Lean manufacturing and its effect on businesses

Introduction

Lean philosophy has been adopted and implemented in many different and diverse business sectors; these include pharmaceutical company glaxosmithkline. Banking institute HSBC. Telecoms company Vodafone and the United States army. This is an indication that the lean philosophy can be used in many different businesses, business sectors and applications. Since its conception lean has grown in popularity throughout the world with companies realising what an advantage to the business a lean philosophy can bring by looking at other organisations performance that have implemented a lean philosophy.

2. 0 The Rationale, Evolution and Future of Lean Manufacturing

2. 1 Rational

The definition of lean manufacturing according to the author Likers (1996) is " a philosophy that when implemented reduces the time from customer order to delivery by eliminating sources of waste in the production flow". Lean manufacturing is regarded as a manufacturing philosophy that if adopted and carefully implemented can undoubtedly form the roadmap to global manufacturing excellence Krafcik (1988)

Lean manufacturing is a philosophy of production that emphasises the minimisation of the amount of all the resources used in the various activities in the enterprise. It involves identifying and eliminating non-value adding activities in design, production, supply-chain management, and dealing with the customers. Cox and Blackstone (1998)

2. 2 Evolution of lean manufacturing

Lean manufacturing concepts were used by large organisations before Toyota did it. Ford car manufacturer used similar philosophies to manufacture their model T car. Henry Ford’s idea about continuous assembly lines, and flow systems are considered as very important concepts of lean manufacturing. The next stage of this manufacturing revolution began in Japan, with Toyoda family, when they shifted from textile equipment manufacturing to car manufacturing. By the late 1940’s Japans industry was collapsing and the economy was badly affected by the World War II. Coupled to that, Japanese manufacturers faced many problems. Limited sources of raw materials, labour movements, and limited capital availability are few of them. Meanwhile, automobile manufacturers faced another problem. They could not compete with the already existing forces of west. Especially players like Ford, simply out performed small manufacturers like Toyota. Therefore they could not compete on the overseas markets. This made Japanese manufacturers to produce for their local markets. These markets were very diversified and small. Challenged by these demands Toyota gave the task of making a system which will stand in these conditions to Taichii Ohno. Ohno with his colleague Shingo created a manufacturing system for next three decades, which is known as Toyota Production System (TPS). The roots of this system were clearly linked to the Ford’s system. Actually all the managers in Toyota said to learn the Ford’s system. Fortunately though, they did not simply copy the Ford’s system. Instead they clearly understood the pluses and minuses of the system. They impart the Pluses to their system, while eliminating the problems. This manufacturing method got the influence

of the Quality movements in USA. Especially thinking of people like Juran and Deming influenced the Toyota production system.

2. 3 Future – Agile Manufacturing

Agile manufacturing is a new concept and can be argued is the next evolutionary step from lean manufacturing. Agile manufacturing is a concept that would allow organisations to gain a competitive advantage over their major competitors by being able to rapidly respond to changes in the market place. The concept of Agile Manufacturing is also compiled around the combination of a number of companies that each have unique core skills or competencies which are bought together as a joint venture, this is based on using each partner company's facilities and resources., The joint ventures are called virtual corporations, because they do not own significant resources of their own. This approach will help enable them to be agile, as they can be formed and changed very rapidly.

" There is now an increasing realisation that global superiority in manufacturing can only be achieved through innovation. We can learn from others, but in a highly competitive world we can only become world leaders if we develop new ideas that take us beyond the state-of-the-art" Kidd (1994). In this authors opinion lean manufacturing will be continue to be implemented and used by companies throughout the world for the foreseeable future because of its huge benefit in simple waste reduction techniques. No other process currently being used in the market place offers an organisation straightforward proven benefits that allow the organisation to immediately compete in the market place. Agile manufacturing it could be

argued is not fully proven and could be a gamble that most organisations are not willing to take. Some companies have prospered from an anti-lean principle; it can be argued that apple is one of these companies. Apple operate with a different philosophy they ignore the convention of open platforms, transparency in communication and operations. Steve Jobs, Apples CEO micromanages every aspect of the business. It has been reported that apples designers are housed in separate buildings and kept from seeing each other's work. And there is strict restricted access to many departments Employees are banned from talking to family members about work they are undertaking Sinnocchi and Bernstein (2010). It is Steve Jobs charisma, devotion and drive that allow Apple to succeed. Could this approach be an alternative to the lean principles approach?

3. 0 Lean Vs Mass production strategies

According to the author Ohno (1988) The fierce competition imposed by mass production systems during and after the World War II era led the Toyota Motor Company to a thorough study of the production system of the American automobile industry and in particular Ford. The solution offered by Toyota led to a complete reconstruction of the company and soon gave way to the introduction of an alternative production system, The Toyota production system (TPS) which aimed at directly attacking any form of waste in the production process. This directly paved the way for the lean manufacturing philosophy.

3. 1 Mass Production

Mass production by definition is the manufacture of a product on a large scale. The mass production of items is often done by using an assembly line, or another efficient means of production. The process is often carefully determined, to try to produce the greatest quantity of items while using the fewest resources. It was popularized by Henry Ford in the early 20th Century, notably in the Ford Model T.

3. 2 Lean Production

The definition of Lean production is an assembly-line methodology developed originally for Toyota and the manufacturing of automobiles. It is also known as the Toyota Production System or just-in-time production. Its main objectives are

Eliminate waste

Minimise inventory

Create a continuous improvement culture

Pull production from customer demand

Meet customer requirements

Maximise flow

Do it right the first time

Design for rapid changeover

Partner with suppliers

Empower workers

3. 3 Differences between lean & mass production

Lean manufacturing can be compared in contrast to its predecessor, mass production. Mass production uses semi skilled employees to design components made by unskilled or semiskilled workers operating expensive, single-purpose machines. The machines produce standardised components in extremely high volume. Due to the high cost of disruption of the process, the mass producer adds fat into the process – extra supplies, workers and space – to guarantee smooth production. Because of the high cost of changing over to a new product, the mass producer keeps pattern designs in production for as long as possible. The outcome is the consumer gets lower costs but at the expense of variety, and workers tend to find their part of the process tedious. Lean production, by contrast, uses teams of multi skilled workers at all levels of the organisation, and uses very flexible, increasingly mechanised machines to produce huge volumes of products in enormous variety. (Refer to figure 1 for a comparison table) The expression lean comes from its using less human effort in the factory, less manufacturing space, less investment in tools, and less engineering hours to develop a new component in less time. The most prominent difference though between mass and lean production is that mass producers set a goal for themselves – “ good enough.” To do better would cost too much or exceed natural human capabilities. The lean producer, on the other hand, sets the objective of perfection, thereby delivering ever-increasing benefits. Lean production also pushes responsibility farther down the organisational ladder, to individual workers. Lean production also calls for individuals to learn a vast number of

professional skills and apply these creatively. This contrasts with the traditional ideas of career progression, where an individual develops higher levels of technical knowledge and proficiency in an ever-narrowing area of specialisation.

Mass Vs Lean

Mass Production

Lean Production

Production

Large machines, functional layout, low skill level, long production runs, immense inventories

cell layout, multi-skilling, one-piece flow, zero inventories

Cultural

Culture of loyalty and obedience

Harmonious culture of involvement based upon long term development of human resource

Strategy

Product production strategy focused upon large scale and stable product design with non unique technologies

Customer focused strategy, focused upon identifying and exploiting competitive advantage

Production cycle times

Weeks or months

Hours or days

Production schedules

product is pushed through the facility on planning

product is pulled through the facility by customer orders

Manufacturing lot size

Large, with large batches sizes

Small, based on one-piece flow

Manufacturing costs

High and difficult to control

Stable and under control

Inventory levels

High – large warehouse of finished goods.

Low – small amounts between operations.

Plant and equipment

By department function

By product flow, using cells

Flexibility

Low – difficult to handle and adjust

High – easy to adjust to and implement

Figure 1 – Comparison between Mass Production & Lean Manufacturing

4. 0 The Organisational, Operational and Human barriers of Lean

4. 1 Organisational Barriers

Cultural change can be defined as a form of organisational transformation, that is, major and fundamental form of change. Cultural change involves altering the basic values, norms and beliefs among members of the organisation in order to improve organisational performance. Lean implementation can have high associated set up costs, it can also take employees a long time to adapt to the implemented changes and then some of them will reject the changes. It could be argued that even with high setup costs lean production can still hugely benefit organisations lead time, productivity and profit. “ Firms having completed the radical realignment can typically double productivity again through incremental improvements within two to three years and halve again inventories, errors, and lead times during this period.” Anderson (2004)

4. 2 Operational Barriers

Lean production implementation can be a long process and therefore for the employees to adapt sufficiently to the lean production culture have to be given time and freedom to fully embrace lean. This initial disruption to the current production flow routine could be said to become an operational barrier in the implementation of lean manufacturing. It could be argued that lean manufacturing could still become a success if only a proportion of the lean tools are implemented. If an organisation only used cell manufacturing for example in its factory it would still greatly improve the product flow but without the other allaying elements such as kanban or Kaisen it would not be as effective at reducing wastes and further reducing cycle times and therefore increasing profitability. In an ideal manufacturing environment all the lean tools would be implemented and used effectively maximising output and profit. Some organisations do not have either the capital investment or the time to implement all of the lean aspects, this does not mean that the organisation cannot improve in some way its products and performance.

4. 3 Human Barriers

It can be said that organisations with an abundance of free thinking, well educated and motivated individuals could allow for a smoother, faster implementation of lean philosophies. These types of individuals recognise the requirement for change and understand the lean principles therefore accepting and more importantly contributing to the change culture. It can be argued that firms with individuals who don’t possess these attributes could cause a barrier in the implementation of lean by objecting to change and not fully understanding lean principles and the benefits of lean.

It is also important to have a proactive management in place that can get everyone pulling in the same direction and showing how lean principles can improve the organisation and at the same time motivate and empower the workforce to help the organisation succeed.

5. 0 Quality Improvement Philosophy – RR Customer Delivery Centre

5. 1 Quality problem identification

Within Rolls Royce's final engine assembly lines engines where being built on the assembly lines, tested/inspected and then dispatched to the relevant customers. The Quality problem encountered in this process was that a high volume of engines dispatched to the customer where being almost immediately returned to Rolls Royce from the customer with complaints of various minor aesthetic and mechanical defects. These ranged from bolts and clips being in the incorrect orientation, very minor fluid leaks, paper process tags not being removed prior to dispatch or slightly dirty engine units. The customer insisted on a very strict zero defects policy and was returning engines with these very minor discrepancies. These returns where costing Rolls Royce £millions, return transportation, fault rectification and fines from the customer.

5. 2 Quality problem rectification

Rolls Royce decided to implement TQM in the form of a customer delivery centre, this is a final check off area which every engine goes through to be checked and cleaned thoroughly before dispatch to the customer, and this ensures that engine returns are eradicated, therefore upholding the

reputation of the company and saving £millions in costs. In addition to this the company highlighted awareness of right first time principles across the employees. This TQM principle has been adopted throughout Rolls Royce's production lines worldwide. This approach to quality can only strengthen Rolls Royce's market position

6. 0 Key Improvement Operations

6. 1 Kaisen

Kaizen is a Japanese word which roughly translates to continuous improvement. In the framework of Lean manufacturing, kaizen is understood to signify small, incremental, frequent improvements to a process. Lean philosophy states that instead of making large changes that may need significant amounts of investment and risk. Kaizen philosophy aims to make process improvements without adding people to the process, adding space to the process, and without expenditure to implement the change.

6. 2 Just in time

According to the author Harber et al., (1990). the JIT production philosophy is founded upon three fundamental principles: elimination of waste, continuous quality improvement, and encouragement of worker participation in operations planning and execution.

The objective of JIT is to eliminate waste, where waste is defined as anything that does not specifically add value to the product or service. Therefore, JIT can be viewed as a long-term strategy, one that promotes excellence and eliminates waste throughout a company.

The just-in-time (JIT) philosophy, pioneered by Toyota in the 1960s, can be identified by different names such as stockless production, short cycle manufacturing and lean manufacturing it originated from a need to produce a greater variety of products in smaller batches in a repetitive manner with the same production facilities. Its secondary objectives were to eliminate: waste, inefficient activities and work-in-process inventory at every stage of the value chain. The concepts of JIT and total quality management (TQM) have evolved into the lean and six sigma management paradigms Bhasin and Burcher, (2006).

6. 3 Total quality management (TQM)

The definition of TQM can be described as to reduce the errors produced during the manufacturing process, increase customer satisfaction, streamline supply chain management, aim for modernisation of equipment and ensure workers have the highest level of training.

6. 4 Six Sigma

Six sigma focuses on the value added elements of a process by reducing variation, and defects, from the process. In contrast, the emphasis of lean is on eliminating waste from non-value added activities. The 7 wastes are overproduction, defects, unnecessary motion, inventory, space, transportation and waiting time.

6. 5 Comparison

Whilst Kaisen, JIT, six sigma and Total Quality Management all fall under the umbrella of lean manufacturing they all have different and equally important

roles to play in the business improvement journey. Kaisen is a tool that can be implemented with little or no cost to the business and produces small incremental improvements this complements the JIT philosophy of continuous improvement and worker involvement to reach a common goal. TQM and six sigma focus more on the quality improvement side of business improvement. Reducing variation and removing errors from the processes, again complementing each other. These improvement philosophies can be applied effectively individually but when applied as a whole they become a very powerful and worthwhile total business improvement weapon.

7. 0 Conclusions

It has become apparent throughout the research for this assignment that a lean philosophy can be applied successfully in many different business sectors. Organisations implementing lean can expect to greatly improve processes, lead times, workplace culture and profitability through increased output. Whilst lean can be expensive to implement in some respects it can be argued that the advantages the company gain greatly outweigh the initial costs involved. An organisation that implements a lean philosophy can certainly quickly achieve market competitiveness and generate increased revenue. But if the organisation wishes to become a market leader it is no use following others and “ copying” what they have done trying to achieve parity. A new radical form of business improvement technique must be pursued in order to achieve a competitive advantage over market competitors. This author is not certain what that technique is yet but it could be said that agile manufacturing will form some part of the future, maybe individually or possibly coupled with lean to make agile lean? What is certain

is that organisations will continue to follow the lean manufacturing route for years to come helping to improve generations of businesses.