasons for the lack in progress in management implementations include insufficient leadership, resources and commitment. This should be the focus in improvement for organizations.

It is good to note that there is not a known universal world-class plant-management style (Moskal, 1995). Problems will not just automatically disappear by copying practices from other countries or randomly assigning responsibilities to people in the shop floor. The biggest challenge for non-world-class plants is to break out of the vicious circle of firefighting, which drains time, energy and money away from process improvement (Moskal, 1995). Organizations looking for systems that lead to excellence like lean manufacturing, six sigma and TQM has to start with a significant commitment and leadership by the top management.

In order to achieve the best results of lean manufacturing, manufacturers should be able to embrace a vision focused on lean enterprise. For that reason, they should pursue a higher

vision for the supply chain while integrating essential functions such as the manufacturing flow, organization, process control, metrics and logistics throughout the whole manufacturing system and more collaboration with customers. A lean enterprise is one that aligns itself to the goal of being as responsive and accurate as possible in all responses to customers and eliminating the many forms of waste, for both resources and time (Columbus, 2008). Lean, therefore is ‘a way of thinking’; to adapt to change, to eliminate waste and continuously improve (Anvari, 2011). Thus, in order for organizations to adjust to the change, it requires the following: ability to acknowledge that change is occurring, systems must have a conscious awareness of its state, the flexibility enough to make the change and the responsiveness of the system.

In summary, the Philippine manufacturing industry is currently experiencing a shift in mindset. In order for the framework to successfully shift from mass production to lean thinking, a significant commitment from the top management is most important. Their commitment to support the change in culture and to maintain the program is essential.

References

- (n.d.). Retrieved from <http://www.unilab.com.ph/about/>
- (n.d.). Retrieved from <http://leanmanufacturingtools.org/>
- Abdullah, F. (1996). Lean Manufacturing Tools and Techniques in the Process Industry with a focus on Steel.
- Amante, M. (1997). The 'Best Practice Model' and the Japanese Human Resource Approach in the Philippines. *Keio Business Review*, 13-32.
- Andersson, R. E. (2006). Similarities and differences between TQM, six sigma and lean. *The TQM Magazine*, 282-296.
- Anvari, A. I. (2011). A Study on Total Quality Management and Lean Manufacturing: Through Lean Thinking Approach. *World Applied Sciences Journal*, 1585-1596.
- Augustin, R. (2008). Manufacturing in a global context. In R. S. Schwientek, *Operational Excellence* (pp. 144-146). Palgrave Macmillan.
- Austenfeld, R. (2005). *A Study of the Use of Lean Manufacturing Techniques By Japanese Small and Medium Enterprises*. Papers of the Research Society of Commerce and Economics.
- Becker, R. (2001, June). Learning to think lean: Lean manufacturing and the Toyota production system. *Automotive Manufacturing & Production*.
- Bernardo, R. (2015, July 5). Retrieved from Business world online: www.bworldonline.com
- Bodek, N. (2010, August). A New Way to Become Lean. *Manufacturing Engineering*.
- Chiarini, A. (2013). *Lean Organization: from the Tools of the Toyota Production System to Lean Office*. Bologna, Italy: Springer.
- Columbus, L. (2008). *Best Practices in Lean Manufacturing*. Cincinnati: Cincom.
- Dahlgaard, J. D.-P. (2006). Lean production, six sigma quality, TQM and company culture. *The TQM Magazine*, 263-281.
- Dahlgaard, J. K. (1998). Quality management practices: A comparative study between East and West. *The International Journal of Quality & Reliability Management*.

- Daniel, S. L. (2010). Implementation of Japanese manufacturing strategies through management control systems. *Asian Business & Management*.
- Dominici, G. P. (2012). Decoding the Japanese Lean Production System According to a Viable Systems Perspective. *Springer Science + Business Media*.
- Ferdows, K. (1997). Making the most of foreign factories. *Harvard Business Review*, 73-88.
- Harrington, H. (1996). National traits in TQM principles and practices. *The TQM Magazine*, 49-54.
- Hasegawa, H. N. (2014). *Asian Business and Management*. Palgrave Macmillan.
- Ho, S. (2010). Integrated lean TQM model for global sustainability and competitiveness. *The TQM Journal*.
- Ho, S. C. (1996). Japanese 5-S practice. *The TQM Magazine*, 45-53.
- Kaluarachchi, K. (2010). Organizational culture and total quality management practices: a Sri Lankan case. *The TQM Journal*, 41-55.
- Katayama, H. B. (1996). Lean production in a changing competitive world: a Japanese perspective. *International Journal of Operations & Production Management*.
- Kerr, J. (2006). *What does "lean" really mean?* Logistics Management.
- Kull, T. W. (2009). Quality management effectiveness in Asia: The influence of culture. *Journal of Operations Management*.
- Lacksonen, T. R. (2010). Cultural Issues in Implementing Lean Production. *Industrial Engineering Research Conference*.
- Lee, C. Z. (2000). Quality management and manufacturing strategies in China. *International Journal of Quality and Reliability Management*, 876-898.
- Lillrank, P. K. (1989). *Continuous Improvement : quality control circles in Japanese industry*. Michigan: University of Michigan.
- Marksberry, P. (2013). *The Modern Theory of the Toyota Production System*. CRC Press.
- Mehta, R. M. (2012). An Exploratory Study on Implementation of Lean Manufacturing Practices (With Special Reference to Automobile Sector Industry). *Yonetim Ve Ekonomi*, 289-299.

- Mellat-Parast, M. (2012). Supply chain quality management: An inter-organizational learning perspective. *International Journal of Quality and Reliability Management*.
- Miyagawa, M. Y. (2005). An empirical study of TQM practices in Japanese-owned manufacturers in China. *The International Journal of Quality and Reliability Management*, 536.
- Moore, J. (1987). Japanese Industrial Relations. *Labour and Industry*.
- Moskal, B. (1995, April 3). Japan still rules the lean world. *Industry Week*.
- Ouchi, W. (1978). Type Z Organization; Stability in the Midst of Mobility. *Academy of Management Review*.
- Pepper, M. S. (2009). The evolution of lean Six Sigma. *International Journal of Quality & Reliability Management*.
- Pettersen, J. (2009). Defining lean production: some conceptual and practical issues. *The TQM Journal*.
- Pojasek, R. (2003). Lean, six sigma, and the systems approach: Management initiatives for process improvement. *Environmental Quality Management*, 85.
- Prajogo, D. S. (2003). The relationship between TQM practices, quality performance, and innovation performance: an empirical examination. *International Journal of Quality and Reliability Management*, 901-918.
- Roll, D. (n.d.). *Introduction to 6S*. Retrieved from Enterprises:
https://www.vitalentusa.com/learn/6s_article.php
- Russell, R. T. (1998). *Operations Mnagement: Focusing on Quality and Competitiveness 2nd edition*. Prentice Hall.
- Shimokawa, K. F. (2009). *The Birth of Lean*. Cambridge, Massachussetts: Lean Enterprise Institute.
- Smalley, A. (2005). The starting point for lean manufacturing: Acheiving basic stability. *Management Services*.
- Sohal, A. (1998). Assessing manufacturing / quality culture and practices in Asian companies. *The International Journal of Quality & Reliability Management*.

- Tobin, R. (2010). *Descriptive Case Study*. Retrieved from Encyclopedia of Case Study Research:
<http://www.srmo.sagepub.com/view/encyc-of-case-study-research/n108.xml>
- TPS Throughput Solutions. (2011). Retrieved from Lean Manufacturing Training:
<http://www.tpslean.com/>
- Wilson, L. (2010). *How to implement Lean Manufacturing*. McGraw-Hill.
- Womack, J. J. (1990). *The Machine that Changed the World*. New York: Maxwell Macmillan International.
- Womack, J. J. (1994, March). From Lean Production to the Lean Enterprise. *Harvard Business Review*.
- Wu, S. Z. (2010). Customization of quality practices: the impact of quality culture. *International Journal of Quality & Reliability Management*.

Appendix

Preliminary Interview Questionnaire

Company Background

1. In which type of business your company is involved with?
2. Who are the owners of the company?
3. How long have the company been operating?
4. What is the annual sale of the company?
5. What is the percentage of market share/sales of the company in its category?
6. How many employees does the company currently employ?

Production

1. What productivity improvement schemes do you implement in the manufacturing plant?
2. How do you implement Lean Manufacturing / TPM strategies in the manufacturing plant?
3. How extensive are your strategies implemented in the manufacturing process?
4. How does it influence the decision making in the production process?
5. How are the employees involved in implementing strategies for the production process?
6. How do they affect the decision making process?
7. Who makes the final decisions in your production process?
8. How does it produce satisfactory outcomes in your processes?

Quality Control

1. What quality improvement schemes do you implement in the manufacturing plant?
2. How do you implement Lean Manufacturing / TQM strategies to ensure the quality of your product?
3. How extensive are your strategies implemented to ensure the quality of your product?
4. How does it influence the decision making in the control of quality?
5. How are the employees involved in implementing strategies for quality control?
6. How do they affect the decision making process?
7. Who makes the final decision in the quality control process?
8. How does it produce satisfactory outcomes in your processes?

Cost Accounting

1. How do the strategies implemented for manufacturing and quality control affect the cost accounting of the company?
2. How does it influence the decision making in financing/accounting?

Leadership

1. As to which extent does the top management participate or assumes responsibility in the production/quality improvement practices?
2. How are the top management involved in all activities towards quality excellence?
3. How do you train/give training in regards to TPM/TQM?

Strategic Planning

1. How important are customer satisfaction measures in your business' strategic planning process?
2. How important are competitor comparison measurements to your organization's strategic planning process?
3. How often are customer expectations translated into design of new products and services by the department developing them?
4. How often do you use process simplification to improve business process?
5. How often do you use process cycle time analysis?
6. What percentage of employees are involved to some measurable extent in various quality-related teams?

Lean Manufacturing

1. What do you think of Lean Manufacturing/TPM/TQM?
2. Why do you think Lean Manufacturing Strategies are applicable or not to implement in your company?
3. How effective are the lean manufacturing tools in your manufacturing processes?