PROCUREMENT PRINCIPLES AND MANAGEMENT IN THE DIGITAL AGE

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Procurement Principles and Management in the Digital Age

Green Belts and Six Sigma Black Belts, and are overseen by Six Sigma Master Black Belts ('experts' on Six Sigma techniques and project implementation, who play a key role in training and coaching of Black and Green Belts).

Six Sigma was first developed by the Motorola company but has now been adopted by many others. Motorola defined Six Sigma as:

> A measure of goodness – the capability of a process to produce perfect work.

The Six Sigma concept is about the aim of making all processes in the chain highly capable; this means achieving a capability index of at least 2. Six Sigma refers to the number of standard deviations from the average setting of a process to the tolerance limit. In statistical terms, this translates to 3.4 defects per million opportunities for error (or 99.99966 per cent non-defective). At Motorola, this concept has been extended to every function in the company, where everyone is considered to be both a supplier and a customer. For such levels of quality, both design and manufacturing must play a role.

'Sigma' refers to the symbol that is used for the standard deviation of the normal distribution. In statistical process control, where samples are taken from a process, the readings are expected to stay within plus or minus three standard deviations of the mean. If a sample is taken that plots outside of these limits, the process is said to be 'out of control'. It should then be stopped and investigated.

Six Sigma refers to the aim of reducing process variance to half the distance between specification limits.

When Motorola announced its Six Sigma programme, such levels of process capability were rare. Most product manufacturing chains were found to have quality levels at five sigma (99.9767 per cent) or even four sigma (99.379 per cent – which is still a good standard not achieved today by many companies). Expressing the company goal as six sigma made for a clear aim. Figure 5.21 depicts the range of Six Sigma.

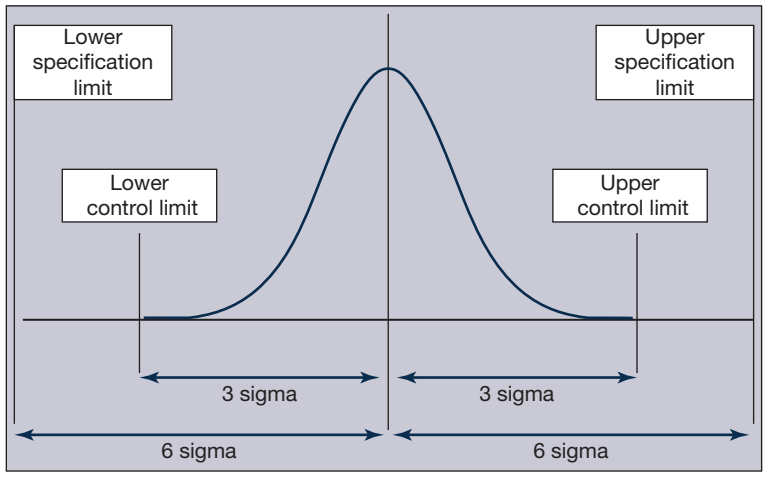

Figure 5.21
Six Sigma

The Motorola Six Sigma Methodology

- Identify customer requirements
- Define the processes for doing the task
- Identify necessary process requirements
- Improve all processes to six sigma using teamwork
- Mistake-proof the process
- Implement controls.

Motorola has attacked the Six Sigma objective through a variety of means, but team involvement and design of experiments have been particularly important.

Benefits

General Electric, who first began to adopt Six Sigma in 1995 after Motorola and Allied Signal developed it, is one of the most successful companies implementing Six Sigma, estimating benefits to the order of $10 billion.

Quality update: Quality 4.0

Quality 4.0 is the digitalisation of quality management. It adds sensor data and advanced analytics, such as machine learning (ML), Blockchain and Big Data, to traditional quality processes, teams and data strategies. Quality 4.0 generates new insights that enable manufacturers to attain unprecedented quality, operational and financial performance.

Quality 4.0 blends new technologies with traditional quality methods to arrive at new optimums in operational excellence, performance and innovation, but although it relies on technology, the true transformation occurs in culture of quality, leadership and quality processes. Success with Quality 4.0 requires a solid traditional quality foundation.

These technologies can reduce procurement quality problems by as much as 60 to 70 per cent.

Summary

1. Quality means different things to different people. It can be defined as ‘fitness for purpose’.
2. Statistical process control (SPC) is a mathematical system used to monitor an organisation’s quality capability. It is a proactive approach to preventing defective work being produced. SPC devolves responsibility for quality down to the operator, who is authorised to take corrective action should measurements stray outside of acceptable limits.

3 'Off-line' approaches to quality assurance have assumed a greater prominence in recent years. The work of Taguchi in connection with the quadratic loss function has been extremely influential in this regard. Ideas such as failure mode and effect analysis and early supplier involvement exemplify other 'off-line' approaches.

4 QFD and HOQ are outlined. QFD is defined by the American Supplier Institute as a 'system for translating consumer requirements into appropriate company requirements at every stage, from research, through product design and development, to manufacture, distribution, installation and marketing, sales and services'.

The HOQ technique recognises the inter-relationships between customer requirements and design variables and between the design variables themselves.

5 Performance specifications encourage the supplier to be innovative in providing an appropriate product/service to meet the need. Conformance specifications are clear and unambiguous, relating to the product/service rather than its application.

6 Standardisation can be a difficult and lengthy process as it often requires individual preferences to be ignored. However, the benefits of variety reduction, lower stockholding costs, economies of scale on larger orders, etc., can make the exercise well worthwhile.

7 An organisation wishing to achieve ISO certification must ensure that it has a quality system that meets the requirements of the standard.

8 Six Sigma is an overall strategy to accelerate improvements in processes, products and services, and is a measurement of total quality to know how effective a company is in eliminating defects and variations in its processes, products and services.

9 In statistical terms, this translates to 3.4 defects per million opportunities for error (or 99.99966 per cent non-defective).

10 Quality 4.0 is introduced as the digitalisation of quality management.

Self-assessment tasks

1 Outline the cost of quality.

2 Explain the operation of four models of quality management.

3 Evaluate requirements for sustainable specifications.

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Inventory management

Introduction

Holding inventory costs money, and therefore reduces profitability. That inventory is designed to support production and service operations. Some level of inventory is essential in order to provide continuity of service and to avoid costly downtime and service disruption and non-availability, but inventory reduction and, therefore, the release of cash and reduced operating costs remain essential concerns of inventory management. However, natural disasters and the Covid-19 pandemic forced procurement to rethink its supply chain, questioning the logic of the just-in-time concept as a lack of risk management, poor resilience and a lack of agility in supply chains were made visible. Real-time management of stock and lean, integrated supply chains had become the norm but, following the pandemic, procurement has reviewed its management of inventory and put more effort into understanding risk across tiers, on occasion, by just-in-case inventory. There is, therefore, a need for greater collaboration and sharing of information to build up resilience and trust.

Objectives of this chapter

- To consider provisioning systems for stock and production purposes
- To examine positive and negative reasons for holding stock and approaches to reducing inventories
- To identify methods of stock control and their application
- To explain the economic order quantity (EOQ) concept
- To discuss the usefulness and limitations of forecasting in the supply context
- To develop an appreciation of MRP, MRP2 and ERP systems
- To discuss ‘just-in-time’ and related philosophies such as lean and agile supply
- To identify the impact of the Covid-19 pandemic on inventory management
- To examine the future of inventory management

Provisioning systems

Stock control could be defined as the policies and procedures that systematically determine and regulate which things are kept in stock and what quantities of them are stocked. For each item stocked, decisions are needed as to the size of the requirement, the time at which further supplies should be ordered, and the quantity that should be ordered. Production planning and control could be defined as the policies and procedures that systematically determine and regulate manufacturing programmes and establish requirements for parts and materials to support production. For each item required, decisions are needed as to the size of the requirement, the time at which it should be ordered and the order quantity.

Requirement quantities can be aggregated or subdivided in various ways, and the quantity notified to the procurement department as required is not necessarily the same as the quantity the procurement department orders from suppliers.

Ordering policies used by procurement include:

- blanket orders, which group many small requirements together for contractual purposes;
- capacity booking orders, which reserve supplier capacity for the production of various parts, used in conjunction with make orders, which specify later which parts are to be made (this type of purchasing is becoming more commonplace as supply chains become more flexible or agile);
- period contracts stating an estimated total quantity for the period and the agreed price, in conjunction with call-off orders, which state delivery date and quantity;
- period contracts specifying a series of delivery dates and quantities (e.g. '1000 during the first week of each month');
- spot contracts and futures contracts in various combinations;
- 'open-to-buy' (OTB) and the similar 'order-up-to' systems sometimes used by stock controllers in the retailing sector;
- part-period balancing and lot for lot, in conjunction with materials requirement planning (MRP) or kanban systems;
- the economic order quantity (EOQ).

We go on to consider order quantities in connection with stock control and then with production control.

Order quantities and stock control

Stock can be a nuisance, a necessity or a convenience. Certainly, post-Covid-19, procurement is reviewing its lean approach in order to increase inventory and have a more agile, responsive supply chain with built-in resilience.

Why do we carry stock? The reasons include:

- the convenience of having things available as and when required without making special arrangements;