An Appropriate Manufacturing Operations Model

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Abstract

This paper attempts to consider the main concepts and issues related to quality processes that produce quality goods and services to customers. First, the main concepts of value chain, Value Added management, Waste and Total Quality, Design for Manufacture and the Market, Just –In-Time concept and Concurrent Engineering are explored. These concepts presented, guide us to a better understanding of the links between these areas. Secondly, the importance of value adding in manufacturing industry is emphasized. Finally, this study has shown that efficient value adding is essential to be competitive. The quality model can be established by realizing the strategic links of total quality management and just in time in elimination of waste to increase value adding operations

Keywords:

1. Method of study

The methodology followed is first by, presenting the main topics and key issues for possible construction of appropriate manufacturing operation model valid for producing a quality product or service. Then moving on to discuss and analyse the link between these concepts and their role in building the model. The review of these concepts can guide us to a better understanding of the relationships between adding value, successfully manufacturing well designed product from the start and the characteristics of quality manufacturing system capable of generating profit.

2. Introduction

Manufacturing is concerned with the process of 'adding value' to raw materials. This is achieved by converting them to finished products which are worth more to customers than the unprocessed materials, and which can therefore be sold at a higher price. The profit to the manufacturer is the revenue from goods sold; less the cost of raw materials and the cost of adding value to these raw materials through the conversion process. To be able to build a model, we need to understand the meaning and importance of value adding in manufacturing and how customers see it. Also to understand and appreciate the need for the voice of customers being transmitted to all parts of the organization and how the technique of quality function deployment can ensure that customers perceptions of value are translated to the product specifications and manufacturing operations.This can be achieved by concurrence and integration of lean production engineering concepts.

3. Literature Review

- *Value Adding Management (VAM)*

Manufacturing companies produce a product in the form of goods and services (or both) which have a marketable value. Manufacturing operations must add value so that the final product is more valuable than the original components. Any activities that do not add value to the product can be regarded as waste. Each stage of manufacturing must add value as shown graphically in Figure 1 which is drawn for a product with four stages of production.

- *The Value Chain*

Within any manufacturing company, there will be many types of activities that add value to the product, either directly or indirectly. Porter draws a distinction between 'primary' and 'support' activities within the value chain .The primary activities are the most obvious value adding activities because they are part of the physical process of converting raw materials into saleable product, the physical logistics of ensuring a flow of materials through the factory and out to customers, and the sales and marketing activities involved in making customers aware of the products the firm is selling.

- *Value Adding and Non Value Adding Activities*

The definition of what is and what is not a value adding activity is not that straight forward. If we refer to Porter's analysis of the Value Chain, we will see that all activities are considered as part of the chain, and hence, to add value. The activities which play a crucial role in the value chain should be enhanced and the ones which form the part of the general overhead could be reduced or eliminated without affecting the company's competitive performance. Some activities such as physical processing of materials, product design and production engineering activities directly add value to the product. But other activities such as quality control, reporting, administration, and team formation may not.

4. Tools for building the model

Waste and Total Quality Management

We have seen how non value adding activities can have a dramatic effect on the success of a manufacturing organization. In order to be successful, it is necessary to stay competitive in the market, or better than anyone else who is attempting to sell their goods in the same markets. Non value adding activities will have a major influence on an organization's ability to compete, since

they consist substantially of waste. Figures 2, illustrates waste; the cost of failure .It is like an iceberg (juran and gryna 1993)

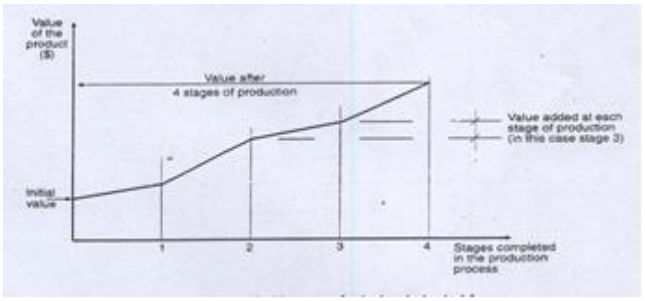

Fig. 1: Value added by manufacturing (adapted from Kissky (1994))

Quality Costs

Four major categories of costs are associated with quality management:

* Prevention
* Appraisal
* Internal failure
* External failure

Product Design for manufacture and the Market

Product design is the root of the value adding process. In designing a product, it is important to look first at the customers' requirement in terms of economic value, fitness for use, and value of the product. Design and manufacture must then be related to meet these requirements.

Voice of the Customer

A manufacturing system must be innovative. In order to be innovative, a company must have flexibility in its manufacturing system so that its design and management can be a direct result of customer requirements. A major problem of any manufacturing organization is to determine these customer requirements and to ensure that they are communicated to the manufacturing system so that this can be designed and managed in a way to allow maximized value adding efficiency.

Quality Function Deployment

Quality Function Deployment (QFD) is a mean of communicating the voice of the customers to the manufacturing system. It helps manufacturing companies to add value into the product with optimum efficiency.

QFD rests on three important aspects:

- Value features of product – as determined by customers
- Functional characteristics – as determined by the products' designers and manufacturers
- Quality and Value of competitor's product

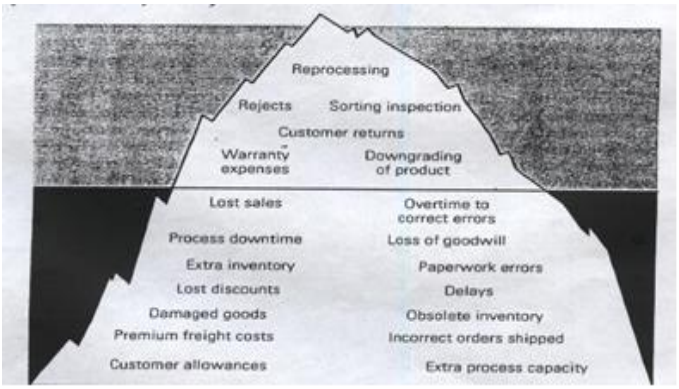

Fig.2, Costs of Failure (Juran and Gryna, 1993)

Concurrent Engineering

Hearing the voice of the customer is one of the most important factors in providing value. Manufacturers cannot provide value to the customer unless they are very clear about the way in which the customer perceives value when a product is purchased, and equally importantly, in the service which accompanies it. Quality Function Deployment is a very powerful step in helping the manufacturer hear the voice of the customer. However, there is little point in hearing the voice of the customer and offering the desired value , but with such time delay that the customer has gone elsewhere , or at such cost as to threaten the business viability of the enterprise . Value must therefore not only be provided, but also in an extremely rapid and efficient manner. Efficient value adding really stems from two main areas:

- The design of the product itself
- The design of process and support activities which are required for manufacture of the product.

Just –In-Time Manufacturing

5. The basic principle of just-in-time manufacturing is the total elimination waste – all forms of waste. This includes safety stock of raw materials, wok-in-progress and finished goods, extra people, excess capacity, returns of wrong or damaged items, unnecessary operations, poor design, safety time and over-production. As Figure, 3 illustrates JIT strategy is a production strategy for continuous improvement built around the two fundamental ideas of the total elimination of waste and a high respect for people. Quality at the source is the quality produced by the person on the shop floor who is adding value to the product

6. Discussion

To expand on the need to carefully consider design for manufacture, we can examine the importance of the design function in the concept of Lean Production which is expanding rapidly around the world. In simplified terms, Lean Production means doing much more with much less. Otherwise expressed, value adding processes

must be designed to prosper on less space, less inventory, less people, less investment and less and ever decreasing waste in general. Manufacturing systems have always been characterized by slack or buffers designed to the system to counteract their conceived inevitable variation in performance. Lean Production challenges this view adopting the philosophy that there is always a better way to add value .It is also pertinent to note that waste can be eliminated in two ways:

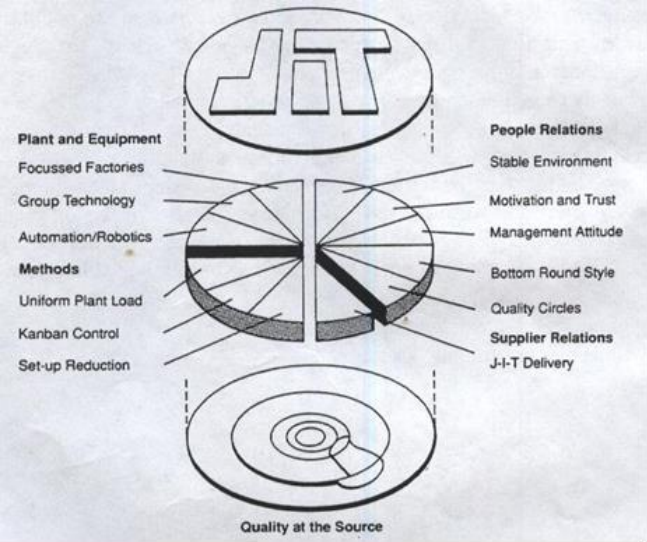

Fig.3 the elements of just –in –time (Source: K Wantuck, the Just-In-time Manufacturing Management technique, Technology transfer Council, Sydney, n.d.p.20

. • By improving the existing manufacturing system.
• By utilizing conceptually leaner technology

We can easily see the links between the different areas of (value adding, waste and total quality management, product design, concurrent engineering, and just in time manufacturing. This study of the value chain has shown that efficient value adding is essential to be competitive. We have seen that manufacturing activities can be analyzed in categories of value adding and non value adding .Consideration of non value adding activities has brought the need to control waste in manufacturing activities.

7. Conclusion

Our study of the value chain has shown that efficient value adding is essential to be competitive to achieve competitiveness we have seen that manufacturing activities can be analyzed in categories of value adding and non value adding. Consideration of non value adding activities has brought to the fore the need to control waste in manufacturing activities Also, total quality and involvement of the total organization is essential to efficient value adding This reinforces the concepts of linkages in the value chain and leads to the idea of totality of the manufacturing organization aimed at meeting customer requirements. From here, we change emphasis to the product Design is the start of the value adding process QFD is perhaps the ultimate technique for ensuring that the design is in tune with customer requirements. Customer requirements can be translated into design and manufacture parameters which should percolate through the whole of the manufacturing system. Concurrent engineering is an approach that can speed up the product design and development cycle and end ensure that the voice not only of the customer but also the manufacturing engineer, the cost accountant, the production manager, and even the suppler all suppler all have an input into the design.

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