LEAN START-UP:

A CASE STUDY AT K TECHNOLOGIES

By

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ABSTRAK

Semua perniagaan akan melaksanakan usaha yang berterusan untuk terus bersaing dalam ekonomi yang berdaya saing. Dalam usaha untuk menangani keadaan ini, mereka cuba untuk melaksanakan teknik-teknik baru dan inovatif iaitu *LEAN* dalam organisasi mereka untuk meningkatkan keberkesanan dan kecekapan.

Dalam kajian ini, punca yang membawa kepada masalah yang timbul daripada pelaksanaan *LEAN* akan diserlahkan . Dari kajian teknikal , analisis punca, analisis *SWOT* dan analisis *TOWS*, kajian itu menemui cabaran yang dihadapi dalam pelaksanaan *LEAN* dan memberikan cadangan untuk penambahbaikan.

Kajian ini akan terus membantu organisasi untuk meningkatkan proses, menyelaraskan kepada kehendak pelanggan dan visi organisasi untuk meningkatkan produktiviti, kualiti dan daya saing.

Kata Kunci: lean, pembuatan lean , perlaksanaan lean, isu lean

ABSTRACT

All businesses has put in continuous efforts in order to survive in this current competitive economy. In order to handle this situation, they are trying to implement new and innovative techniques namely LEAN in their organization to increase its effectiveness and efficiency.

The objectives of this study is to identify the problem arises from the implementation of LEAN, to recognize the root cause and also to recommend how to improve on the implementation of LEAN in K Technologies. The methodology used in this case study consists of data collection, data linkages, data analysis and interview questions. Root cause analysis, SWOT analysis and TOWS analysis will be used to discover the challenges faced in the implementation of LEAN and gives recommendation for improvement. Interviews session were conducted with the managerial and operational level employees to obtain a more comprehensive findings.

This study is very important for the organization as there is no formal review on its progress and this study is expected to highlight on the main issues faced after the implementation. On other hand, managerial level employees will be able to understand what is being perceived by the operational level employees and this will helps the top management to rectify the problem and provide a well-defined training for this group of employees.

This study will further assist the organizations to improve its process, align to the requirement of its customer and organization's vision to enhance productivity, quality and competitiveness.

Keywords: lean, lean manufacturing, lean implementation, lean issue

CHAPTER 1: INTRODUCTION

1.0 INTRODUCTION

This chapter elaborate on the research outline of this case study. It will begins with the background of the study, research problem statement, case issues, research objectives, research questions, significance of study and lastly organization of chapters.

1.1 Background of Study

LEAN is no longer a strange word to anyone especially those that are directly or indirectly related to manufacturing/production. It is a philosophy that focus on creating value added to customers through a culture of continuous improvement and focus on elimination of waste.

Womack, Jones and Ross (1990) state that lean manufacturing is the systematic elimination of waste. Karlsson and Åhlström (1996) highlight that lean aims to increase productivity, reduce lead time and cost and improve. Liker and Wu (2000) elaborate lean as a philosophy of manufacturing that focuses on delivering the highest quality product on time and at the lowest cost. Hines, Holweg & Rich (2004) remark that lean

has undergone a significant evolution and development and has attracted more attention to be applied in the service sector. Dennis (2007) finds that the foundation of the lean system is stability and standardization. Wilson (2010) says that lean system strives to make one piece at a time; this is true one piece flow.

According to Womack and Jones (1996), there are five principles that form the basis for the concept of Lean manufacturing:

1) Specify value: The most efficient way to create a product is to have a complete understanding of what the end-user wants before production begins.
2) Identify steps: Once value has been identified, a process flow is mapped out to achieve the value.
3) Process flow: When the steps to achieve the value have been laid out, the actual process flow is ready to begin. Each step in the process should flow into the next step without hesitation.
4) Pull inventory: Only the exact number of parts is pulled from inventory and placed at the point of manufacture.
5) Strive for perfection: Improve the system continuously.

In short, the main objective of LEAN manufacturing is to produce an item based on customer specifications, in the fastest and most efficient way with the best possible price. (Campos, 2013).

1.2 Research Problem Statement

Before transforming lean production system into manufacturing excellence, K must know how to get things started in achieving lean. For instance, if a group of people were trapped in a completely dark room without any light penetration for an extended period of time and suddenly you were forced to be exposed to bright light, what would actually be the outcome? Without the right glasses on to minimize the discomfort, the spontaneous response is to quickly close your eyes, back to the comfort zone “blindness”.

The same theory applies when transforming batch production system to lean production system can provoke a similar response in a company. If the culture’s behaviors and mentalities (the glasses filtering their reality) are not adapt to lean thinking before lean tools are introduced, the relationship between the changes and the benefits will be doubtful.

As time goes by, when lean developments expose to negative issue in company’s processes and structure, the highest tendency of thoughts in everyone mind is return to working as they were familiar even if it is inefficient and unproductive. This is why so many companies across a

variety industries are struggling to sustain the implemented lean initiatives.

1.3 Research Gaps

During the research on the lean manufacturing, tools and techniques of lean manufacturing has been identified. During literature review research, several tools and techniques of lean manufacturing such as TQM, Kaizen, VSM, 5S's and may others were identified. It was also indicated that the procedure for implementation is equally an important issue. Past research has indicated that there are many obstacles that come while implementing LM. Many researchers found some barriers to LM. Teleghani Mohammad (2010) describes the various issues which can come while implementing the lean manufacturing technique in any industry through his research paper. While he has explained some of the barriers of lean manufacturing, he has not provided the inter relationship between them, nor he has suggested ideas to overcome these.

Following gap are identified from the structured review of literature:

Gap 1: Lean Manufacturing Practices in test and measurement industry is not fully explored.

Gap 2: Very little literature review available on Lean Manufacturing Practices in test and measurement industry.

1.4 Case Issues

In this case study, we would like to study how LEAN lead K Technologies in achieving their vision and become the most reliable supplier to the customer and to sustain it in future.

In order to achieve K's strategic objectives, investment was pour in for capacity expansion that enable them in the growing demand of electronic measurement devices. Hence, new highly innovative methodology and technologies of manufacturing processes required to improve their competitiveness.

With over 75 years of knowledge in this field, they have been receiving positive feedback as well as negative feedback from their existing and new customers. Hence, it is important that products produced in K are meeting the quality required and on-time delivery at competitive prices. In conjunction to that, lean production concept will be one of the best way to achieve the vision.

From a brief interview with key person involved in implementing Lean principles in K Technologies is conducted by the Operational Excellence and in K's point of view, LEAN is defined as delivery of superior value to their customers, shareholders, end employees through continual elimination of waste. K Technologies applies the LEAN principles in the strategic initiatives namely to identify the voice of the

customer, identify end to end improvement opportunities, improve flow and reduce variation, link support processes and standardize continuously improve. K Technologies also implement the seven waste in one of the LEAN principles. The identified wastes are transportation, inventory, motion, waiting, over processing, over production and defects.

There are three key dimensions that are identified as the factors that affect the implementation in this case – Cultural Transition Issues, Employee Development and Technology Challenges. Firstly, implementing lean requires only small number of employees which need to take up a wider range of responsibilities. This will lead to changing the norm of the employee by assigning unfamiliar work processes. Secondly, talent gap will be created when implementing lean principles in one organization. LEAN requires more educated and trained employees compared to conducting the production in a conventional way. This will refrain the current employees from develop as organization tends to hire qualified employees to fill up the gap. Lastly, technological challenges will be one of the key issue in LEAN manufacturing because in order to achieve continuous improvement, significant upfront investment is important in ensuring statistical analysis can be obtained for monitoring quality improvement purposes.

If K is able to overcome the three key dimensions and reinforce its ability then they will have a higher chance to successfully transform into a more customer focused, waste eliminating manufacturer and sustain

a business model of continuous improvement. Successfully sustaining the LEAN manufacturing processes required true commitment from all key personnel.

1.5 Research Objectives

The objective of this research as below:

1. To identify the problem arises from the implementation of LEAN in K Technologies.
2. To recognize the root cause that lead to the problems arises resulted from the implementation of LEAN in K Technologies.
3. To recommend how to improve the implementation of LEAN in K Technologies.

1.6 Research Questions

To achieve the objectives above, various research question could be generated in order to obtain more extensive and reliable information especially from the related personnel that are directly and indirectly related in utilizing the lean principles. This research will address the following questions:

1. What are the problem arises from the implementation of LEAN in K organization?

2. What are the root cause that lead to the problems arises resulted from the implementation of LEAN in K organization?

3. How to improve the implementation of LEAN in K organization?

1.7 Significance of the Study

This study will be beneficial to the company in term of how the stakeholder perceived on the implementation of LEAN in the organization.

The study contributes to the company by identifying the root cause that lead to the problem arises from the implementation of LEAN. By reducing or eliminate the factor that lead to inefficiency of LEAN implementation will help to smoothen the implementation progress.

1.8 Organizations of the Chapters

This study is organized into seven chapters. Chapter 1 present on the introduction of this case study. Chapter 2 elaborates on the industry profile. Chapter 3 contains literature review. Chapter 4 discusses on the research methodology for this case where Chapter 5 presents on the case

write up. Chapter 6 discusses on the case analysis and finally Chapter 7 presents on recommendation, limitation, contribution and conclusion.

CHAPTER 2: INDUSTRY PROFILE

2.0 Introduction

In this chapter, test and measurement industry will be discussed and reviewed in order to have a thorough overview on the industry nature.

2.1 Test and Measurement Industry

The test and instrument industry is a dynamic and fast-growing segment of the global economy. They serve as a diverse group of end market and provide critical products and services that helps their customers in improving their quality, safety, productivity and compliance to the international standard.

Companies in this industry produces equipment used to test electrical properties and signals. They deal with the manufacture, research and development of advanced test and measurement tools required in most industries. Major companies in the rest and measurement industries are Agilent, Danaher, and Teradyne (all based in the US), along with Anritsu

(Japan), Rohde & Schwarz (Germany), Spirent Communications (UK), and Yokogawa Electric (Japan).

Test and measurement devices are essential tools for developing new technologies. These tools derived from some simple measurement devices such as ruler to more advances tools like oscilloscopes, millimeter, analyzer and spectrometers. Wireless Internet, desktop computers, aircraft and other electrical infrastructure may not exist without electronic test and measurement tools as the supporting equipment in product's construction. Demand is driven by growth in primary end-use markets, including electronics and semiconductor manufacturing, telecommunications, aerospace and defense. The profitability of individual companies depends on controlling manufacturing costs and maintaining continuous, rapid product innovation. Large companies enjoy economies of scale in sourcing components and product distribution. Small companies can compete by specializing in equipment for niche markets or developing a reputation for high-quality products. The US industry is concentrated: the largest 50 companies account for about 75 percent of revenue.

Based on the test and measurement review by KPMG in year 2013, the growth prospects or this industry are driven by numerous factors. They are being identified as increasing products complexity, shortening product life cycles, increasing healthcare expenditures, tighter regulations and

lastly growing demands for accountability, quality and traceability. The first driver, increasing product complexity which emphasizes on progressively innovated new products are becoming more complex and customized. The continuous need for improvement and efficiencies in materials, costs and capabilities is encouraging manufacturers to further utilize test and measurement companies to test products and processes for compliance with quality, performance and regulatory standards.

Secondly, shorten product life cycles and reduces production time are necessary in ensuring faster and more accurate product development support. Test and measurement companies accompanied with their expertise in test design and ability to leverage investments in technology, are increasing their focus on efficiency and specialized capabilities in order to keep up with competition and enhance their standing with customers.

Thirdly, more companies are increasingly turning to the test and measurement industry to certify new products and help remain in compliance with tougher, continually evolving laws ad requirement. Regulations have been introduced, effected, altered, amended, withdrawn and reissued multiple times in the past ten years. This often requires significant and ongoing testing and certification services.

Lastly, growing demands for accountability and quality where customers are increasingly aware of the product quality issues and manufacturers has to be prepared to deal with customers concern effectively. Test and measurement companies help manufacturers to understand the complexities and deal with the potential problems before, during or after they arise.

The test and measurement industry includes both products and services. Major products include instruments such as frequency counters, logic analyzers, millimeters, oscilloscopes, voltmeters, and waveform synthesizers. Other products include instruments designed for a specific application, such as communications testing equipment and instruments to test semiconductors. These instruments are used to test electrical equipment and to measure electrical properties.

The collective value of all products and services is estimated at $130 billion globally. KPMG had projected an annual growth rate of 5 percent to 9 percent for the industry subsectors. KPMG has estimated global market of $55 billion for test and measurement instruments and a growth rate of 5 percent to 7 percent has been projected long-term.

Globalization has continue to encourage mergers and acquisitions in this industry. Acquirers are seeking to expand their current market to gain local capabilities and expertise in order to meet the fast changing

customer's demand. In order to meet this demand, larger companies will seek the opportunity to acquire smaller and specialized competitors in order to strengthen and diversify their current offering and also to leverage their resources. This strategy will provide ample opportunities for the sellers to achieve liquidity.

2.2 K Technologies in Test and Measurement Industry

K Technologies is one of the company that combine through mergers and acquisitions to be more focus on the test and measurement industry. At the same time, K Technologies had acquired AT organization in order to venture into the wireless space. K Technologies involved in several industry however this study will focus on test and measurement industry. K Technologies provides electronic measurement solutions to the communications and electronics industries in the United States and internationally. It operates through two segments: Measurement Solutions, and Customer Support and Services.

The Measurement Solutions segment sells radio frequency and microwave test instruments and related software, and electronic design automation software tools for use in wireless, and aerospace and defense applications; digital test products, including oscilloscopes, logic and serial protocol analyzers, logic signal sources, arbitrary waveform generators, and bit error rate testers that are used by research and development

engineers; and voltmeters, multimeters, frequency counters, bench and system power supplies, function generators, and waveform synthesizers, as well as related software that are used by engineers in research and development laboratories. This segment also offers semiconductor and board test solutions, such as parametric test instruments and systems, in-circuit test systems, and laser interferometer measurement systems; surveillance systems and subsystems comprising probes for detecting signals and software, which are used by defense and government engineers and technicians; fiber optic test products, including optical modulation analyzers, component analyzers, optical power meters, and laser source products; and atomic force and scanning electron microscopes.

The Customer Support and Services segment provides repair and calibration services for its customers' installed base of instruments; facilitates the resale of refurbished used equipment; and offers parts and self-maintenance tools. The company sells its products through direct sales force, distributors, resellers, and manufacturer's representatives.

Overall, test and measurement industry is positioned as a stable and consistent future growth due to strong fundamental. Both strategic and financial acquirers expect industry consolidation to continue as an attractive market to invest in.

CHAPTER 3: LITERATURE REVIEW

3.0 Introduction

In this chapter, literature review on lean manufacturing/production, cultural issues, employee development, technology challenges incorrect implementation and application of lean will be discussed.

3.1 Lean Manufacturing/Production

Lean principles help to examine business processes and focus on minimizing unnecessary costs, reducing waste and improving inefficient procedures. The benefits of implementing lean are able to identifies problem areas and bottlenecks, increase business efficiencies, cost saving and simplify processes.

The first ever lean processes has been originated by Henry Ford followed by Kiichiro Toyoda and Taiichi Ohno in the 1930s for developing the Toyota Production System. The lean concept originated by Toyota helps companied achieve more with less human effort, time and cost. (Womack et al, 1994). It was then popularized by Jim Womack the

author of Lean Thinking, The Machine that Changed the World and Lean Solutions (Womack et al, 1990) was earlier solely implemented on the manufacturing shop floor usually referred to as “lean manufacturing” or “lean production”. In another study conducted by Womack and Jones (1994), Lean production can be defined as an alternative integrated production model because it combines distinctive tools, methods and strategies in product development, supply management and operations management into a coherent whole. According to Womack and Jones (2003) research, lean principles can be applied in any industry. The lean approach consists of various practices which aim to improve efficiency, quality and responsiveness to customers.

According to Shah and Ward (2007) and Ugochukwu et al., 2012 lean is a management philosophy that enhance customer value through waste elimination and continuous improvement in a system, by applying lean principles, practices and techniques. Achieving lean production is a long and practically constant process which the participants must continuously manage and undergo changes. (Karlsson and Ahlström, 1996).

Dankbaar (1997) stated that lean production makes optimal use of the skills of the workforce, by giving workers more than one task by integrating direct and indirect work and by encouraging continuous improvement activities. As a result, lean production is able to manufacture

a larger variety of products, at lower cost and higher quality, with less of every input, compared to traditional mass production: less human effort, less space, less investment and less development time.

Singh (1998) stated that Lean manufacturing is a philosophy, based on the Toyota Production System, and other Japanese management practices that strive to shorten the time line between the customer order and the shipment of the final products, by consistently eliminating waste. Lean manufacturing extends the scope of the Toyota production philosophy by providing an enterprise-wide term that draws together the five elements – product development process, supplier management process, customer management process and policy focusing process.

Alves et al. (2012) stated that lean production is evidenced as a model where the persons assume a role of thinkers and their involvement promotes the continuous improvement and gives companies the agility they need to face the market demands and environment changes of today and tomorrow. Hallgren and Olhager (2009) described lean manufacturing as a program that aimed at increasing the efficiency of operations. Holweg (2007) mentioned that lean manufacturing extends the scope of the Toyota production philosophy by providing an enterprise wide term that draws together the five elements – product development process, supplier management process, customer management process, and policy focusing process.

3.2 Cultural Issues

According to research done by Bhasin (2012), every Lean failure is the fundamental issue of corporate culture and change management. The supporting cultural considerations need to be in place to support the appropriate environment ensuring Lean is successful. In other research performed by Kull, Yan, Liu, & Wacker, (2014), lean manufacturing has cultural vulnerabilities that manifest in the observed lean manufacturing practices being less effective. Popular discussion of culture and lean manufacturing focus too much on operators, missing the fact that national culture has facility-wide effects on the shared system of assumption, values and beliefs. (Schein, 2004).

Some managers and employees presumed that the factor behind Toyota success was about the cultural roots, but not lean practices. Despite criticism raised by other organizational management, Toyota as a successful leading organization in lean application has demonstrated high performance with its production system established in all multinational manufacturing sites (Wafa and Yasin, 1998). Many employees reported a culture shock when their organization started to implement lean principles, processes and practices (Czabke, Hansen and Doolen 2008).

3.3 Employee Development

Awareness regarding the importance of managing employees during the lean conversion is not new, as the following sentence from 1991 reveals: "*We know very little about the causes of implementation problems, but the evidence seems to suggest that human resource issues often are their root*" (Huber and Brown, 1991). Even fewer studies consider workers' feelings and perceptions (Brown and Mitchell, 1992 and Shafer et al., 1995), and none of them considers employees' feeling of success, which we think are crucial to successful lean implementation. Employees are usually concerned with their own tasks and "direct" work environment, perception regarding the success or failure of lean manufacturing from employees' point of view can be derived largely via employees' own experience.(Losonci, Demeter, & Jenei, 2011). The source of activation of hidden resources is the creativity and innovative capability of employees (Mertins and Joechem 2001)

Iverson (1996) studies employee acceptance of organizational change and suggests that commitment should be considered as a main determinant, and a mediator of factors in the process. Shadur et al. (1995) study predictors of an employee approval of lean production and find that commitment to the company is one important element. Total quality management (TQM) programs also show that "*the commitment of employees to the goals of the organization is a critical component of any total quality programme*" (Jackson, 2004)

3.4 Technology Challenges

It is now common for manufacturing firms to adopt both manufacturing technologies and lean practices and therefore, it is important to understand the synergistic effects of manufacturing technologies and lean practices on improving operational performance. (Challis et al., 2002). Technology implementation not only requires learning new software applications, but also requires learning how to reinvent workflow, how to train employee and assign responsibilities, and the way of modelling construction. (Arayici et al., 2011).

3.5 Incorrect Implementation and Application of Lean

According to Marvel and Strandridge (2009), applying lean strategies incorrectly will increase the inefficiencies of an organization's resources and reduced employee confidence in lean strategies there by applying the appropriate lean in a particular process or procedure is very important. Incorrect application of lean concept leads to waste of the organizational resources and reduction in employees' confidence in practicing lean In addition, Marvel and Strandridge also argues that a few organization gain significant improvement after implementation however due to the implementation remain localized, those organization unable to sustain the continuous improvement. It is suggested that scope and content of lean manufacturing should be holistically verified prior to any lean implementation (Crute, Ward, Brown, & Graves, 2003). Complications of

lean implementation are believed to be driven by executive, cultural, managerial, implementation and technical barriers (Flinchbaugh, 1998).

Bhasin and Burcher (2006) study show that the implementation of lean is still facing problems and presented the underlying reasons surrounding low rates of successful lean initiatives.

According to Womack and Jones (1996), most the literature focused on the implementation of lean technique or principles in an organization however the effectiveness and sustainability of these lean has been highly variable (Motely, 2004). The critical issue identified from these review has been categorized as pre-implementation, implementation and post implementation.

3.5.1 Pre-implementation Issues

Implementation plan is very important in order to determine the success of lean adoption in an organization. Before implementing lean, an awareness program has to be created for all employees. The objectives of lean should be make clear to all employee especially operational level employees. It is not easy to identify lean drivers and barriers for an organization therefore top management have to commit to ensure reducing barriers and leveraging driver. Develop a full plan of implementation and post-implementation task. Some of these prerequisites cannot be taught

or forced, but should be developed and nurtured through proper training (Anand & Kodali, 2010a).

3.5.2 Implementation Issues

The implementation phase focus on identification and elimination of waste through proper lean tools and principle application. This has been agreed by Worley (2004) where they mentioned about lean manufacturing is defined as a systematic removal of waste by all members of the organization from all area of the value stream. Lean is a practice with objectives to generate a system that is efficient and well organized and devoted to continuous improvement and the elimination of all forms of waste. Lean means “manufacturing without waste.” The lean approach is focused on systematically reducing waste in the value stream.

3.5.3 Post-implementation Issues

Observation obtained showing that many of the companies reported initial gain from lean implementation often found that improvement remain localized and the company unable to retain continuous improvement. (Mohanty et al., 2007). The post-implementation phase complete the lean implementation process however due to lack of pre-implementation planning it will eventually impact the overall progress. This phase is mainly to observe the outcomes and analyzing the entire process as after implementing lean, the organization needs to be patient in order to observe positive outcome.