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Role of IT in Lean Manufacturing: A brief Scenario

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ABSTRACT: *A concept of Lean can be seen as a loosely connected set of potentially competing principles whose goal is cost reduction by the elimination of waste, and organise the possible effort to utilise waste of all kinds in a productive way. The avoidance and then lateral removal of waste has a long history, and as such this history forms much of the basis of the philosophy now known as "Lean". Many organisations are implementing 'lean manufacturing' (LM) with the objective of achieving a superior competitive advantage over other organisations. Few companies have attained their objective, while many of them did not. One of the reasons for failure is that the managers of these organisations have not understood clearly: how the performance measures of an organisation are affected, when it gets transformed through LM.*

Lean can be elevated through optimized utilization of Information Technology. Lean IT is the extension of lean manufacturing and lean services principles to the development and management of information technology (IT) products and services along with other manufacturing sectors . Its central concern, applied in the context of IT, is the elimination of waste, where waste is work that adds no value to a product or service. Although lean principles are generally well established and have broad applicability, their extension from manufacturing to IT is only just emerging. Indeed, Lean IT poses significant challenges for practitioners while raising the promise of no less significant benefits. And whereas Lean IT initiatives can be limited in scope and deliver results quickly, implementing Lean IT is a continuing and long-term process that may take years before lean principles become intrinsic to an organization's culture. This paper is an attempt to summarise the various components of lean manufacturing, role of IT in lean manufacturing and a brief overview of lean and I T.

Keywords: *lean services, smart automation, wasteful, unevenness, overburden, business building, etymologically, world class manufacturing.*

I. Introduction

Is is observed that the things in many ways goes waste which directly affects the cost and quality of the product . So it becomes essential on the part of manufacturers to reduce the waste from all possible angles and accordingly they have stepped up the waste elimination movement in possible manner. But the results were not creating any sensation in entire role of waste elimination. By that time Lean principles came from the Japanese manufacturing industry. The term was first coined by John Krafcik in a Fall 1988 article, "Triumph of the Lean Production System," published in the Sloan Management Review and based on his master's thesis at the MIT Sloan School of Management.

Lean manufacturing, lean enterprise, or lean production, often simply, "Lean," is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. Working from the perspective of the customer who consumes a product or service, "value" is defined as any action or process that a customer would be willing to pay for. Lean manufacturing concepts were developed over the last five to six decades, primarily in Japan, particularly for the Toyota production system. These concepts met various tests for many years and passed the test of time very easily.

Lean manufacturing revolutionaries the manufacturing process. It was not a fine tuning of the existing manufacturing processes. These manufacturing techniques are conceptually different from the traditional process.

Lean manufacturing is a variation on the theme of efficiency based optimizing flow; it is a present-day instance of the recurring theme in human history toward increasing efficiency, decreasing waste, and using empirical methods to decide what matters, rather than uncritically accepting pre-existing ideas.

The difference between these two approaches is not the goal itself, but rather the prime approach to achieving it. The implementation of smooth flow exposes quality problems that already existed, and thus waste reduction naturally happens as a consequence. The advantage claimed for this approach is that it naturally takes a system-wide perspective, whereas a waste focus sometimes wrongly assumes this perspective.

II. A 'LEAN' CULTURE

2.1. Brief Overview

Also known as the flexible mass production, mainly it has two pillar concepts, Just-in-time (JIT) or "flow", and "autonomation" (smart automation). The smooth flowing delivery of value achieves all the other improvements as side-effects. If production flows perfectly then there is no inventory; if customer valued features are the only ones produced, then product design is simplified and effort is only expended on features the customer values. The other of the two pillars is the very human aspect of autonomation, whereby automation is achieved with a human touch. The "human touch" here meaning to automate so that the machines/systems are designed to aid humans in focusing on what the humans do best. It is now possible to give the machines enough intelligence to recognize when they are working abnormally and flag this for human

attention. Thus, in this case, humans would not have to monitor normal production and only have to focus on abnormal, or fault, conditions.

Lean implementation is therefore focused on getting the right things to the right place at the right time in the right quantity to achieve perfect work flow, while minimizing waste and being flexible and able to change. These concepts of flexibility and change are principally required to allow production levelling, using tools like SMED, but have their analogues in other processes such as research and development (R&D). The flexibility and ability to change are within bounds and not open-ended and therefore often not expensive capability requirements. More importantly, all of these concepts have to be understood, appreciated, and embraced by the actual employees who build the products and therefore own the processes that deliver the value. The cultural and managerial aspects of Lean are possibly more important than the actual tools or methodologies of production itself. There are many examples of Lean tool implementation without sustained benefit, and these are often blamed on weak understanding of Lean throughout the whole organization.

Lean aims to make the work simple enough to understand, do and manage. To achieve these three goals at once there is a belief held by some that Toyota's mentoring process,(loosely called Senpai and Kohai, which is Japanese for senior and junior), is one of the best ways to foster Lean Thinking up and down the organizational structure. This is the process undertaken by Toyota as it helps its suppliers improve their own production. The closest equivalent to Toyota's mentoring process is the concept of "Lean Sensei," which encourages companies, organizations, and teams to seek outside, third-party experts, who can provide unbiased advice and coaching.

2.2. Lean goals and strategy

Some commonly mentioned goals are:-

Improve quality: To stay competitive in today's marketplace, a company must understand its customers' wants and needs and design processes to meet their expectations and requirements.

Eliminate waste: Waste is any activity that consumes time, resources, or space but does not add any value to the product or service. See Types of waste, above.

Reduce time: Reducing the time it takes to finish an activity from start to finish is one of the most effective ways to eliminate waste and lower costs.

Reduce total costs: To minimize cost, a company must produce only to customer demand. Overproduction increases a company's inventory costs because of storage needs.

2.3 Lean Manufacturing Metrics

The goal of Lean Manufacturing is the creation of "World Class" level of manufacturing operations metrics. The following chart shows typical world class manufacturing metrics:

Measure	Performance	Measure	Performance
Manufacturing Lead Time	<1 day	Delivered Quality	3 PPM
Delivery Performance	99+ %	Inventory Turns	>50
Conversion Costs	25-40% less than mass	Manufacturing Space	35-50% less than mass producers
New Product Development	<6 months	Skill Trades Response	<2 minutes
Production Skilled Trades Ratio	>20:1	Changeover Time	<TAKT Time

Table No. 1 world class manufacturing metrics

2.4 Principles of lean

The five-step thought process for guiding the implementation of lean techniques is easy to remember, but not always easy to achieve:

- Specify value from the standpoint of the end customer by product family.
- Identify all the steps in the value stream for each product family, eliminating whenever possible those steps that do not create value.
- Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer.
- As flow is introduced, let customers pull value from the next upstream activity.

Fig. No.1 Principles of lean

- As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste.

III. LEANMANAGEMENT AND WASTE

While the elimination of waste may seem like a simple and clear subject it is noticeable that waste is often very conservatively identified. This then hugely reduces the potential of such an aim. The elimination of waste is the goal of Lean .Diagram given below refers to forms of waste and components of lean production system.

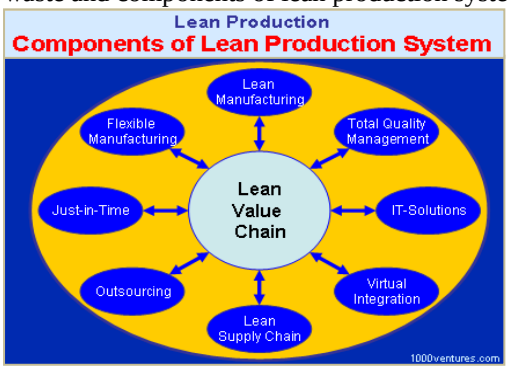

Fig. No.2 Lean Value Chain

3.1 Muda (wasteful)

Is a traditional Japanese term for an activity that is wasteful and doesn't add value or is unproductive, etymologically none or un-useful in practice or others. Muda has been given much greater attention as waste than the other two which means that whilst many Lean practitioners have learned to see muda they fail to see in the same prominence the wastes of mura(unevenness) and muri (overburden).

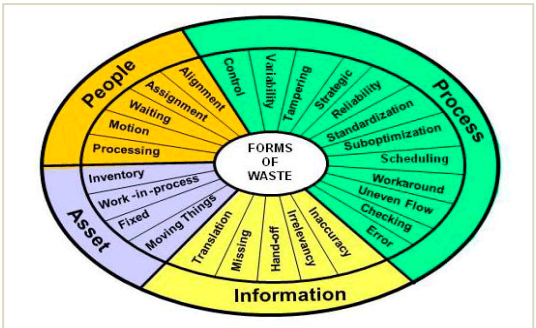

Fig. No.3 Forms Of Waste

3.2 Mura (unevenness)

Is traditional general Japanese term for unevenness, irregularity or inconsistency in physical matter or human spiritual condition. It is also a key concept in performance improvement systems such as the Toyota Production System. Mura is one of the three types of waste. Waste reduction is an effective way to increase profitability. Mura, in terms of business/process improvement, is avoided through Just In Time systems which are based on keeping little or no inventory, rather supplying the production process with the right part, at the right time, in the right amount, and first-in, first out component flow. Just in Time systems create a "pull system" in which each sub-process withdraws its needs from the preceding sub-processes, and ultimately from an outside supplier. When a preceding process does not receive a request or withdrawal it does not make more parts. This type of system is designed to maximize productivity by minimizing storage overhead.

3.3 Muri(overburden)

Muri is all the unreasonable work that management imposes on workers and machines because of poor organization, such as carrying heavy weights, moving things around, dangerous tasks, even working significantly faster than usual. It is pushing a person or a machine beyond its natural limits. This may simply be asking a greater level of performance from a process than it can handle without taking shortcuts and informally modifying decision criteria. Unreasonable work is almost always a cause of multiple variations.

Firstly, muri focuses on the preparation and planning of the process, or what work can be avoided proactively by design. Next, mura then focuses on how the work design is implemented and the elimination of fluctuation at the scheduling or operations level, such as quality and volume. Muda is then discovered after the process is in place and is dealt with reactively. It is seen through variation in output. It is the role of management to examine the muda, in the processes and eliminate the deeper causes by considering the connections to the muri and mura of the system. The muda and mura inconsistencies must be fed back to the muri, or planning, stage for the next project.

IV. LEAN AND IT

4.1 Need and Scope

As lean manufacturing has become more widely implemented, the extension of lean principles is beginning to spread to IT (and other service industries). Industry analysts have identified many similarities or analogues between IT and manufacturing. whereas the manufacturing function manufactures goods of value to customers, the IT function "manufactures" business services of value to the parent organization and its customers. Similar to manufacturing, the development of business services entails resource management, demand management, quality control, security issues, and so on. Moreover, the migration by businesses across virtually every industry sector towards greater use of online or e-business services suggests a likely intensified interest in Lean IT as the IT function becomes intrinsic to businesses' primary activities of delivering value to their customers. Already, even today, IT's role in business is substantial, often providing services that enable customers to discover, order, pay, and receive support. IT also provides enhanced employee productivity through software and communications technologies and allows suppliers to collaborate, deliver, and receive payment.

The relationships between lean manufacturing and information technology is now building a new concept of business building. Software industry and IT can get great lessons from lean. On the other hand lean manufacturers can use IT to help their efforts in the journey. First of all it is important to understand that software alone will not make you lean or even efficient. In most of the cases IT plays an important support role. Good processes can be made more effective and efficient with software and application of IT not the other way around. It is important to know where IT can explore lean concept to a greater extent. Some major areas in this regard are given below.

- Information Technology can be used in communicating data fast and accurately. Sharing the same piece of truth is very important to run a lean system effectively.
- Collection and processing of data is another very important area where IT can help the lean manufacturer. Collecting data and analysis will help you in better decision making.
- Some of the work can be automated using the IT technology. For an example rather than creating a purchase order every time, the system can be configured in such a way that it can pass the requirement to the suppliers in a predefined interval based on the TAKT time.
- When implementing complicated IT systems it is important to make sure the systems also are following the concepts of lean. For an example;
- Collecting and accumulating data which are not used for decision making will increase the workload for people and machinery and also will serve no purpose; hence it creates the wastes of over processing and inventory.

Systems must be made to update just in time and possibilities of erroneous data into the systems must be eliminated making the system error proofed.

In simple terms implementing an IT system will not solve your problem or will not make you a lean manufacturer. You have to put the processes in place first to be facilitated by IT in true lean manner. Like in lean manufacturing, it is important to apply the concepts of lean in designing the suitable IT systems for you. Good IT systems and good lean processes will make you a better lean manufacturer.

4.2 Types of Waste in Lean IT

Lean IT promises to identify and eradicate waste that otherwise contributes to poor customer service, lost business, higher than necessary business costs, and lost employee productivity. To these ends, Lean IT targets eight elements within IT operations that add no value to the finished product or service or to the parent organization

Each element in the table can be a significant source of waste in itself, linkages between elements sometimes create a cascade of waste (the so-called domino effect). For example, a faulty load balancer (waste element: Defects) that increases web server response time may cause a lengthy wait for users of a web application (waste element: Waiting), resulting in excessive demand on the customer support call center (waste element: Excess Motion) and, potentially, subsequent visits by account representatives to key customers' sites to quell concerns about the service availability (waste element: Transportation). In the meantime, the company's most likely responses to this problem — for example, introducing additional server capacity and/or redundant load balancing software), and hiring extra customer support agents — may contribute yet more waste elements (Overprovisioning and Excess Inventory).

Waste Element	Examples	Business Outcome
Defects	Unauthorized system and application changes. Substandard project execution.	Poor customer service, increased costs.
Overproduction	Unnecessary delivery of low-value applications and services.	Business and IT misalignment, Increased costs and overheads: energy, data center space, maintenance.
Waiting	Slow application response times. Manual service escalation procedures.	Lost revenue, poor customer service, reduced productivity.
Non-Value Added Processing	Reporting technology metrics to business managers.	Miscommunication.
Transportation	On-site visits to resolve hardware and software issues. Physical software, security and compliance audits.	Higher capital and operational expenses.
Inventory (Excess)	Server sprawl, underutilized hardware. Multiple repositories to handle risks and control. Benched application development teams.	Increased costs: data center, energy; lost productivity.
Motion (Excess)	Fire-fighting repeat problems within the IT infrastructure and applications.	Lost productivity.
Employee Knowledge (Unused)	Failing to capture ideas/innovation. Knowledge and experience retention issues. Employees spend time on repetitive or mundane tasks.	Talent leakage, low job satisfaction, increased support and maintenance costs.

Table No. 1 Targets of Waste in Lean IT

4.3 .Implementation of lean IT

Implementation begins with identification and description of one or more IT value streams. It is essential to generate a date base which must includes the detailed information of time and motion supplies, customer demand, process flow and product families. The database should have a facility to update and edit the data contents as per requirement of the lean . The generated data is to be analyzed for capacity plan, value stream map current status , vale stream map future status , work balance and layout proposal. The final stage is of project implementation wherein the above discussed steps are to be followed to create foolproof A schematic layout given below can refer to basic theme of Lean It implementation.

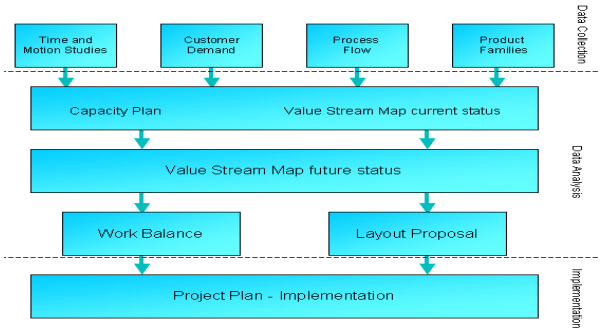

Fig. No.4 Implementation of lean IT

V. CONCLUSION

It now essential to tie up lean manufacturing with information technology so as to expedite lean management movement. The industries and service sectors in totality should move forward to take up this task and must execute possible efforts to update the various events through lean principles . It is now high time to move up for stability as far as global scenario is concerned. It is not that much difficult or complicated to opt for lean management drive. This will not only help the industries and service sectors to downsize the waste to a greater extent but also will enhance the quality of work culture . It has been proved by number of companies that lean manufacturing is a need of today and future of tomorrow.

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