

Lean Management An Effective Tool For Sustainable Development

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Abstract

Manufacturing organizations are bound to adopt lean practices to achieve competitive advantage for the sustainable development of the organization. Sustainable development is something that can be maintained or sustained itself, without jeopardizing the potential for people in the future to meet their needs. Organizations are striving for sustainable development and every day developing new management philosophies to achieve excellence. Customer satisfaction through improved quality, reduced cost, reduced delivery lead times and proper communication paves the way for sustainable development of the organization. To accomplish this, lean thinking brings paradigm shifts and changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers. Elimination of waste along entire value streams, instead of at isolated points, creates processes that need less human effort, less space, less capital, and less time to make products and services at far less costs and with much fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality, low

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cost, and with very fast throughput times which leads to sustainable development. Through this paper an effort has been made to emphasize the role of lean manufacturing towards sustainable development of an organization and practical examples have been presented from the extent literature to support the fact. This paper will be very beneficial for the researchers and practitioners working in the field of lean manufacturing and sustainable development as the existing literature provides very few evidences which prove the importance of lean manufacturing in sustainable development.

KEY WORDS: Lean management, sustainability, paradigm shifts, customer satisfaction, and competitive advantage.

1. INTRODUCTION

In spite of the numerous benefits offered by lean manufacturing to today's industrial world, the irony is that it is obvious that many manufacturers have yet to grasp the full benefits of this philosophy. In particular, the focus at many Indian industries which are still working on Henry Fords mass production principles or continued to be driven by an in-trenched and outdated batch and queue mentality. However, there are those who have been faster to catch on to the lean manufacturing notion and now accept it as a key part of their strategy for long-term manufacturing survival with the focus on eliminating waste from the present system and concentrating their efforts on adding more value to the end product by reducing lead times, reducing inventory and improving overall communication. Lean manufacturing focuses on eliminating waste and non-value adding activities and waste can be overproduction, defects,

unnecessary inventory, inadequate processing, excessive transportation, waiting and unnecessary motion (Womack et al.,1990). Lean manufacturing as a multidimensional approach that encompasses a wide variety of management practices, including just-in-time, total quality management (TQM), work teams, cellular manufacturing, suppliers involvement, etc., in an integrated system. The main thrust of lean production (LP) is that these practices can work synergistically to create a systematised, high quality system that fulfils the demands of the customers at the required pace (Shah and Ward, 2003). But, the implementation of lean management to any industry is not a simple task and lean manufacturing philosophy is designed for a smooth demand. That is why, many Indian industries are still unable to take full advantages of lean benefits. To motivate the Indian industry towards lean implementation, some lean implementation issues required to be identified and discussed in context to Indian conditions. Lean manufacturing has been increasingly adopted as a potential solution for many organizations, particularly within the automotive [Jones] and aerospace manufacturing industries. Lean manufacturing derives its name from the manufacturing systems and processes of the Toyota production system that are so effective at producing at low cost and short cycle time. These systems are highly flexible and responsive to customer requirements. Lean manufacturing is a multi-dimensional approach that encompasses a wide variety of /management practices, including just-in-time, quality systems, work teams, cellular manufacturing, supplier management etc. in an integrated system. The core thrust of lean production is that these practices can work synergistically to create a streamlined, high quality system that produces finished products at the pace of customer demand with little or no waste [Shan & Ward, (2003)].Lean manufacturing also called lean Production is a set of tools and

methodologies that aims for continuous elimination of all waste in the Production process. The main benefits of this are lower production costs; increased output and shorter production lead times. More specifically, some of the goals include defects and wastage, cycle times, inventory levels, standard processes, continuous flow, pull production, quality at the source, continuous improvement.

It is well known that lean manufacturing had been influenced by many techniques and school of thoughts. One such management thinking is TQM or Total Quality Management influence of TQM on lean manufacturing is very large therefore many techniques are common to both lean manufacturing and TQM .In lean manufacturing, we can discuss TQM as one of its prime tools used to achieve its objective. Many of TQM gurus like Deming and Juran played a major role in shaping Toyota Production System (TPS). SO, it is worth learning, some of the total quality management techniques and tools which are commonly used in lean manufacturing. It is said that lean manufacturing can bring all the results TQM alone can bring quickly. A baseline technical definition of what TQM is all about has been given by the American Federal Office of Management Budget circular (cited in Milakovich, 1990, p.209) TQM is a total organizational approach for meeting customer needs and expectations that involves all managers and employees in using quantitative methods to improve continuously the organization's processes, products and services. TQM is an attempt to improve the whole organization's competitiveness, effectiveness and structure.

1.1 Sustainable development

Sustainable development has been defined differently by many researchers and academicians.

The most common definition of sustainable development is as follow:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of **needs**, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

Sustainable development has been defined in many ways, but the most frequently quoted definition is from Our Common Future, also known as the Brundtland Report.^[1]

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Maintaining a competitive advantage in today's increasingly resource-strained global economy is more complex than ever before. Added pressure comes from stakeholder resistance in the form of regulations, boycotts, protests, litigation, and bad press. It takes a top team, knowledgeable about sustainability, to stay in the smart zone ahead of regulation, to lead effective proactive stakeholder engagement, to reduce risk, maintain a good corporate image, and find areas of opportunities for eco-efficiencies. Organizations that work with natural systems and understand the context that businesses and their employees exist within will begin to operate in ways that build our natural capital and maintain healthy communities. The challenge now is to infuse a strategic approach to sustainable development throughout the organization. Before getting started, it is important to set the inspirational goal of becoming a sustainable organization and demonstrate top-level support. The old adage, "what interests my boss fascinates me," holds true. Then a four-step process becomes very useful. Step one involves getting everyone on the same page, so that people throughout the organization understand enough about sustainability, and the system in which they are operating, to contribute to the goal. Here, four sustainability principles originally articulated by The Natural Step organization provide a succinct expression of sustainability. These principles state, that in a sustainable society, nature is not subject to systematically increasing:

2. LITERATURE REVIEW

Lean manufacturing uses tools like one-piece flow, visual control, kaizen, cellular manufacturing, inventory management, Poka yoke, standardized work, workplace organization and scrap reduction to reduce manufacturing waste. VSM is an excellent tool for any enterprise

that wants to become lean (Russell and Taylor, 1999). Rother and Shook (1999) defined VSM as a powerful tool that not only highlights process inefficiencies, transactional and communication mismatches but also guides about the improvement. According to Hines and Rich (1997) value stream is a collection of all actions value added as well as non-value added that are required to bring a product or a group of products that use the same resources through the main flows, from raw material to the hands of customers. Jones and Womack (2000) explain VSM as the process of visually mapping the flow of information and material as they are and preparing a future state map with better methods and performance. A value stream consists of everything including the non-value added activities and provides a pictorial view of what elements of the process the customer is willing to pay for (Tapping and Shuker, 2003)

3. LEAN MANUFACTURING CONCEPTS

Lean manufacturing concepts are fundamentally different from the conventional manufacturing concepts. These are proven to be correct for past six decades.

3.1 VALUE CREATION AND WASTE

Value-added activities are those activities, which transform the materials into the exact product that the customer requires.

Non value-added activities are activities, which aren't required for transforming the materials into the product that the customer wants. Anything, which is non-value-added, may be defined as waste. Anything that adds unnecessary time, effort or cost is considered non value-added. Another way of looking at waste is that it is any material or activity for which the customer is not willing to pay. Testing or inspecting materials is also considered waste since this can be

eliminated insofar as the production process can be improved to eliminate defects from occurring.

Research at Lean Enterprise Research Centre (LERC) in the United Kingdom indicated that for a typical manufacturing company the ratio of activities could be broken down as follows [Hines P. et al, (2000)].

Table 1 (Breakdown of activities)

Activities	Breakdown (%)
Value-added activities	05
Non value-added activities	60
Necessary non value-added activities	35
Total Activities	100

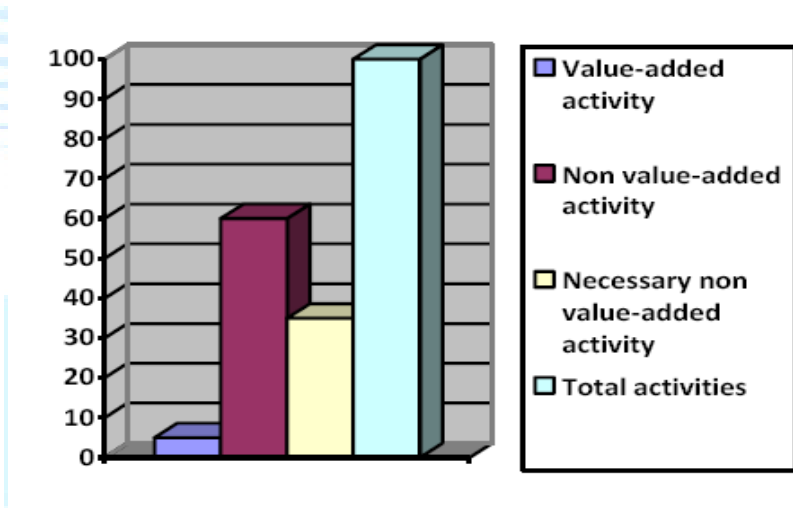


Figure 1 (Breakdown of activities)

3.2 FIVE PRINCIPLES OF LEAN (Womack and Rrse, 1996):

Value– The traditional definition of value is the end product that the customer purchases. In the Lean model, value is not just the end product, but the chain of activities that are required to

perform in order to produce and end product/end services to be delivered to the customer.

Value Stream – Value is identified through value stream mapping (VSM). This stream is comprised of each step that is performed from raw materials to end product and every step is designed, in order to fulfill customer expectations at minimum price. Every role, functions, and responsibilities are designed to make the delivery mechanism more responsive with, minimum resources.

Flow – Flow is the efficiency of the process that transforms raw material into an end product. This involves analyzing every step in the process that touches and does not touch the end product and goal is to provide a continuous flow without any bottlenecks.

Pull-production – Also called Just-in-time (JIT), Pull-production aims to produce only what is needed, when it is needed. Production is pulled by the downstream workstation so that each workstation should only produce what is requested by the next workstation.

Perfection – The improvements in the identification of value, the analysis and flow of the value stream, and the pulled product/service can be felt and seen at the all levels of the organization.

3.3 WASTAGES IN LEAN MANUFACTURING (MUDA)

In the book, "Lean Thinking" (Womack and Jones, 1996) the very first word is interestingly the Japanese word for waste ('muda') and it is concluded that muda is everywhere. Generally manufacturers agree that there exist 8 types of 'muda', which are waste absorbing resources that create cost but no value. In any organization it is believed that the 8 types of waste exist. Taiichi Ohno (1912-1990), a Toyota executive identified seven types of waste found in any process:

Transportation: - Unnecessary transport of parts under production

Inventory: - Stacks of parts waiting to be completed or finished products waiting to be shipped.

Motion: - Unnecessary movement of people working on product

Waiting: - Unnecessary waiting by people to begin the next step

Over-processing: - Over-processing the products with extra steps

Over-production: - Over-production of products not needed

Defects:- Defects in any products.

Some authors have added an eighth waste as goods and services do not meet the customer's need and someone has added underutilization of people.

3.4. OBJECTIVES OF LEAN MANUFACTURING

Lean manufacturing, also called Lean Production, is a set of tools and methodologies that aims for the continuous elimination of all waste in the production process. The main benefits of this are lower production costs; increased output and shorter production lead times. More specifically, some of the goals include.

Defects and wastage - Reduce defects and unnecessary physical wastage, including excess use of raw material inputs, preventable defects, and costs associated with reprocessing defective items and unnecessary product characteristics which are not required by customers.

Cycle Times – Reduce manufacturing lead times and production cycle times by reducing waiting times between processing stages as well as process preparation times and product /model conversion times.

Inventory levels - Minimize inventory levels at all stages of production, particularly work-in progress between production stages. Lower inventories also mean lower working capital requirements.

Labor productivity – Improve labor productivity, both by reducing the idle time of workers and

ensuring that when workers are working, they are using their effort as productivity as possible (including not doing unnecessary tasks or unnecessary motions).

Utilization of equipment and space – Use equipment and manufacturing space more efficiently by eliminating bottlenecks and maximizing the rate of production through existing equipment, while minimizing machine downtime.

Flexibility – Have the ability to produce a more flexible range of products with minimum changeover costs and changeover time.

Output – Insofar as reduced cycle times, increase labor productivity and elimination of bottlenecks and machine downtime can be achieved, companies can, generally increase output from their existing facilities.

4. TOTAL QUALITY MANAGEMENT

4.1 Definitions and Concept of TQM: A variety of definitions of TQM have been offered over the years. Reviewing previous contributions a dominant insight among experts seems to define TQM as an approach to management characterized by some guiding principles of core concepts that embody the way the organization is expected to operate, which, when effectively linked together, will lead to high performance. Although there are some differences of opinion, there is a general agreement regarding the assumptions included in the TQM concept that can be summarized in three main points.

Firstly, the core concepts of TQM can be classified into two broad categories or dimensions: social or soft TQM and technical or hard TQM. The social issues are centered on human resource management and emphasize leadership, team work, training and employee involvement. The technical issues reflect an orientation toward improving production methods

and operations and seek to establish a working method through the establishment of well-defined processes and procedures to make possible the constant improvement of goods and services to customers.

Secondly, the management of social or technical TQM issues cannot be performed in isolation. Social and technical dimensions (and the core concepts that form them) should be interrelated and mutually support one other, reflecting the holistic character of TQM initiatives. This holistic character is also extended to the expected results of a TQM initiative because a balance of the stakeholders' interests should be considered when the firm defines TQM practices.

Thirdly, the literature suggests that the optimal management of TQM core concepts will lead to better organizational performances, as studies such as Kaynak (2003) have verified. The basic theoretical foundation for this relationship is based on the assumption that TQM provides superior value to the customer by identifying customers' expressed and latent needs, responsiveness to changing markets, as well as through improving the efficiency of the processes that produce the product or service.

Therefore, TQM includes both an empirical component associated with a statistics and an explanatory component that is associated with management, of both people and processes. The terms hard and soft are commonly used to represent these two components. TQM brought recognition to the fact that task can be categorized as value adding or not. The obvious corollary is that non value adding tasks would be eliminated and value adding ones improved. Many processes design an operation tools have been highlighted in TQM, such as a statistical process control, Kanban and flexible organization.

5. CONCLUSIONS

Through this paper an effort has been made to correlate lean manufacturing techniques and sustainable development and it found that lean techniques play a vital role in sustainable development of any organization. After reviewing the available literature and correlating lean manufacturing and sustainable development, it has been concluded that major manufacturing industries in the developed countries have been trying to adapt lean manufacturing initiatives by eliminating non-value added activities to satisfy customer needs and improve processes continuously for sustainable development. Lean manufacturing has become a very effective technique that focus on cost reduction, inventory control, and reduction of lead times, cycle times, and finally customer satisfaction.

7. REFERENCES

American Federal Office of Management Budget Circular (cited in Milakovich, 1990, p-209).

Bayou M.E, Korvin A. de; *Measuring the leanness of manufacturing systems-A case study of Ford Motor Company and General Motors.J.Eng. Technol.Mange .25 (2008) 287-304.*

Bhasin Sanjay; 2008 *Lean and performance management*; Journal of Manufacturing Technology Management, Vol 19,No 5.pp.670-684.

Comm., C.I, and Mathaisel, D.F.X.(2000), “*paradigm for benchmarking lean initiatives for quality*”,*Improvement,benchmarking:An International Journal*,Vol.7No.2,pp. 118-27.

Melton T, June2005;*The Benefits of Lean Manufacturing, What Lean thinking has to offer the. Process Industries*, Trans IchemE, Part A, Chemical Engineering Research and Design,

83(A6):662-673.

Natasha M Baker: *Similarities and Differences between TQM, Six Sigma and Lean in Project Management Media Gallery*(2009).

Shiba, S., Graham, A. and Walden, D. (1993), *A New American TQM: Four Practical Revolutions in Management*, Productivity Press, Portland,OR.

Singh Bhim, Garg SK, Sharma SK (2009); *Value stream mapping a versatile tool for lean implementation: an Indian case study of a manufacturing industry*; J. of Measuring business excellence.

Van der Wiele ,A.,Williams,A.R.T. and Dale, B.G. (2000), “ *Total quality management :is it a fad, fashon , or Fit?*”, Qaulity Management Journal, Vol. 7 No. 2,pp. 65-79.

Womack. J.P. and Jones. D.T., and Roos .D; 1990 *The Machine That Changed The World: The Story of Lean Production* (Harper Collins Publishers, New York, USA).

Womack. J.P. and Jones. D.T.;1996 *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*; (Simon & Schustes, New York, USA).

Hines, P. and Rich, N. (1997), “The seven value stream mapping tools”, International Journal of Operations & Production Management, Vol., Vol. 17, pp. 46-64.