

Operations Analysis Exam paper

by Chris Ashmead

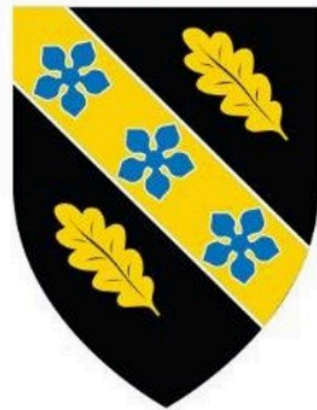
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Q1) Critically discuss the benefits and limitations of lean operations providing examples (33.3 marks)

Lean operation is a doctrine that is focused on continuous improvement and was first established after the emergence of the Toyota's production system. The principle is predicated on waste reduction as means to increase the velocity between the varying operations within an organisation. By adopting a lean based principle, it enables a greater and more continuous flow of materials and information between a company, the manufacturers, and the end consumer. Furthermore, the lean philosophy focuses on ensuring that a product of a high quality is produced at a much lower cost. As the origins of lean management were founded by the Japanese Toyota system, much of the terminology used to depict the various types of waste have yet to be translated from its original source.

The various types of waste are highlighted as follows:

- **Muda** (Waste) - The first cause of waste Muda focuses on those undertakings that are carried out which do not add any value to company's operation or provide any fulfilment to a customer's overall needs.
- **Mura** (inconsistency) - The second cause of waste Mura coincides with wastes that have been caused due to sudden deviations which can cause disparities throughout a manufacturing chain. Such a level of inconsistency throughout a process could be as the result of sudden fluctuations within demand or from the inclusion of new manufacturing equipment or services within an organisation.
- **Muri** (unreasonable) - The final cause of waste Muri means waste that has been caused by unconscionable and redundant conditions placed on a process that produce a negative outcome. To exemplify, waste can be caused by failing to have an effective plan in place to prioritise tasks accordingly or having the necessary time and resources in place for carrying out the task at hand.

Having determined the different types of waste it therefore plausible to establish what are the contributing factors that can cause waste. There seven causes of waste they are highlighted as follows:

Overproduction - refers to the supplying of more or less than what is required or what is needed within the next phase of the production process.

Waiting time - refers to the time that is wasted between all stages of a supply chain. A prime example could be the time wasted by factory workers that are waiting for the replenishment of raw materials from external suppliers.

Transportation - relates to the waste that has been caused by the double or triple handling of products throughout an operation which does not add any significant value to the product or service. A clear example of how such a waste could be reduced is by minimising the distance that the product needs to be moved by

positioning machinery or workplaces in a successive order so that the product moves from place to place thus reducing the amount of transportation that needs to occur.

Process efficiencies - The overall process in producing a product can be seen as a waste. Such process efficiencies can appear due to several factors. Firstly, waste may occur because poor maintenance practices which may result in significant time being wasted to either fix or replace a particular piece of machinery that is crucial to a manufacturing process. Secondly, waste can occur by using machinery that is deemed to be not fit for purpose therefore time will be wasted to find a suitable replacement. An effective method of reducing this form of waste is by carrying a regular inspection of machinery and implementing more training for employees to ensure that they are using equipment properly to further reduce the chances of the machinery becoming damaged.

Inventory - this refers to waste that has been caused because of having an excessive inventory that is often the result of an organisation holding onto products “just in case” that it might be needed. This may be due to meet the unexpected fluctuations in demand, to use as a safeguard if there are delays within production or to replace products that may of being defected during the manufacturing process. Nevertheless, by producing such a disproportionate amount of products this does not add any value but only increase the amount of space that is required for them to be stored which subsequently causes cost depreciation of a product and additional storage costs.

Motion - relates to the significant time that is lost through the necessary movement of both machinery and personnel within an organisation. A key example of this form of waste is the over excessive trips by a forklift in a warehouse to retrieve items.

Defects - the waste from defects is caused by a product that deviates away from the expectations of the customer. Such errors would therefore need resolving which create additional waste of time to rectify those issues. A prime example of a defect would be if a customer was to receive the wrong documentation for a product.

Working examples of companies that adopt lean within their operations

FedEx Express

Although FedEx Express is widely known as being global leader when it comes to the delivery of packages and mail, the company is therefore heavily dedicated to ensuring that maintenance of their aircraft is high on the list of their agendas. As it is at present, Fed Ex has over 170 facilities globally, with more than 100 of those situated within the United States that are committed to such a service.

Keeping up with the annual and thorough maintenance of aircraft is a monumental operational undertaking for the company which often accumulates to a significant amount of man hours, money, and capital

resources. Therefore, in a bid to reduce such costings and speed up the overall process, FedEx decided to adopt a leaner management-based approach and since its inclusion, it has greatly boosted the company overall performance.

To put this in a greater context, one of FedEx's main central locations in Los Angeles revealed that before adopting a lean approach the maintenance crew were only capable of carrying out 14 checks annually which took up to 32,715 hours to complete. Whilst contrastingly through effective lean implementation it enabled 30 checks to be carried out by the crew yearly which took only 21,355 hours to complete. For such significant improvements to be made the crew established 68 markers which are fundamental to a maintenance check and scheduled that those markers were to be completed with a four hour window. By effectively establishing those 68 markers it enabled a much more progressive workflow which meant that less time was subsequently wasted.

Zara

The significant rise of the fashion retailer Zara is something quite remarkable, its overriding success is largely due to its effective application of a variety of lean techniques. Several of these lean techniques employed by Zara are highlighted as follows:

- **Work off a 'Just in time' mentality** - the organisation applies a just in time approach by holding low stock and keeping their clothing range continually updated. Furthermore, at precise times, store managers order clothes and twice a week on schedule the new garments arrive. Most of the orders can arrive in store within fifteen days which means during that time. Zara can respond to consumer demand by manufacturing more of its more popular garments and neglecting those less popular items.
- **Acting in agile and responsive way** - From its outset Zara was designed to be as responsive and agile as possible. For this to be realised, the company has focused its attention on outsourcing to machine-controlled factories within Spain and finishing factories in North Africa and Turkey to create unfinished garments. Once a new design has been sanctioned, then the unfinished goods are forwarded from the factories to a finishing shop to be transformed into final product. From there, the finished garments will then be sent out into the European market within a 24-hour window and distributed into the Asian and North American markets within 40-hour window. By functioning in such an ingenious way, Zara can reduce their markdowns and chances of lost sales from occurring and ultimately this has allowed the company to increase its profit margins to as much as 28 per cent.

Limitations of lean operations

Although adopting a lean approach seems to be a very effective way of reducing waste it does however come with a series of disadvantages which are accentuated as follows:

- **Mechanical failure** - as lean has small error margin. Mechanical failure with a lean operation can be extremely damaging and can often result in a series of serious discrepancies that can cause the entire operation to fall behind with orders or be stopped completely. In other manufacturing facilities it would be for employees to change from one machine to another relatively easily. However, within such an approach is also always possible as all equipment is being utilised.
- **Discrepancies in supply delivery** - working in conjunction with mechanical failure, lean manufacturing can give rise to discrepancies in delivery. By implementing lean procedures means that you have a very little room for error, therefore if deliveries of supplies are late this will mean that there won't be adequate raw materials to satisfy customer demand which could bring about late deliveries and ultimately could damage customer relationships as well as the reputation of the organisation.
- **Employee disgruntlement** - By adopting a lean manufacturing approach means that significant amount of change would need to be implemented to make production processes run more efficiently. Subsequently this may give rise to employee disgruntlement, as employees may decide to dismiss such new founded approaches. Therefore, it is imperative to have managers in place to provide the necessary support to assist those employees in embracing the new changes.

Q2) Discuss the four quality related costs and methods to minimise the total cost of quality (33.3 marks)

The four costs that are associated to quality are prevention costs, appraisal costs, internal failure costs and external failure costs.

Prevention costs are those costs that have been sustained when attempting to mitigate against issues, failures, and potential errors from the outset of an operation or process. Such examples may include:

- Making a clear distinction of where a possible problem may lie and making the necessary changes to the operation or process to reduce the chances of poor quality been produced.
- Providing employees with the necessary training to enable them to develop their current skillsets which will help them to be able to carry out their job more proficiently

Appraisal costs are costs that are directly related to quality control. They are calculated when an organisation evaluates their overall level of quality to establish whether an error or problem may have taken place during or after the manufacturing of a product. Such control measures may include:

- Acquiring data that has been compiled from testing and inspection
- Examining quality issues and producing quality reports

Internal failure costs are costs that have been accrued due to significant errors that have transpired within the internal operations of an organisation. Such costs within a company may be as the result of

the following:

- The cost associated with defective products or raw materials
- The substantial amount of time that is subsequently required to rectify errors

External failure costs are the costs of errors that haven't been identified until the product or service has arrived with a customer. Such costs may result in a:

- Loss of mutual respect that a customer has towards an organisation which could adversely affect the reputation and future of the business
- Customer in wanting to seek legal action against the business to regain the costs that have been spent on the product or service

In a conventional view of quality management, it is alleged that internal and external failure costs decrease when money that is spent on prevention and appraisal is increased. Moreover, it was also foreseen that there is a maximum level of which quality should be implemented in all situations which should aim to deduce the overall cost of quality.

Q3) Comparatively discuss Total Quality Management (TQM) versus Six Sigma (33.3 marks)

Six sigma

Six sigma can be perceived as a dynamic system that focuses its attention towards ensuring a level of perfection is maintained throughout the supply chain. Furthermore, six sigma comprises of a series of procedures and instruments that are used for developing and improving both maintenance and quality of all the varying sectors within a company to ensure that the manufacturing of a product matches those expectations laid out by the consumer in terms of cost and quality.

There are two well established methodologies of six sigma which are **DMAIC** and **DMADV**

DMAIC is known as a data-oriented approach for developing existing processes and products. Furthermore, the DMAIC system is used when a current process or product can be upgraded to match or surpass a customer's demand. The DMAIC process is comprised of five stages which are outlined as follows:

- **Define** - the issue or issues to fully comprehend and establish what needs to be carried out and what are the exact requirements that need to be implemented in order strengthen operating processes
- **Measure** - This step requires affirming the issue and establishing whether that it is an issue that is worth rectifying to come to such a decision it requires assessing data and measuring and determining exactly what is happening.

- **Analyse** - This stage provides a chance to establish an overall assumption to what is the underlying cause of why a problem continues to persist
- **Improve** - This step evolves developing ideas that can be introduced to eradicate the root causes of a problem as well as examine the varying solutions that have been suggested and of those solutions that are deemed as being feasible are correctly applied, validated and results measured.
- **Control** - This stage focuses on continually verifying that the newly introduced improvements are having a positive impact and that a high-performance level is constantly maintained.

DMADV is known as DFSS (Design for Six Sigma) This methodology is applied when developing a product or process that does currently reside in the current confines of an organisation. DFSS is an area of Six Sigma that is geared towards the redesign or design of the various operational practices that are used within service delivery or product manufacturing whilst take into consideration the needs and expectancies of customers. Moreover, **DMADV** is applied when it is deemed that a process or product fails to fulfil customer requirements. The **DMADV** approach consists of five key stages which are addressed as follows:

- **Define** - This step addresses identifying the purpose of a service or product and then establishing a series of quantifiable measures from an organisational perspective to develop an effective schedule and regulations to help assess and recognise potential risks
- **Measure** - This stage focuses on measuring the various factors that are vital to ensuring quality of a product
- **Analyse** - After a product is produced the manufacturing process is then assessed. This is carried out to establish a baseline for improvement. All relevant data when then be used to identify where parts of the process need to be developed.
- **Design** - After the subsequent changes to a process have been implemented then the product is then assessed against a customer's requirements. From here, if the product still doesn't conform to the customer wants and needs any additional alterations will be made and the improved process will be checked again. Once the product is deemed to be of an acceptable quality it will then be released
- **Validate** - The final stage is focused on verifying that a finished product continues to be produced to a high standard and ensuring that continuous customer feedback is taken into consideration to make necessary adjustments to a process if it is needed.

Total quality management

Total quality management is an ideology that is oriented towards producing customer satisfaction through the continued process of identifying, reducing, or eradicating those faults within manufacturing to improve customer experience and keep all costings to a minimum. Additionally, Total quality management is directly focused on ensuring that quality is maintained by all employees throughout the whole organisation.

How six sigma and Total quality management differ?

- Total quality management focuses on delivering a higher quality product whilst six sigma is aimed towards achieving better results
- Total quality alludes to a constant effort that is carried out by staff to guarantee that a premium quality is produced. By contrast, the processes conducted under a six-sigma philosophy are the integration of a series of small changes within operational procedure to ascertain good results as well as achieving a good level of customer satisfaction
- The process of total quality management makes sure each member within a company works towards developing current processes and systems to ensure long term quality products are produced. Contrastingly, six sigma is interested in determining and ultimately eliminating those defects which may be detrimental for organisational success
- The process of six sigma is more focused around customer opinions and is more exact and more results - driven than that of total quality management