

IMPLEMENTATION OF LEAN MANUFACTURING PROCESS TO XYZ
COMPANY IN MINNEAPOLIS AREA

by

Kazuhiro Yamashita

A Research Paper

Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
With a Major in

Management Technology

Approved: 3 Semester Credits

INMGT-735 Field Problem in Management Technology

Carol Mooney, Ph. D.
Research Advisor

The Graduate School
University of Wisconsin-Stout

May 2004

The Graduate School
University of Wisconsin-Stout
Menomonie, WI 54751

Abstract

	Yamashita	Kazuhiro		
(Writer)	(Last Name)	(First Name)	(Initial)	
Implementation of Lean Manufacturing Process to XYZ Company in Minneapolis Area				
(Title)				
Management Technology	Dr. Carol Mooney	May, 2004	43	
(Graduate Major)	(Research Advisor)	(Month/Year)	(No. of Pages)	

American Psychological Association (APA) Format

(Name of Style Manual Used in this Study)

Today, numerous companies have a major opportunity to reduce their costs and customer lead time and cycle time through the application of Lean Manufacturing processes. Its roots lie in the manufacturing industry and are strongly influenced by the production system principles originally developed by the lead automotive company called Toyota in Japan. These Lean Manufacturing technologies have been widely utilized and applied by numerous manufacturing companies worldwide. However, not many organizations talk about how the Lean Manufacturing process has a large and long lasting impact on their performance and profits.

This case study research paper focused on behaviors that organizations must exhibit to correctly implement and sustain lean manufacturing practices. The purpose of this case study was to determine how the consultant of Stout Advanced Manufacturing Assistance (SAMA) is implementing the Lean Manufacturing process based on the

company actually located in Minneapolis. Data, such as a company's information, was provided by SAMA.

This paper also focused on how the business consultants execute organizational change such as "Lean Manufacturing Implementation Process" in the real business world from a corporate training standpoint. Lean Manufacturing fundamentally seeks to remove non-value-added processes from production in order to improve efficiency. Upon completion of this case study, the researcher will be able to define how the manufacturing industry can learn more about the Lean Manufacturing process and not be concerned with the size of a company.

Acknowledgements

First of all, I express my gratitude to Dr. Carol Mooney who is my study advisor, for her initial encouragements, valuable time, advice, and comments to me to take on this big challenge. Without her intellectual advice and support, I would think this study would not be completed. I also express my special gratitude to Ms. Vicki Weber who corrected my grammar for this study.

I especially thank my parents and all of my friends in the United States and Japan, and many individuals who have gave their support and encouragement, otherwise, I could not have completed this much volume of study.

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Chapter One

Introduction

When was the last time you purchased a customized computer just for you and found exactly what you wanted? Because of the large number of options available that a consumer can make, most customers end up compromising. You buy the shape you do not prefer or pay for a premium DVD drive you may not need. This problem is not just for the computer industry. Why do modern day factories manufacture an abundance of products that sit as excess inventory yet they still do not know what exactly the customer wants? In the past, the rule of traditional business in the manufacturing industry was dictated by a high volume of products at low costs. Today, Lean Manufacturing has been a great interest for manufacturers not only in the United States but the whole world. It is because this principle affects companies of all sizes. Numerous companies are applying Lean technologies and seeing dramatic improvements in quality, production, customer service, and profitability. What is “Lean Manufacturing”? Lean Manufacturing technology is not just a management style or a way of producing better products. It is a production philosophy. You can also understand as the way of mapping the overall production process from raw materials to finished products all the way to the customers. It is called “Lean” because this technology, or a process, helps manufacturers to produce more with less time, inventory, capitals and fewer resources.

In most production cycles, only a small amount of time is spent adding a value to a product, something that is meaningful in the eyes of customers. Most manufacturing efforts

are spent on activities that do not add value to the product and are not required by the process or by the customers. This is non-value added activity. Often cases, when manufacturers would like to improve or increase production output, it is common practice to simply plan more of everything. It is very common to hire more employees, buy more equipment, or a build more factory space. This actually would result in more value added activity with higher output but also higher non-value added activity. Lean Manufacturing takes a different approach. In Lean Manufacturing, the production output or non-value added activity is expanded into value added activity. The operation should be the same size as prior time, additional employees should not be higher than before unless it's really needed, new equipment should not be purchased unless it's really needed, and existing employees do not need to work harder or faster than before. The Lean Manufacturing approach is to redirect non-value added activity into value added activity.

Lean Manufacturing technology is focusing on the whole operation. It examines the total operations system rather than an isolated system improvement. A guiding principle of Lean Manufacturing is production management. Flow will improve when you get rid of wasted time, effort and processing. Lean challenges the principle of economy of scale, which says the larger the production run will lower the cost per unit. Lean Manufacturing principles are actually focused on smaller batches to smooth production flow in the plant.

Statement of the Problem

Organizations of all sizes are trying to stay competitive and profitable for a long-term period. Most companies have a major opportunity to reduce their cost, customer lead-time and cycle time through the application of Lean Manufacturing technologies. The

purpose of this study is to identify how the business consultant can develop an efficient organizational culture that is capable of implementing “Continuous Improvement” for a long term.

Research Questions and Objectives

This research will address the following questions:

1. What are the benefits of implementing Lean Manufacturing with consultants?
2. Would it be suitable to implement Lean Manufacturing technology into a small shop with a small number of production and employees?
3. How do senior business consultants measure the effectiveness of Lean Manufacturing implementation?
4. How do senior business consultants deal with resistance when employees are against organizational changes?

Research Objectives

Objectives of this study were to:

1. Identify the benefits of learning how manufacturing industry should learn more about Lean Manufacturing process not to be concerned with the size of a company.
2. Identify approaches to redirect non-value added activity into value added activity in order to improve efficiency of production.
3. Provide solutions to production processes that reduce cost, free up working capital, and reduces customer lead time.

Assumptions

Lean Manufacturing technology is applicable to all sizes of manufacturing related companies in any environments.

Limitations

The researcher was limited to the resources available and the body of knowledge on the topic of Lean Manufacturing technology and was limited to the time available to complete the study.

Methodology

This research paper will focus on behaviors that organizations must exhibit to correctly implement and sustain Lean Manufacturing practices. The purpose of this study is to determine how the senior business consultant of Stout Advanced Manufacturing Assistance (SAMA) is implementing the Lean Manufacturing process based on a company actually located in Minneapolis. Company data will be provided by SAMA. The researcher will conduct interview sessions at the office of the consultant. During the interviewing session, interviewee will be given a direction questionnaire. Interviewee will only be asked the questions which researcher has prepared in advance. The answers will be recorded by a digital recorder for quotation and analysis purposes. The fundamental background of the Lean Manufacturing process and consultant's work execution procedure will be learned by information gathering from academic books, the Internet, and various academic journals. This paper will also be focusing on how the business consultants execute organizational change such as "Lean Manufacturing Implementation Process" in the real business world from a corporate training standing point.

Definition of Terms

Cycle time - The maximum time that the product is available at each work station (Heizer & Render, 1995).

Just in Time (JIT) – A philosophy of continuous and forced problem solving that drives out waste (Heizer & Render, 1995).

Kaizen – The Japanese word for the ongoing process of incremental improvement (Heizer & Render, 1995).

Kanban - The Japanese word for card that has come to mean “signal”; a Kanban system moves parts through production via a “pull” from a signal (Heizer & Render, 1995).

Lead time - In purchasing system, the time between placing and order and receiving it; in production systems, it is the wait, move, queue, setup, and run times for each component produced (Heizer & Render, 1995).

Poka-yoke – Literally, translated, “foolproof”; it has come to mean a device or technique that ensures the production of a good unit every time (Heizer & Render, 1995).

Pull System – A JIT concept that results in material being produced only when requested and move to where it is needed just as it is needed (Heizer & Render, 1995).

Total Quality Management – Management of an entire organization so that it excels in all aspects of products and services that are important to the customer (Heizer & Render, 1995).

Value Added – A process is value added if it causes a change in the physical state of the material, in accordance with customer specifications (Regan & Slattery, 2000).

Work in Process (WIP) – in complete products or components of products that are not longer considered raw material but have yet to become finished products (Heizer & Render, 1995).

5S – Japanese have 5 words all beginning with “S” that describes their strategy for attaining workplace organization and cleanliness. The five Japanese S’s are spelled in English as “Seiri, Seiton, Seiketsu, Seiso and Shitsuke”. The last two S’s are most frequently translated as Standardized Cleanup and Discipline, but the typical Japanese explanations are not useful (Regan & Slattery, 2000).

Chapter Two

Literature Review

In Chapter Two, a review of literature related to the Lean Manufacturing principles was conducted and discussed. Detailed topics included in this chapter are for history of Lean Manufacturing, Lean Manufacturing philosophy, Quality Management concept, and Employee Empowerment.

History of Lean Manufacturing

Jones, Roos, and Womack (1991) found that “After World War II, Eiji Toyoda and Taiichi Ohno at the Toyota Motor Company in Japan pioneered the concept of Lean production” (p.11). Toyota Motor Company developed their original moving assembly line called “Toyota Production System (TPS)” to keep material flow continuously. Monden (1983) states that:

The TPS was developed and promoted by Toyota Motor Corporation and is being adopted by many Japanese companies in the aftermath of the 1973 oil shock.

Thought the main purpose of the system is to reduce costs, the system also helps increase the turnover ratio of capital (i.e., total sales/total assets) and improves the total productivity of a company as a whole” (p.1).

The Toyoda family originally owned a big textile company in Japan. After World War II, the Toyoda family decided to start new venture from Toyota Automatic Loom Company to a Toyota Motor Company. Wren and Greenwood (1998) stated, “The Toyota Automatic Loom Works was the product of the inventive and entrepreneurial genius of Sakichi, who perfected Japan’s first power-driven loom and held numerous patent for automatic looms

and textile production” (p.218). Sakichi sold his automatic loom patents to finance a research of automobile manufacturing system with his son Kiichiro. In the mean time, General Motors (GM) and Ford assembly plants had located in Japan. Therefore, challenging the new automotive venture for the Toyoda Group was considered a risky business. According to Wren and Greenwood (1998), the eldest son of Sakichi, Kichiro Toyoda, was in charge of loom production. He had a great interest of the automotive engine as well. He had studied Western automotive industry to modify their management into Toyota’s way of automobile assembly line. Even though conditions to make competitive automobile products against Western automobile products were extremely difficult, both the Toyoda family and Taiichi Ohno were trying to modify number of ideas and skills imported from the Western countries. Kiichiro was trying to modify higher production quantities into smaller production quantities in order to match with Japanese economy size at that time. In addition to the smaller production quantities, Kiichiro was trying to establish Toyota cars as fuel-efficient vehicle that would match Japanese narrow streets and tight expenditure of Japanese people (Wren & Greenwood, 1998). Jordan and Michel (2001) stated, “Toyota and Japan needed a different manufacturing paradigm” (p.14).

The Japanese have defined that anything prevents the flow of material is called “Muda” which means “Waste” in Japanese language. Jordan and Michel (2001) stated, “Toyota and Ohno realized they had to get the most out of each worker, and that would happen only if the workers knew how to do many different tasks effectively” (p.14). After World War II when Japanese manufacturing industry was suffering from a poor quality production system, Toyoda Motor Company started to develop their own efficient

production principal. According to Jordan and Michel (2001), “the Japanese government, with support from the United States occupation forces, provided a protective cover for struggling Japanese industries while the domestic manufactures tried to find the way”(p.14).

When we talk about the history of Lean, we should not forget about Henry Ford. Because it is not too much to say that he initiated to pioneer the foundation of lean production system in manufacturing industry. Globally, Henry Ford is well known as a pioneer of Ford Motor Company also known by pioneer of “Mass Production”. In the book *The Machine That Changed the World*, Jones, Roos, and Womack (1991) stated that:

After World War I, Henry Ford and General Motors’ Alfred Sloan moved world manufacturing from centuries of craft production- led by European firms- into the age of mass production. Largely as a result, the United States soon dominated the global economy (p.11).

Henry Ford knew that he could keep the prices of his products low by reducing the production cycle by using their assembly line. However, in the book *Becoming Lean*, Liker (1996) stated that:

Ford made a dramatic wrong turn at his new Rouge complex. He maintained the assembly track but rearranged his fabrication machinery into process villages. He proceeded to run a push schedule in which growing fluctuations in end-customer demand and persistent hiccups in upstream production were buffered by a vast bank of finished units forced on the dealer network and equally vast buffers of parts at every stage of production upstream from assembly. Thus "flow" production - as

Ford termed it in 1914 -became mass production (a term he also coined, in 1926, without realizing the difference), and the opportunity to carry lean thinking to its logical conclusion was lost (p.xiv).

The focus on the Ford flow production system was getting their automobiles out and keeping all machines and equipment busy all the time. They did not pay attention whether the next process was ready for producing more products or not. Eventually, they produced excess inventory all the time. Unfortunately, Ford Motor Company failed to develop an efficient production system from the original vision of Henry Ford's plan.

Quality Management Concept

The first management consultant (engineer named a Frederick W. Taylor) can follow development of an integrated quality control. Philip B. Crosby asserted the "non-defective" program adopted by the federal government of the United States, which defines quality as "conformance to requirements." The work about nature improvement is continued. Application of these concepts to a service industry resulted in the new concept based on the marketing approach and the strong customer focus of Philip Kotler's. Deming, Juran, and Crosby (these people began the TQM process) share the common theme of the participatory management (Mighetto & Associates, 2001).

Deming is widely accepted to be the teacher of a quality management, and he is known by the world of his "14 points for Management". Deming began teaching a statistics quality control immediately after World War II in Japan, and it is admired that it was an important contributor to the nature improvement program of Japan (Cottman, 1993). Following are the 14 major points of quality management.

1. Create a constancy of purpose for improvement of product and service
2. Adopt the new philosophy
3. Cease dependence on mass inspection as the primary method for improving quality
4. End the practice of awarding business on the basis of price tag
5. Constantly improve the process of production and service
6. Integrate modern methods of on-the-job training
7. Develop tailored methods of supervision and management
8. Drive out fear
9. Break down barriers between departments
10. Eliminate slogans, numerical goals, posters and other pressure-creating devices
11. Eliminate procedures that require a specific output from each employee
12. Remove the barriers that stand between the engineer and his right to pride in workmanship
13. Institute a vigorous program of education and retraining
14. Encourage every individual within the workplace to dedicate himself to this transformation (Cottman, 1993, p.29-30)

Quality management has a big impact on the entire organization in every competitive business environment. Total Quality Management (TQM) technique is developed by Americans to control production and quality. According to Mighetto and Associates (2001):

TQM is a participative management style which emphasis of total employees' commitment to customer satisfaction. It is a holistic approach to managing complex organizations and replaces top-down management with decentralized customer-driven decision making. Total Quality Management is an integrated management system for creating and implementing a continuous improvement process -- eventually producing results that exceed customer expectations. It is based on the assumption that 90 percent of problems are a result of process, not employees (<http://www.eskimo.com/~mighetto/1stqm.htm>).

Capezio and Morehouse (1993) define that "Total Quality Management refers to a management process and set of disciplines that are coordinated to ensure that the organization consistently meets and exceeds customer requirements" (p.1). After World War II, there was a growing awareness for all nations manufacturing industry to remain compatibly strong in a global market place requiring adopting a new business culture. Japan was trying to analyze the American industry after the war, and desired to take over the challenge of the direct competition with the United States (Capezio & Morehouse, 1993). TQM is requiring the new business culture. Every one of the employees play a part to producing and delivering quality products. Cartin (1993) speculates that:

It will become evident that TQM is a way to manage any organization. It is being successfully adopted in industry, government, and services. But it is not a collection of tools that can merely be plugged in to produce results. Some tools use alone can produce improvement, but only adoption of the fundamental principles will results in maximum benefits (p.xii).

Manufacturing industry has been to understanding the significance of continuously improving the quality of their products and service as a means of achieving long-term business goals. Manufacturing industry has also recognized that quality must be customer driven from placing the order to delivering the products.

Quality improvement is the peculiar portion of a quality control process.

Continuous improvement has to consist of diagnosing core quality process in the entire system. Berk (2000) stated that “The continuous improvement concept focuses on finding shortfalls and sources of variability in administrative, manufacturing, and service process that can detract from a quality output, and improving the process to eliminate undesirable outputs” (p. 7). Berk (2000) has also given the outline for “Strategy for improving Continuous Improvement”. This outline is used very successfully in a large number of organizations. The outline below can provide a good road map for considering quality management. Following is the 12 points outline.

1. Define Current Status
2. Define Objectives
3. Select Improvement Teams
4. Assign Improvement Teams
5. Define Processes
6. Identify Variability Sources
7. Identify Potential Improvements
8. Perform Experiment(s)
9. Modify Upgrades As required

10. Implement Pilot Upgrades
11. Measure Results
12. Implement and Move To Next Projects

Figure 2-1 (Berk, 2000, p.7)

Mighetto and Associates (2001) states that, “Management participation and attitude, professional quality management, employee participation, and recognition reflect a philosophy making internal and external customer satisfaction as the organization's primary goal”. Quality management is for all organizations. The only thing required before implementation is “Willingness of Change”. Even leading companies in the United States have recognized that, in the long term period of time, they will surely support customers further by delivering higher quality products at the lowest possible cost in a short period of time (Cartin, 1993).

Employee Empowerment

Employee Empowerment is defined as “Enlarging employee jobs so that the added responsibility and authority is moved to the lowest level possible in the organization. Empowerment allows the employee to assume both managerial and staff responsibilities” (Heizer & Render, 1995, p. 370). Employee Empowerment is one of the ways of managing complex organizations. Western managers believe they are “in Charge” (Cartin, 1993, p.61). According to Orf (1997), she thinks the Japanese are well known for group orientation society. She states that:

One of the reasons often given to explain why Japanese managers succeeded in winning such a high degree of commitment from their workers is that instead of

imposing their own decisions on the workers, they often leave decision making up to their workers (p.75).

However, the beauty of empowerment is universal strategy. Hand (1994) states that “Managers support and stimulate their people, co-operate to overcome cross-functional barriers, and work to eliminate fear within their own team” (p.25).

Often times, many supervisory levels of employees believe that empowerment may end up losing their authority and eventually losing their jobs. Consequently, you can expect that most of the resistance to empowerment comes from the middle management. However, employee empowerment does not mean that managers no longer have the responsibility to lead the company and are not responsible for subordinate’s performance. Hand (1994) speculates that supervisory and middle managers must be trained well due to accustom with organizational change. It’s actually that stronger leadership and accountability are required to obtain in an organization that seeks real empowerment. There are no companies can create high quality work process and products without making sure each employee in that company is well trained.

Initiating employee empowerment is going to help in creating a healthy work environment where employee motivation can be developed. Therefore, employees are able to make more decisions beneficial to organizations. Communication between management and employees is one of the identical signs of employee empowerment. It is significantly important to recognize that there is a relationship between satisfying internal customers (employees) and meeting external customers’ needs. When organizations cannot treat their employees correctly, they cannot be expected to treat external customers with loyalty.

According to Cartin (1993), “Involvement is most effective when organizational members are organized into teams (p. 61). Organization can measure the result of empowerment only when the entire organization is willing to work as a team. Capezio and Morehouse (1993) define that “The process of forming teams and making them work in a productive and results-oriented way requires key elements to ensure success (p.157):

1. Clear roles
2. Skill development
3. Participative environment.

The synergy of work processes improvements by teams can be significant. If an organization has not been actively initiating employee empowerment, according to Conner (2001), “no amount of Lean technologies will make a significant and sustainable difference in your company’s performance” (p.171).

Chapter Three

Research Methodology

Introduction

Research Methodology applies to ways the researcher comes close to problems and seeks answers. This chapter describes the subject of the study and how he was selected for inclusion in this study and the methods used to gather information.

The main objective of this research project was to eliminate non-value-added activities and increase company's profitability while increasing production and reducing costs at the same time. The purpose of this study was to determine how the consultant of Stout Advanced Manufacturing Assistance (SAMA) is implementing Lean Manufacturing process based on the company actually located in Minneapolis.

The UW-Stout Technology Transfer Institute (STTI) was established to promote technology transfer between UW-Stout and industry. The institute, part of UW-Stout's College of Technology, Engineering, and Management (CTEM), draws on Stout's impressive technical resources, including the expertise of its faculty, staff, and students and its well-equipped and diversified laboratories. Stout Advanced Manufacturing Assistance (SAMA) is the one of many centers located within STTI. SAMA offers a broad array of affordable services to make companies successful. They offer educational seminars and on-site, hands-on technical assistance. SAMA can provide advanced manufacturing services such as, Computerized Process Simulation, Mold fill Analysis and Finite Element Analysis to optimize process and product designs. SAMA uses proven technologies and best

practices to help solve complex business problems as well as new and innovative solutions (UW-Stout website, 2003).

Research Design

The participant in this study was a full-time senior consultant within the Stout Advanced Manufacturing Assistance (SAMA) at University of Wisconsin-Stout. Following a review of the related literature, an interview session was used due to gather data from full-time senior Lean Manufacturing consultant.

The research addresses following questions:

1. What are the benefits to implementing Lean Manufacturing?
2. Would it be suitable to implement Lean Manufacturing technology into a small shop with small number of production and employees?
3. How senior business consultants measure the effectiveness of Lean Manufacturing implementation?
4. How the senior business consultants deal with resistance when employees are against organizational changes?

The research objectives of the study were:

1. Identify the benefits of learning how manufacturing industry should learn more about Lean Manufacturing process not to be concerned with the size of a company.
2. Identify approaches to redirect non-value added activity into value added activity in order to improve efficiency of production.
3. Provide a solutions to production processes that reduce cost, free up working capital, and reduce customer lead time.

Instrumentation

Interview. The intention was to elicit an honest, straightforward response from the senior consultant about his attitudes and perceptions toward Lean Manufacturing. Data will be provided by the senior consultant of SAMA. The researcher will conduct an interview session at the Stout Advanced Manufacturing Assistance office. The purpose was to gather data on SAMA's Lean training program as perceived by the senior consultants' viewpoints, identify the key points of making corporate changes within the organization by using senior consultants, identify solutions to stay competitive and training encountered by the employees and employers. The instrumentation process involved an interview questionnaire of 20 questions. The research instrument was developed for the study and as such the questionnaire and the data obtained from the questionnaire were original. The questionnaire was designed to determine how the business consultant could develop an efficient organizational culture that is capable of implementing "Continuous Improvement" for a long term. The interview questionnaire was also designed to extract feedback regarding the senior consultant that provides lean business training to many manufactures. The main purpose of the interview was to attain answers to the objectives previously discussed in the methodology introduction and research design part. In order to collect and classify the main data for this research project, the questionnaire was chosen as a research tool. While it is generally the basis of original research, especially the questionnaire developed for this study, therefore is original to the proposition itself. However, the review of published literature lacked recent substantial studies specific to execute organizational change such as "Lean Manufacturing Implementation Process" in the real business world from a corporate

training standpoint. This study answered questions concerning what senior lean business consultant's values for topics and delivery methods. Clear directions and interview session with SAMA senior consultant improved the reliability.

Sample Selection

To accomplish the objectives of this study, an interview session was conducted to a full-time senior consultant within the Stout Advanced Manufacturing Assistance (SAMA) at the University of Wisconsin-Stout. The researcher was referred to the interviewee by the program director of the Management Technology major since the interviewee has tremendous amount of experience in implementing the Lean Manufacturing process into many organizations. The interviewee from SAMA was identified as a qualified data source for this research project, as his professional opinions and viewpoints could best address the research questions.

Research Procedures

The interview was conducted on August 21, 2003 at the office of the SAMA consultant. During the interviewing session the interviewee was given directions and questionnaires. The interviewee was only asked the questions which the researcher had prepared in advance. Prior to the date of interview session, the interviewee was informed that the participation in the study was voluntary, and there were no consequences for choosing not to participate. Their answers were recorded by digital recorder for quotation and analysis purposes. The fundamental background of Lean Manufacturing process and consultant's work execution procedure will be learned by information gathering from academic books, the Internet, and various academic journals.

Data Analysis

The data collected during the interview session was analyzed to determine the scale that raising potential profit through increased production size or reduced operational costs at the same time. Data analysis for this study consisted of compiling responses to open-ended questions. All open-ended responses were listed by the researcher and summarized into appropriate headings. The data is clearly displayed through appropriate headings that could potentially be improved. Qualitative data was analyzed by identifying and organizing the qualitative responses that introduced distinctive concepts. The data from the interview will be compiled to determine what characteristics are. It will then be decided if consultant should be utilized for lean manufacturing implementation, or having no trainers would succeed in lean training environment. The following chapter displays a complete review of the data gathered by interview session.

Chapter Four

Results

Introduction

This chapter reports on the results from the interview session with the full-time senior consultant within the Stout Advanced Manufacturing Assistance (SAMA) at the University of Wisconsin-Stout. The data gathered from the interview questionnaires based upon the responses of the consultant was used to meet the objectives of this study.

The objectives for this study were:

1. Identify the benefits of learning how manufacturing industry should learn more about Lean Manufacturing process not to be concerned with the size of a company.
2. Identify approaches to redirect non-value added activity into value added activity in order to improve efficiency of production.
3. Provide a solutions to production processes that reduce cost, free up working capital, and reduce customer lead time.

The interviewee provided responses that assisted in meeting the objectives for this research study. The following 20 questions were the questions used in the interview session instrument.

Interview Session Review

Question 1: How do you define the Lean Manufacturing? Interviewee responded that Lean Manufacturing is a philosophy or strategy eliminating “non-value added” or “waste” in business environment.

Question 2: What are the benefits of Lean Manufacturing? Interviewee responded that a typical benefit is not unusual to have a 50% reduction of floor space requirements, and increase capacity of the units produced, 30 to 100% increase of capacity. It would also reduce direct labor cost, indirect labor cost and floor activity improvements of 20 to 50%. Interviewee responded that organizations are also able to expect 90% of cycle time reduction, WIP (Work in Process Inventory) reduced by 60 to 80%.

Question 3: What techniques are used by Lean Manufactures? Interviewee responded that there are some diagnostics that need to occur before actual implementation of Lean. Then consultants start working on” Value steam mapping tool”. It is a graphical and a quantitative review of current state of organization. This is a projection of what the future state might look like. Some other tools might be used implement Lean is set up production, Kanbans system, Pull system, Preventative maintenance, Process Kanbans, Material Kanbans and Line balancing. Those are the tools of Lean might be used for the company of traditional batch manufacture into Lean Manufacture environment.

Question 4: What is the history of Lean Manufacturing? Interviewee responded that it can trace Lean Manufacturing as Toyota Production System (TPS). TPS is the origin of assembly line. The most of the companies and most teachings are credits Lean Manufacturing back to the TPS. Lean is the brand name; it has been under other names in the past. However, the Lean is the brand name; it has not gotten popular until mid 90’s.

There are new brand names coming out lately. Today, Lean can anticipate 20 to 25 of new brand names.

Question 5: When the organization does not have much budget to implement Lean, how much does it cost to the implementation of Lean? Interviewee responded that how much money an organization has always how much money organization can spend. It based on plant capacity and financial and time. Interviewee also responded that what can organization swallow the change at one time is the key point. It can be inexpensive. Interviewee speculated that usually smaller shop's ability to change is more significant than a big company. Big organizations have bigger organizational cultures and egos. Therefore, it's usually slower to implement Lean thinking. Smaller companies have limited financial status but typically they can implement Lean much quicker and aggressively than bigger companies. Interviewee also responded that successful company implements Lean into an innovative and creative concept. Typically, companies with successful Lean implementation are providing Lo-tech rather than Hi-tech skills and products. In America, 20 years ago, manufacturers were looking for solutions based on a technology basis. Lean is not necessarily for that. Organizations should be focusing on "doing for less", innovation and low cost have much more meaningful role to the organizations. Interviewee speculated that a typical Lean implementation at small companies with under 30 people will get the 80% of the benefits with doing three things.

1. There is a basic training and basic education needed so that everybody understands what the Lean is and common terminologies.

2. Consultants and organizations need to do diagnostics of the company before implementing Lean into organizations. Value stream mapping (diagnostic tools) is one of the Lean tools consultants usually use during diagnostic events. Value stream mapping indicates that where organizations are your heavy hitters are and major opportunities and improvements lie.
3. Lastly, consultants take those heavy hitters into real Lean implementation process. Series of Kaizen events needed to occur. Once a company starts doing Kaizen events, the company can assume that probably 80% of Lean implementations are done at this time. However, companies have to understand that Kaizen approaches have long-term continuous improvements process.

The interviewee also mentioned that typically, one training event could cost \$30,000 with one value stream mapping event, and one Kaizen event.

Question 6: Even for the shops do not make thousands of pieces and products every year, we can still implement Lean manufacturing? The interviewee responded that one of the common misunderstandings for Lean is that lots of people think Lean is only for high volume and repetitive products manufactures. Interviewee speculated that even though consultants are able use Lean concepts in high volume and repetitive products manufacturers, the biggest return of investment is in small job shops.

Question 7: Can Lean be applied to the Administration and Indirect areas of business? Interviewee responded that Lean is the way of eliminating the waste. Wherever waste exists or non-value added activity exist, concept of Lean can be applied.

Manufacturing industry actually leads Lean and right now medical industry and administrative industry is beginning to realize the benefits potentially doing Lean concepts.

Question 8: How is the effectiveness of the change Lean measured? Interviewee responded that from a financial standpoint, especially in the manufacturing industry; the current financial community is using a technique developed by Ford a long time ago. Interviewee speculated that financial figures in manufacturing industry are way behind what the current trend is. Therefore, financial measures often lead you in the opposite direction of Lean thinking. The best way to measure the effectiveness of Lean is with the ratio of value added and non-value added time. Interviewee responded that the ideal way to measure value added time is calculating percentage of total times of value added time. Interviewee also responded that organizations should also be look into “Sales dollars per Full time equivalent employees (FTE)” or how many sales dollars you can support for particular business environment.

Question 9: What kinds of waste does Lean Manufacturing eliminate? Interviewee responded that organization could eliminate “Time”. “Waiting” is a biggest waste of time in all organizations. “Waiting” for machines, people or products will direct correlation to costs.

Question 10: Some companies seem to use Lean Manufacturing as just another way of getting rid of people’s job. I guess job security is one of the biggest issues for front line stuff or shop floor people. Is that a purpose? Interviewee responded that companies’ values are varied. There are two sides of the equation for making money. Organizations can increase output with same input or keep same output with decreasing your input.

Otherwise, organizations can keep constant output while reducing your input in order to make more profit. Interviewee responded that what consultants would like to see is combination of those two. Implementation of Lean can reduce the input required while increasing the output. It is very important to understand the balance of reducing both input and output ratio. Which way do consultants see more often? It depends on a company's vision. Interviewee responded that often times they see the necessity of increasing a job but, not under the old way of ratio. It should be under the new ratio.

Question 11: What is the final target or vision of Lean Manufacturing? Interviewee responded that they are looking for zero waste, which means total elimination of waste.

Question 12: How long will it take to complete implementation of Lean Manufacturing? Interviewee responded that once an organization starts the Lean process, they really never get to the end. Lean is a continuous improvement process. Majority of the Lean process goes through a 3 to 9 month period. After 3 to 9 months period, all the Lean process will become a continuous improvement process.

Question 13: Is it necessary to hire consultants to implement Lean Manufacturing? Interviewee responded that only 10% of the companies that he is aware of take some workshops or seminars about Lean Manufacturing. The process of learning Lean is like driving a car. People need to do classroom education and then need to do behind the wheel training before you can go on your own. Consultants rarely see companies hurting their own company implementing Lean by their own. However, organizations can hurt their company when they do it wrong.

Question 14: Who would lead the project? Interviewee responded that consultants facilitate the process. Consultants should never lead the projects. Projects can be executed by shop floor people or by someone from the management level. Often case, management people usually lead the project. Organizations have to have buy in from top management. However, organizations should remember that actual implementation is done by shop floor people.

Question 15: Do you have an outline so that clients can understand what will be done during the training sessions? Interviewee responded that clearing the expectations is really important. When the project does not go well, there are some major expectation discrepancies between consultants and clients. A client is expecting one thing and it is something different from what they have expected.

Question 16 and 17: What are the basic steps are before the actual first training day? How would the assessment done normally? Interviewee responded that clients need to recognize some needs in their operation. Assessment is basically looking into where the opportunity lies in your company. Then consultants talk about how you address those opportunities into Lean environment. These steps could be generated by the consultants. Get buy-in before the actual implementation of Lean process is really important as well. Once a company has buy-in from everyone, some educational steps can be skipped. Consultants do not need to teach what the “Kanban” is. If people already know what the Kanban is, consultants can move to the next step. Consultants can talk more about how to implement Kanban system.

Question 18: How do you mostly concentrate on most on training day? Interviewee responded that consultants pay attention to cultural resistance during training sessions. Consultants especially concentrate on measuring people's willingness and ability to change towards Lean environment. Interviewee responded that within the training world, things cannot be changed when people in the company do not want to change.

Question 19: How do you deal with people who resist the change? Interviewee responded that resisting is the most difficult thing to deal with. Often times, people do not like to change because people like the things as they were and want to keep the things as they are. Interviewee responded that this is human nature. How do you deal with it? It depends on personality and each situation. In a Lean implementation process, dealing with changes, motivating people with new environment and having management people to deal with employees who do not want to change are the most difficult part. Interviewee responded that when you watch a person walk a dog, you can tell who is walking who. When the dog is pulling a leash and choking and person stretching leash, neither one of them has much control of walking. By simply teaching a dog how to yield, when the dog is going too far forward or slowing too far back, you give a little talk and you can pull the dog back into right position. If you can do this process repeatedly, you can do the same type of training into manufacturing industry. When you have well trained employees, the work will be very enjoyable one. Following discipline and having an efficient work process makes everybody a lot happier in along run business environment.

Question 20: Do you do anything different from other consulting agencies?

Interviewee responded that they have more of a social conscious. Traditional consulting is

like any other traditional business thinking. Primal objective was making more money. SAMA and few other agencies around the nations are called “Social consulting enterprise”. SAMA’s goal is to let the company become more competitive, more efficient, and Leaner environment in the business world. Interviewee responded that SAMA wants to make money while they are doing that.

The following chapter will illustrate the summary, conclusion, and recommendations for further research study. The following chapter will utilize the interview session result and literature review to provide ample data to assist in illustrating the importance of hiring professional business consultants while implementing a Lean concept into a real company.

Chapter Five

Summary, Conclusions and Recommendations

Introduction

This chapter contains the conclusions and recommendations drawn from all the information gathered in the previous four chapters. Based on the findings, a number of conclusions are made, with specific recommendations suggested for each conclusion. This chapter is divided into three sections: [1] a summary of the study; [2] conclusions based upon the results of the study; and [3] recommendations for further study.

Summary

This section addresses several elements as related to this study. Included in this section will be a restatement of the problem and a review of the methods and procedures used to gather all the information found in this research.

Restatement of the Problem

The purpose of the study was to identify how the business consultant can develop an efficient organizational culture that is capable of implementing “Continuous Improvement” for a long term. This paper also focuses on how the business consultants execute organizational change such as “Lean Manufacturing Implementation Process” in the real business world from a corporate training standing point.

Objectives of this study were to:

1. Identify the benefits of learning how manufacturing industry should learn more about Lean Manufacturing process not to be concerned with the size of a company.

2. Identify approaches to redirect non-value added activity into value added activity in order to improve efficiency of production.
3. Provide a solutions to production processes that reduce cost, free up working capital, and reduce customer lead time.

This research will address the following questions:

1. What are the benefits of implementing Lean Manufacturing with consultants?
2. Would it be suitable to implement Lean Manufacturing technology into a small shop with small number of production and employees?
3. How senior business consultants measure the effectiveness of Lean Manufacturing implementation?
4. How the senior business consultants deal with resistance when employees are against organizational changes?

Methods and Procedures

The method used for gathering all the information found in this research was an interview session conducted by the researcher. The researcher contacted the interview session with full-time senior consultant within the Stout Advanced Manufacturing Assistance (SAMA) at University of Wisconsin-Stout. The purpose of this study was to determine how the consultant of Stout Advanced Manufacturing Assistance (SAMA) is implementing Lean Manufacturing process based on the company actually located in Minneapolis. The interviewee from the SAMA was identified as a qualified data source for this research project, as his professional opinions and viewpoints could best address the research questions.

Conclusions

The senior consultant within the Stout Advanced Manufacturing Assistance (SAMA) at the University of Wisconsin-Stout who participated in this research indicated and mentioned the many benefits of Lean Manufacturing process. Whatever the industry, many organizations agree that Lean thinking and Lean Manufacturing processes are the continuous process that must be driven even further down the supply chain. The positive compensation in the near future can be tremendous and remarkable. Lean environment involves the total elimination of waste due to providing customers with high quality products within targeted delivery due dates at an efficient target cost. The following were a few important findings from the literature review and the interview session.

Major Findings

What are the benefits of implementing Lean Manufacturing with consultants?

This research indicates that labor force will be definitely flexible, and all the workers would have the ability to move from one workstation to another while maintaining the highest production rate and operational standards. Furthermore, an organization will see the total elimination of non-value added time because of the efficiencies achieved by practicing Lean thinking. Production levels will be stabilized because of improved operation systems, standardized work process, and improved labor skill and knowledge. By defining success in implementing Lean Manufacturing process into the organizations, professional consultants will be focusing overall operational systems and processes that affect a manufacturer's operation level. They will research and study everything from workforce, machine productivity to products, operational cost, finance, and process engineering. Moreover, when consultants make a visit to company, they would like to see the key processes and support systems that can improve a plant's productivity and often

its quality performance as well. Most of the organizations that are focusing on quality in process are more likely to see tremendous improvements in productivity of their quality products. Those two areas are intimately linked to each other because when an organization is improving one aspect, it will usually improve the other aspect at the same time. Organizations paying attention to the simplified work process often is the resulting benefit of higher quality products with less resources and capital. Moreover, improved process engineering and product design will reduce the need for inspections and quality control activities at plant. Less rework can be done at the end of the work process, as well as fewer defects at the customer level.

Would it be suitable to implement Lean Manufacturing technology into a small shop with small number of production and employees? Lots of manufacturers have been expressing their doubts about Lean Manufacturing implementation. Often times, manufactures assume that Lean is only for high volume and repetitive products manufactured. However, the reality is, in most respects Lean Manufacturing process can be implemented faster, cheaper and better in a small job shop. Smaller job shops have a smaller number of people. While implementing Lean concepts into organizations, teamwork is a critical point to Lean Manufacturing success. Organizations must recognize how to best provide the leadership, training, support from management, and the understanding required for the Lean system to succeed. Lean environment requires that managements should go to the shop floor more often and pay special attention to the employees who are actually doing the job.

How senior business consultants measure the effectiveness of Lean Manufacturing implementation? When organizations would like to track Lean progress,

then performance measures are essential. Performance measurement is critical aspect, but primal targets after implementing Lean Manufacturing process must be more than cost reduction. Lean thinking and process need to provide proper customer driven quality production system and not be internally focused. Performance targets have to consider not only reflect a tentative reduce in all costs, but also a long term in standardization of work and pay attention to continuous improvement of their work process and quality. Lean thinking will offer a positive approach and methods for meeting these objectives. Definitely, the best approach is to merge the principles, objectives, tools, and methodology behind Lean thinking into the strategic and business plans of one's organization. Researches in previous chapters indicate that common performance measures and typical targets for improvement through lean are listed below.

Lead time

1. Speed and consistency of quality product delivery is one of the key factors among many customers. Customer is seeking the supplier who could offer the shortest lead time possible, and delivered consistently.

Cost and Price

2. Usually, customers are seeking the lowest cost products as possible. Make sure to use Lean thinking to reduce costs along the whole supply chain, while sustaining high quality products and service.

Consistency

3. Often, customers are looking for vendors with delivering a high quality product consistently. Once key measures of Lean process are fixed, standards of work process can be set and acceptable variances established. When Lean

Manufacturing process is employed, organization is able to track and analyze outcome to identify organization's major quality problems. When Lean Manufacturing process is deployed in the correct way, organizations can expect reductions in scrap, rework, returns and waste from the customers.

How the senior business consultants deal with resistance when employees are against organizational changes? One of the common mistakes that organizations make while implementing Lean Manufacturing process is assuming that Lean systems are going to be like one of small process change over their existing operational system. When employees are using one particular brand of tools to measure your products, whether employees use other brand tools to measure your products if it measures the same, it does not really affect anything else in the company. Lean manufacturing implementation process is very different from regular modification of work process. It is definitely an organizational change for your company. The implementation of Lean manufacturing process is a continuous and often rough road to follow. The concepts of Lean thinking can be difficult for all labor force who are experienced in mass production techniques. In addition, Lean concepts such as stop producing products when there is no reason to produce would be hard to understand for managers and operators. Resistance from those operators and managers can be expected. They will need to be gently bringing round over time to the Lean way of thinking. Organizations must make sure that all of your labor forces completely understand the necessity of changing the production method into Lean way. If necessary, organizations need to begin with a needs analysis to evaluate their work processes, their existing technical knowledge, and their impact the system will have on their roles. This research indicates that Lean thinking usually requires managers and

employees to do more or different tasks that do not add obvious value to their jobs. It can be very confusing for managers and employees why they need to do some extra work that they have never needed to do before, especially if managers do not understand why that work process is important to produce high quality products, they will find ways to work without it. Organizations really need to make an effort to connect the task back to the managers and employee's "want". Otherwise, no labor force will make a commitment to practice Lean Manufacturing process. It is easy to foresee that all the labor force would resist changes that may affect them individually, although all those organizational and process changes are necessary to improve their company's future performance. The knowledge that they have the full commitment of the top management is critical in the process of creating a climate of change where managers are not afraid to try new systems.

Recommendations

Based on the review of literature and the finds of this study, the following recommendations are made for further investigation:

- This study involved only a small segment of SAMA consultants. The sample size for the volunteer interviewee could be larger. A study that involved all SAMA consultants or any other Lean Manufacturing consulting firm would seem appropriate.
- When selecting the human subjects, select the entire consultants not just the senior consultants. Different levels of consultants interact with their clients and have different influence on the business with every organization.
- The research indicates that there are varieties of methods for success when implementing Lean Manufacturing process into an organization by

consultants. A research of all consultants of SAMA would be helpful in determining how prevalent and different methods would be

- For future study and increasing data, the researcher could distribute a survey to all SAMA's future clients. Therefore, the researcher and SAMA would have a clear understanding of beneficial points to hire consultants to implementing Lean Manufacturing process.

In order to the tremendous amount of information available about Lean Manufacturing tools and techniques, many people do not realize that Lean Manufacturing is a philosophy. When organizations can implement this philosophy, organizations can avoid total waste in the manufacturing system. The beauty of Lean Manufacturing is doing more with less. For all the shops and plants in the whole world, going to Lean Manufacturing is more of an organizational change. Organizations must be aware that change does not happen overnight. Practicing Lean manufacturing process can come slowly to many employees, and always happens with some resistance to change. In the United States, the number of manufacturers that have effectively adopted Lean Manufacturing process is still a small number. However, the progress toward practicing Lean thinking is clearly increasing. The researcher encourages manufacturers who would like to learn more about developing Lean Manufacturing process to hire a professional Lean consultant and involving more in local quality management community. Lean thinking is one of the best ways to manage manufacturers with standardized manufacturing concept. Usually, professional Lean consultants are hired as manufacturer's resource for implementing Lean Manufacturing process and training. The

researcher encourages all sizes of manufacturers to take advantage of all that is available from professional business consultants.

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Appendix A – Consent Form

Consent Form

Project Title: Implementation of Lean Manufacturing at XYZ company in Minneapolis area

Kazuhiro Yamashita of College of Technology Engineering and Management at the University of Wisconsin-Stout is conducting a research project titled, Implementation of Lean Manufacturing at XYZ company at Minneapolis area. We would appreciate your participation in this study.

It is not anticipated that this study will present any medical or social risk to you. The information gathered will be kept strictly confidential and any reports of the findings of this research will not contain your name or any other identifying information.

Your participation in this project is completely voluntary. If at any time you wish to stop participating in this research, you may do so, without correction or prejudice. Just inform the researcher.

Once the study is completed, the analyzed findings would be available for your information.

NOTE: Questions or concerns about the research study should be addressed to Kazuhiro Yamashita, the researcher, Graduate student, college of Technology Engineering and Management, UW-Stout, phone (715)233-0001, or Dr. Carol Mooney, the research advisor, Associate Dean, College of Technology Engineering and Management, UW-Stout, Phone (715)232-1444.

Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the protection of Human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, Phone (715)232-1126.

Appendix B – Questionnaire

1. What is Lean Manufacturing?
2. What are the benefits of Lean?
3. What techniques are used by Lean Manufactures?
4. What is the history of Lean Manufacturing?
5. When the organization does not have much budget to implement Lean, how much will the implementation of Lean cost us?
6. We don't make thousands of pieces of end product every year, is Lean still for us?
7. Can Lean be applied to the Administration and Indirect areas of business?
8. How is the effectiveness of the change Lean measured?
9. What kinds of waste does Lean Manufacturing eliminate?
10. Some companies seem to use Lean Manufacturing as just another way of getting rid of people's job. I guess job security is one of the biggest issues for front line stuff or shop floor people. Is that a purpose?
11. What it the final target or vision of Lean Manufacturing?
12. How long will it take to complete implementation of Lean Manufacturing?
13. Is it necessary to hire consultant to implement Lean Manufacturing?
14. Who would lead the project?
15. Do you have an outline so that clients can understand what will be done during the training sessions?
16. What are the basic steps are before the actual first training day?
17. How would the assessment done normally?
18. How do you mostly concentrate on most on training day?
19. How do you deal with people who resist the change?
20. Do you do anything different from other consulting agencies?