

## Lean Manufacturing and Value Engineering, Two Concepts for Sustainable Management

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### Abstract

This project aims to evaluate the lean production concepts in use in the textile industry. The goal is to investigate the management practices that contribute to the development of sustainable production processes. The adjustments necessary to the system development focuses on the management of resources and inputs of production processes to promote the best use of these and still cutting costs, making the company sustainable economy. The purpose, therefore, is to deploy management practices, tools and routines that help in the company's processes. The research will be developed through case study, we intend to analyse the reality of the organization. The data collected through interviews, questionnaires and secondary source (books, articles and magazines) that will be used as the basis of information and provide the necessary clarification for the rationale.

**Keywords:** Lean manufacturing; Value engineering; Resources; Controls; Tools

### Introduction

Several social, environmental and technological changes experienced in the last decade have provoked demonstrations in the market. Concern about the environmental impacts caused by man is observed around the world. In this respect, companies also worried about possible damages seek to contribute to the reduction of this impact with proposals for improving the production processes.

Companies seek to expand their production following current concepts to become more competitive in the market. Fundamentally, you need to raise the level of production of goods and services in order to make the process more and more responsive and that contribute to reduced resource use, quality and performance of the company. The definition of practices that promote utilization review, including the assessment of resources, utilization review, cost management, management controls, management processes and internal control. Several studies appear on the theme of industrial production improve the performance of operations, collaborating with the economy, society and the costs of the company.

Jenkins and Hine [1-5] claim that the comparative assessment of the performance demonstrates a concern for management a way to extend the improvement. The authors (Slack, Chiavenato, etc.) seeking to compare the various management strategies and their results doing an overview of how this being this discussion and what are the opinion and research. The lean manufacturing works with practices that create synergy to a system of quality and sustainable management that produces finished products at the rate of customer demand with little or no waste. Sustainable management promotes practical definition that includes the review of use, evaluation of resources, and review of failures, cost management, management controls, management processes and internal control. This type of management is widely used in services, especially in hospital services. The text "Utilization management: issues, effects, and future prospects of Thomas M. Wickizer.

### Background

Being a production process still need to ensure quality, organizational and internal controls to ensure the continuity of production. The management system seeks to ensure production efficiency and still

observe the environmental impacts and internal controls for quick realignment in case of failures. The procedures for internal control and management are important as an instrument in the production process.

### Specific objectives

In trying to understand and evaluate the criteria and tools used to ensure the quality of the products it is necessary to analyse the following aspects related to this research: Investigate the concepts processes practices allies-to analyse the tools used to monitor the processes and products.

### Problem

Problem giving birth to the principle that the economic, social and financial needs are unlimited and the productive resources are limited, any economic system will have to face three problems: what and how to produce? How to produce? What is the best way to produce?

### Relevance

The Lean Manufacturing philosophy is applicable to all sizes of industries in the textile area providing improvement in processes and reduction of waste contribute to the economy in the organization. The tools used for insertion of Lean Manufacturing and engineering technique of the value help in the development of knowledge and awareness of the importance of waste reduction. The use of the concepts of Lean Manufacturing and value engineering ensure the sustainability of the company.

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## Literature Review

Textile manufacturing industries need more and become competitive in the market, mainly by increasing competitive advantage through improvements in their internal and external operations need to improve potential all initiatives are welcome.

Botero [6] comments that philosophy aims to reduce costs and increase the company's results through the application of quality tools in the processes. The study aims to compare the concepts of lean manufacturing and industrial engineering in order to improve productivity, reduce costs and avoid waste.

Yamashita [7] confirms that Lean Manufacturing is a technology that produces more in less time, using fewer resources with the intention of adding value to the product.

Management is a set of activities which aims to: plan, organize, direct and control the tasks that the company performed steadily and synchronized through the management you can coordinate the production processes of the company. The company needs to fit the new techniques and tools to become competitive in the market.

Second Barará [8], the Brazilian organizations need to modernize and win both technical barriers as the technology. The organizational deficiencies have an impact on the world stage, especially those linked to production processes and in their management. The management has to promote continuous improvement in the production system.

Barará [9] States that the system of quality management in industries and services aim to increase productivity using continuous improvement. What is not easy, many times the system is in a cast for controls and archaic processes. The quality management approach focuses on improving production processes for this reason has been used extensively in the international arena. Ballestero-Alvarez [10] style process as:

"[...] a structured, predefined sequence of actions that transform actions and inputs captured in outputs and the offers to the environment, adding value from the moment that handles properly these inputs".

The definition made by Ballestero-Alvarez [11] shows that the transformation of the input occurs by a particular series of actions that make up the process in sequence. So, you can call the production process as a predetermined set of sequenced activities that transform inputs into products and/or services.

Barará [12] style process as a set of ordered and integrated actions for a specific production order at the end of the cycle they generate products, services or information. The production occurs at the end of a predetermined sequence of processes and procedures.

The set of productive or manufacturing operations must have as its main focus for improvement, the increase in productivity and quality. Currently, a technique often used to encourage improvements in the production process is the lean manufacturing or lean production. The lean manufacturing, also known as the Toyota Production System (TPS) is a technique that promotes efficiency by minimizing costs and increasing productivity. Started in the post-WWII period Japan by Sakichi Toyoda and Taiichi Ohno, TPS is largely based on the systematic elimination of that Toyota has identified as the eight types of waste that should be eliminated. TPS uses several tools to align strategically not only their production facilities, but your supplier's facilities in the process of disposing of this waste.

The Lean Manufacturing or TPS, are the terms used to identify practices more efficient, agile, flexible and innovative production system with the organizational and productive improvement. The lean manufacturing (lean production) or TPS (Toyota Production System) can be defined as "a philosophy that focuses on providing high quality product being processed at a cost and benefit available to the consumer." A set of continuous methods by means of procedures, activities, tasks and functions identify the added value or non-value add to the productive process, concentrate their focus on quality and minimize costs. New tools and techniques are incorporated as part of the ongoing effort to reduce costs and improve quality and enable reduced stocks and other lean practices according to LIKER and WU [13-15].

The Lean Manufacturing philosophy is focusing on the whole operation. The concept examines the operations system in its entirety, rather than an improvement of the isolated system. A guiding principle of Lean Manufacturing is the production management. The concept analyses the production flow in to locate the waste of time, effort and processing. The principle of Lean Manufacturing is focused on production in smaller batches to facilitate the flow of production.

Ballestero-Alvarez [16] confirms that the concept of lean manufacturing is based on the reduction of costs, maximizing results and increased knowledge of human capital through quality controls, quality assured and respect people. Many companies that deploy the Lean manufacturing can't get properly advantage of improvements. Even when successful companies have to learn the new benefits and turn them into competitive advantage on the market. The lean production techniques are applicable not only in production, but in any service environment. Lean Manufacturing is a dominant tool accepts worldwide as one of the best tools available to improve operational efficiency in General. According to Cook and Graser [17]:

"The argument is that lean manufacturing provides revolutionary instead of evolutionary efficiency improvements. While lean manufacturing has received much publicity since the term was coined as part of a study that analyzes the production car in the world, it is very difficult to find a concise definition of the term that describes all aspects of the system. Lean Manufacturing is closely related to total quality management and derives from the production model of Toyota."

Smith [18] confirms that the characteristics of lean manufacturing can be defined as flexibility, reduction of constraints, such as the time of setup, or product, specialized tools and techniques to improve production. The concept promotes increased productivity with controls defined, quality assured through quality tools and technical and cultural changes that establish safety and the importance of human capital. Cook and Graser [19] state that in the last decade, the production system has received great attention, the concern with cost reduction, waste and increasing quality is increasing and this connected to quest for total quality. Lean production in the form of that theory gained credibility at birth by the Toyota production system and which has been developed strongly in recent years.

According to The fair and Barreiro [20] the TPS model arises from the study by Eiji Toyoda to improvement in manufacturing system there is already applied by Ford, in addition to this other study also conducted was of Taiichi Ohno, the studies seek a way to get more efficiency. The Toyoda family originally owned a large textile company in Japan. After World War II, the Toyoda family decided to begin new venture of Toyota Automatic Loom and started the company Toyota Motor Company.

The entrepreneur of Sakichi has perfected the first tear the engine of Japan and held numerous patents for automatic looms in the company Toyota Automatic Loom Works. Jones, Roos, and Womack states that the concept comes after World War II, Eiji Toyoda and Taiichi Ohno at Toyota Motor Company in Japan was a pioneer in the concept of lean manufacturing" (p. 11). Toyota Motor Company developed his original line of mobile mounting called the "Toyota Production System (TPS)" to maintain the flow of materials continuously. Second Moden [21]:

"The TPS was developed and promoted by Toyota Motor Corporation and is being adopted by many Japanese companies, in the aftermath of the oil crisis of 1973. I thought that the main objective of the system is to reduce costs, the system also helps to increase the rate of capital turnover (i.e. the total sales/total assets) and improves the overall productivity of an enterprise as a whole."

Ballesterro-Alvarez [22] argues that improvements in processes help make the company more competitive in impacting quality and demonstrating the integration, synergy and consistency of controls. Another important element is the management support to the lean production program, the practice management support is related to the success of lean manufacturing implementation in a simple or straightforward. It is also important to the communication to the development of lean manufacturing at the company, a decisive factor for the process of change that well outlined and in conjunction with lean production practices assist in productivity.

In order to avoid wasting the lean manufacturing uses various tools such as: mura or "irregularities" or production leveling as a method of production planning designed to evenly distribute the variety of products at any time. The distribution or leveling even prevents the processes of experience the uneven workloads and facilitates the process of production planning. Heijunka (plates) are often used in combination with kanban cards as form of workload distribution, as shown in the Figure 1.

The flow of value is defined as all the activities that contribute to the transformation of a product from raw material to the finished product, including l, manufacturing, and physical [23]. Waste is any non-required activity that does not add value to the client. Lean production is very integrated with improvements in the process, such as reduced

inventory, reduced manufacturing times, higher quality, increased flexibility and increased customer satisfaction.

### Value engineering

For the industry to become more competitive we must act upon the challenges faced by the market more and more demanding and competitive in a globalised world. ~ the management system must be prepared to respond appropriately, in this sense, the tools should give the necessary support to develop operational strategies of quick answers and simple. Within this context, the Union of philosophy of lean Manufacturing with value engineering technique through the lean production model created has to give the necessary support to the industry in its production system in order to avoid waste, cost and non-conformities.

Currently it is important to outline goals involving contributions to organizational sustainability. One of the main goals of the globalized companies is to make the sustainable company through operational models. An industry should promote the management of activities in order to achieve the operational capacity of their production. Value engineering is a set of organized methods for optimization of a product. This set of methods aims to avoid waste production through value criteria.

Porter [24], to understand the value chain of activity helps in differentiation and understanding of relevant sources of competitive advantage of a company. The technique came about due to shortage of raw materials during World War II, Csillag [25]. Still, second Csillag [26], value engineering focuses on a set of organized efforts to better understand projects, processes and systems of the company. Through the understanding of the needs of the same items mentioned, thus modifying the cycle of products, processes and reducing costs. The author [27] claims that the theory of value analysis and value engineering with the passage of time had developments such as methodology of value and value management. This development or deployment began with the success of the methodology that led to an evolution in studies.

The basic concept for the methodology is the value, Csillag [28], claims that the real value of a system, process, product, or project

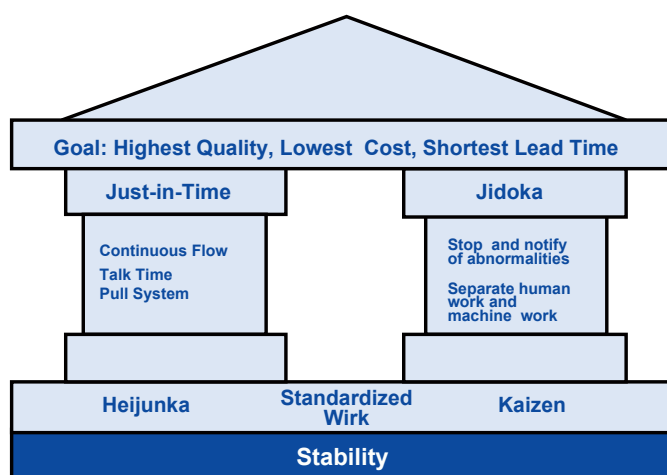


Figure 1: Toyota production system house. Source: Retrieved from [scrumoffice.blogspot.com](http://scrumoffice.blogspot.com).

focuses on customer acceptability customer acceptance and satisfaction are paramount to the concept. The author even says that we can change or improve perceived customer value with improved function and improving performance. The value perceived by the customer or supplier may be influenced by increased function and reducing the cost. The value can be increased by reducing costs, technical efficient handling, eliminating unnecessary functions this requires in-depth knowledge of the functions of the system or process.

Csillag [29] presents in his concept of value engineering, the reduction of unnecessary functions to improve performance, as one of the most important items in this methodology. The methodology part of the value assigned by the client (in this case the employees and collaborators) to the process or system the purpose of which is to simplify the activities, eliminating unnecessary functions through cost-benefit analysis and reducing costs. Porter [30] States that the increase in performance or activities change modifies the value to the buyer (customer), this includes the reduction of activity without value to the product. Yet, according to the author the identification of worthwhile activities require the grouping criteria or dismemberment by categories.

The identification of the activities through the added value to the product or process should consist of an analysis, a thorough examination in the system, process and procedures by determining its functions. Miles [31] States that "value analysis is concerned with reducing the cost of performing a given function". The concern about the reduction of process functions, analyzing the required role of the not required and improving the functionality of the process.

In this sense, the dictionary [32] defined function as practice or exercise, assignment or usefulness, functionality that is able to perform the function or performance with accuracy, efficiency and regularity.

The first step to engineering the value should be the process analysis, definition of the problem and its relevant or that can influence the analysis and solution of the problem. After this step, analyzes the process functions and their derivatives. The functions are divided into "basic" and "minor roles". The functions of the process seeks to identify a cost-performance/benefit. Value engineering is a systematic process by which analyzes the model with focus on functionality. Through the value applied to the model created, projects so improvement and cost reduction.

### Process improvement

Improvement is considered any action proven to change positively the State of an element. According to Dictionary, improvement, improvement or upgrading any action that produces a positive object modification. Or as, the online dictionary improvement is the change to State or condition best. It can be said that the process improvement part of quality management focused on change the State of a process to meet the expectations. According to ISO 900:2005 improvement can be regarded as any effort that has the likelihood of improving customer satisfaction, this includes actions of analysis, research, establishment of goals, evaluation, troubleshooting, measurements and formalized.

The improvement is a continuous activity through which performs changes using techniques and methods that promote better use of resources to satisfy customers. Researchers such as Juran [21], Falconi, Valle et al. [33] state that new technologies for products and manufacturing processes have created the need to invest in strategies to improve quality controls. In General, companies have problems to keep

up with the market requirements, innovations and transformations. Many large how many small firms seek solutions.

Many companies are looking for solutions that can be tailored to your needs momentary. Manufacturing companies to carry out their activities require a management system targeted for improvement in production, performance and reduction of losses (Mesquita [27]). The Operational Management system follows the theoretical bases that are necessary to its development, variables related to this study: quality control fault detection in the process increased quality causes increase in satisfaction of internal and external clients; Performance improvement with a focus on quality management influences the reality of small and medium-sized enterprises providing increased productivity; The results increase the competition on the market and influence on productivity, are relevant for the company. Therefore, it is important that companies seek concepts that promote development and improvement.

### Material and Methods

As conceptual process understandable thematic approach of subjective variables that depend on the decision-making power of the human being. The acquisition of knowledge is developed with the Association of theory and practice. According to Barros and Lehfeld, knowledge is a theoretical-practical activity and/or practical to theoretical. Scientific knowledge is a cognitive expression in which the subject learns from the object of study. Barros and Lehfeld highlight that scientific knowledge is a progressive process of coexistence between theory and practice. In short, the scientific knowledge is generated through associated experiences between theory and practice. And these processes are a set of procedures or not starting from an investigation until the result.

The methodology should lead the work and development, that is, to extend the knowledge on the subject and the development of research. In this way, the work done through the data collected by secondary source (books, articles and manuals) that provided theoretical and practical basis. This study classified as interdisciplinary study by linking various research areas as: management, Quality, environmental management, knowledge management, engineering, sustainability and others. Applied research proposes a study of field collaborating with action research.

To Godoy and Alves [18], the researcher in the analysis phase should be based on specialized literature, in his personal and professional experience, in your collection-interaction analysis. Must also have the ability to describe, interpret and recognize what is relevant. Therefore, chosen as the research method of descriptive and exploratory nature consisting in the analysis and description [34-41].

### Results

This work deals with the measurement of the concepts and their efficiency in reducing losses and eliminate critical points. It can be observed that several authors advocate the use of these concepts in management. Comparing the two concepts that either a lot of similarity and can be said to complement each other when used for process optimization. For better understanding the Table 1.

You can tell by the picture that the two concepts complement each other which can be of great help to the company. The concepts promote improvements through the Elimination of waste in both as in processes.

### Final Considerations

Current approaches to business management is a response to the

Concept	Lean Manufacturing	Engineering und Wert Analyse
Historical evolution	In mid-1940, the concept of Lean manufacturing model adopted in Toyota Company developed by Taiichi Ohno and Eiji Toyoda (JONES; ROOS and WOMACK, 1990).	Lawrence d. Miles (1947 to 1952) main goal focused value analysis technique research of new materials with high availability features and low cost, CSILLAG (2012).
Goal	Eliminate waste, eliminate flaws in processes and reduce costs, MAGEE (2008).	The concept of value Analysis is adopted by the U.S. Navy (1954), the use in existing product for new products the concept is referred to as Value Engineering, CSILLAG (2012)
Methodology	Analysis and workforce alignment, machine, Material and Method, a method of production planning designed to evenly distribute the product range at any time (Womack and Jones, 2007).	Second CSILLAG (2012), value engineering focuses on a set of organized efforts to better understand projects, processes and systems of the company. Through the understanding of the needs of the same items mentioned, thus modifying the cycle of products, processes and reducing costs.
Tools	Mura or "irregularities" or production leveling as a method of planning, Heijunka (plates) are often used in combination with kanban cards as a means of distribution of workload and Kaizen (continuous improvement)	Value engineering uses tools and resource for nalysis of need such as: analysis, Gut, work plan, Pareto diagram, FAST diagram, Ishikawa diagram and other (CSILLAG, 2012)
Approach	Processes	Products, projects and processes

**Table 1:** Comparison of the concepts.

nature of the needs of the production system that often this fragmented by diverse flaws, mistakes and waste. Currently, the concepts are adapted to case-by-case basis, in response to the individual needs of each production system. Historically, the search for solutions has been made in group practices or systematic and comprehensive approach to management of the production system. In this context, it is noted that methodological issues that were the basis for the article can unravel if the companies know promote adequate use of concepts and their tools, that within their expectations, conflicts and interests.

Therefore, the productive system requires monitoring and continuous improvement constantly advocate the use of concepts. The concepts are basically focused on processes, resources and tools that promote the improvement and contributing to make the company leaner. You can't say that the company becomes sustainable using the concepts of Lean Manufacturing or engineering of the value, but you can tell that these techniques help the management to produce avoiding the waste of material and glitches.

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