Improve the business performance in production environment by using Lean Manufacturing.

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ABSTRACT

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 is based on finding efficiencies and removing wasteful steps that don't add value to the end product. There's no need to reduce quality with lean manufacturing – the cuts are a result of finding better, more efficient ways of accomplishing the same tasks. **Lean** manufacturing is simply a continuously progressive way of producing what the customer wants, when they want it, at a price they are prepared to pay and using least resource. The development of **Lean** was little known or understood outside Japan until the 1970's. Britain gained early experience of **Lean** manufacturing from the establishment of Toyota, Nissan and Honda plants in the UK. The main tools of a lean manufacturing program are Value Stream Mapping, 5S, Total Productive Maintenance (TPM), Single Minute Exchange of Dies (SMED), and six sigma .each of these tools focuses on certain aspects and areas of the manufacturing process in order to help improve costs and efficiencies in a company. To find the efficiencies, lean manufacturing adopts a customer-value focus, asking "What is the customer willing to pay for?" Customers want value, and they'll pay only if you can meet their needs. They shouldn't pay for defects, or for the extra cost of having large inventories. In other words, they shouldn't pay for your waste.

INTRODUCTION

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. The main tools of a lean manufacturing program are Value Stream Mapping, 5S, Total Productive Maintenance (TPM), Single Minute Exchange of Dies (SMED), and six sigma. Each of these tools focuses on certain aspects and areas of the manufacturing process in order to help improve costs and efficiencies in a company. Lean production is a Japanese approach to management that focuses on cutting out waste, whilst ensuring quality. This approach can be applied to all aspects of a business – from design, through production to distribution. Lean production aims to cut costs by making the business more efficient and responsive to market needs. This approach sets out to cut out all activities that do not add value to the production process, such as holding of stock, repairing faulty product and unnecessary movement of people and product around the plant. The most important aspects of lean production for current UK A-level specifications are as Just in time production (JIT),Cell production, Kaizen(Continuous improvement),Quality Circles, Total Quality

Management (TQM) and zero defect production quality management, Time based management.

Literature Review

Lean principles are derived from the Japanese manufacturing industry. The term was first coined by John Krafcik in his 1988 article, "Triumph of the Lean Production System," based on his master's thesis at the MIT Sloan School of Management Krafcik had been a quality engineer in the Toyota-GM NUMMI joint venture in California before coming to MIT for MBA studies. Krafcik's research was continued by the International Motor Vehicle Program (IMVP) at MIT, which produced the international best-seller book co-authored by Jim Womack, Daniel Jones, and Daniel Roos called The Machine That Changed the World. A complete historical account of the IMVP and how the term "lean" was coined is given by Holweg (2007)

Lean manufacturing was developed by the Japanese automotive industry, principally Toyota, following the challenge to re-build the Japanese economy after World War II. They realised that if they were to take on the US auto giants of Ford, General Motors and Chrysler they would have to work smarter.

Henry Ford was one of the first people to develop the ideas behind Lean Manufacturing. He used the idea of "continuous flow" on the assembly line for his Model T automobile, where he kept production standards extremely tight, so each stage of the process fitted together with each other stage, perfectly. This resulted in little waste. But Ford's process wasn't flexible. His assembly lines produced the same thing, again and again, and the process didn't easily allow for any modifications or changes to the end product – a Model T assembly line produced only the Model T. It was also a "push" process, where Ford set the level of production, instead of a "pull" process led by consumer demand. This led to large inventories of unsold automobiles, ultimately resulting in lots of wasted money.

Other manufacturers began to use Ford's ideas, but many realized that the inflexibility of Toyota then developed the Toyota Production System (TPS), which used Just In Time manufacturing methods to increase efficiency. As Womack reported in his book, Toyota used this process successfully and, as a result, eventually emerged as one the most profitable manufacturing companies in the world.

Lean Manufacturing Basics

Lean manufacturing is based on finding efficiencies and removing wasteful steps that don't add value to the end product. There's no need to reduce quality with lean manufacturing – the cuts are a result of finding better, more efficient ways of accomplishing the same tasks. To find the efficiencies, lean manufacturing adopts a customer-value focus, asking "What is the customer willing to pay for?" Customers want value, and they'll pay only if you can meet their needs. They shouldn't pay for defects, or for the extra cost of having large inventories. In other words, they shouldn't pay for your waste. Waste is anything that doesn't add value to the end product. In Lean Manufacturing of his system was a problem. Taiichi Ohno there are eight categories of waste that you should monitor

- **Overproduction** – Are you producing more than consumers demand?
- **Waiting** – How much lag time is there between production steps?
- **Inventory** (work in progress) – Are your supply levels and work in progress inventories too high?
- **Transportation** – Do you move materials efficiently?
- **Over-processing** – Do you work on the product too many times, or otherwise work inefficiently?
- **Motion** – Do people and equipment move between tasks efficiently?
- **Defects** – How much time do you spend finding and fixing production mistakes?
- **Workforce** – Do you use workers efficiently?

Lean Manufacturing Process

The Lean Manufacturing process has some stages:

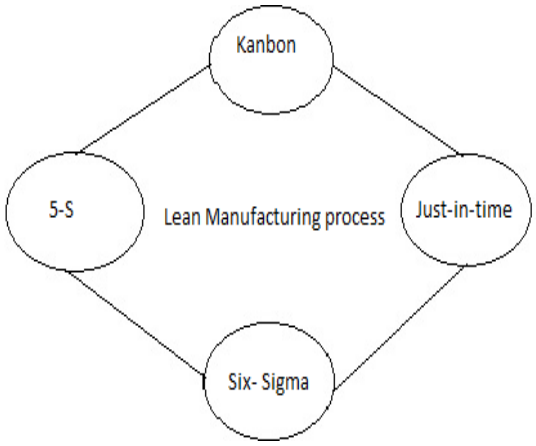
Identify Waste

According to the Lean Manufacturing philosophy, waste always exists, and no matter how good your process is right now, it can always be better. Lean Manufacturing relies on this fundamental philosophy of continuous improvement, known as Kaizen. One of the key tools used to find this waste is a Value Stream Map (VSM). This shows how materials and processes flow through your organization to bring your product or service to the consumer. It looks at how actions and departments are connected, and it highlights the waste. As you analyze the VSM, you'll see the processes that add value and those that don't. You can then create a "future state" VSM that includes as few non-value-adding activities as possible.

Analyze the Waste, and Find the Root Cause

For each waste you identified in the first stage, If a machine is constantly breaking down, you might think the problem is mechanical and decide to purchase a new machine. But Root Cause Analysis could show that the real problem is poorly trained operators who don't use the machine properly. Other effective tools for finding a root cause include Brainstorming .

Tools to Reduce Waste



Just in Time – This is the core idea of Lean Manufacturing and is based on the "pull" model. To minimize stock and resources, you only purchase materials, and produce and distribute products when required. You also produce small, continuous batches of products to help production run smoothly and efficiently. By reducing batch size, you can also monitor quality and correct any defects as you go. This reduces the likelihood of quality being poor in future batches.

Kanban – This is one of the key ways to involve people in the lean manufacturing process. Here, you support the Just In Time model by developing cues in the system to signal that you need to replace, order, or locate something. The focus is on reducing

Over production, so that you have what you need, only when you need it.

Zero Defects – This system focuses on getting the product right the first time, rather than spending extra time and money fixing poor-quality products. By using the Zero Defects system, you'll reinforce the notion that no defect is acceptable, and encourage people to do things right the first time that they do something.

Single Minute Exchange of Die (SMED) – This helps you build flexibility into your production. For example, in the automotive industry, it could take days to change a line to produce a different car model. With SMED, the assembly process and machinery are designed to support quick and efficient changeovers. (Here, a "die" is a tool used to shape an object or material.)

The 5S Philosophy – Lean Manufacturing depends on standardization. You want your tools, processes, and workplace arrangements to be as simple and as standard as possible. This creates fewer places for things to go wrong, and reduces the inventory of replacement parts that you need to hold. To accomplish a good level of standardization, use the 5S System.

Conclusion

This paper provides the blue print from which a successful introductory course can be taught to students who are in the formative years of their educational careers. These students tend to lack an understanding of manufacturing operations, thus, a combination of manufacturing theory and practice is necessary for learning to occur. A conceptual model allows the class is to be view from two perspectives, that of an empirical perspective and that of a conceptual view. The two views are intertwined by the use the problem-based learning strategy that enables students to learn at their own pace. Lean manufacturing in industry and academia is loosely defined and thus, this course presents a starting point from which manufacturing systems and their related productivity improvement strategies can be followed.

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