CHAPTER 4

ATTRIBUTES CONSIDERED FOR THIS RESEARCH WORK

4.1 INTRODUCTION

From the literature survey, it is clear that Product Quality, Cost and Delivery are of prime importance in selecting a supplier. Also, this research work considers Technical Capability, Production Facility, Repair Service and Geographical Location, since expectations on the suppliers are increased in terms of security in service and follow up. Apart from Dickson’s 23 criteria, many factors have to be considered in the supplier selection such as EDI (Electronic Data Interchange), Information security, Internet facility, VMI (Vendor Managed Inventory), JIT (Just in Time) etc. So, there is a need for the purchase managers to consider the above said factors for the efficient selection of suppliers in the modern scenario. In this work, the management strategies, JIT and VMI are also considered for the analysis. The attributes are discussed in the forthcoming topics. Different definitions of the top five attributes are taken from the article “Operational characteristics as supplier selection Criteria in supply chain management” and discussed.

4.1.1 Quality

The amount of research performed on the organizational characteristic of quality is extensive. Quality is a difficult construct for customers to specify and identify (Parasuraman et al 1985). Through past studies, the characteristic of quality has been researched from the viewpoint of four distinct and separate disciplines:
1. Philosophy
2. Economics
3. Marketing
4. Operations

Another researcher Garvin (1984) identified five major approaches to developing a definition for quality: (1) the transcendent approach of philosophy, (2) the product-based approach of economics, (3) the user-based approach of economics, (4) the manufacturing-based approach, and (5) the value-based approaches of operations management.

There are a number of definitions for quality in the dictionary, but a short definition that has achieved acceptance is:

In order to determine the level of quality, certain criteria used in the evaluation, Garvin (1987) developed a list of eight dimensions of quality that pertain to performance and are critical for consumer’s expectations:

1. Performance
2. Features
3. Reliability
4. Conformance
5. Durability
6. Serviceability
7. Aesthetics
8. Perceived quality

Other researchers split these eight dimensions into two distinct classifications, or constructs, based on the level of focus; manufacturing-
based or product-based. Ahire (1996) developed ten dimensions, or constructs, of quality consisting of:

1. Top management commitment
2. Customer focus
3. Supplier quality management
4. Design quality management
5. Benchmarking
6. Statistical process control usage
7. Internal quality information
8. Employee involvement
9. Employee training
10. Employee empowerment

The eight dimensions developed by Garvin (1983) are product related, or product-based, and pertain to the performance of the item manufactured by an organization. The ten dimensions developed by Ahire are organization related, or manufacturer-based.

4.1.2 Cost

For this study, Cost is defined as the total amount of money charged, incurred, or accrued for an item, part, or material from any organization operating as a supplier of goods or services. Many researchers (Bartholomew 1984, Choi and Hartley 1996, Dempsey 1978, Dickson 1966, Ellram 1990) specify that cost is one of the four leading criteria on which a supplier is selected.

The adversarial method of procuring materials, goods, or services used cost as the leading criteria (Spekman 1988). This method typically
applies pressure on the supplier to reduce their bid price to match the price bid by a separate supplier. The suppliers are kept at arm’s length, meaning they are not notified of any information concerning the use or needs of the product they are bidding on. A supplier that has been awarded the sale because they quoted the lowest landed cost has no reason to make any improvements in the product being supplied. Any defect in the product would likely remain in the design until the item was released for bid next time. The fabrication line’s productivity is the determinant of the cost of the final product along with the cycle time, and the satisfaction of the customer (Lee et al 2002). The capabilities of the plant’s suppliers heavily influence the ability of the firm to produce a quality product at a reasonable cost (Watts et al 1990). Smytka and Clemens (1993) took a total cost approach to the selection of supplier. The potential supplier with the lowest calculated total cost is the one selected to join the chain of suppliers.

A connection between the cost of the product and the quality of the product has been identified by Carter and Narasimhan (1994); as quality increases, the cost per unit will decrease in per unit cost. Giunipero and Brewer (1993) identified the cost-ratio approach to the identification of the appropriate supplier to select.

4.1.3 Delivery Performance

Delivery performance will be defined, for the purpose of this work, as the timely transfer or exchange of the manufactured parts meeting the specifications requested from the supplier or its delivery agent to the assembly plant (Choi and Hartley 1996, Garvin 1987, Spekman 1988).

The prompt arrival of parts and material can assist organizations in maintaining low costs. In the global marketplace of today, there are many
organizations that are attempting to gain a competitive edge or maintain a competitive advantage by procuring parts and material from suppliers who offer a reduction in the standard delivery time (Ellram 1991, Lee and Billington 1992, Cavinato 1992, Davis 1993, Hines 1994). The selection of a supplier based on the speed of delivery is a performance evaluation. The components that impact timely delivery are supplier lead-time, manufacturing or production time, and delivery time performance (Davis 1993, Lee and Billington 1992).

Delivery performance is measured by four distinct variables: (1) delivery lead time, (2) throughput time, (3) the percentage late deliveries, and (4) the average lateness requested. The first two variables measure speed of delivery and the final two measure the reliability of delivery performance (Milgate 2001). The manufacturing or production time includes any delay as a result of production equipment downtime, process yields, or material requiring rework. Inventory is the maintenance of a supply of material to ensure against depletion of the same material. It is a type of protection against the uncertainty that would occur if there was no material (Davis 1993). Inventory, when used effectively, is designed to prevent against a non-stock or an out-of-stock situation.

4.1.4 Technological Capabilities

Technological capabilities are directly related to the ability of the organization or members of the organization, to handle or use technology. For that reason, the term technology must be included and defined in this study. Technology can be defined simply as knowledge (Steele 1983). Schon (1967) defines technology as any tool or technique, any product or process, any physical equipment or method of doing or making, through which the capability of an individual is extended. The best definition of technology
comes from Christensen and Bower (1996) when they state technology is the process by which an organization transforms labor, capital, materials, and information into products or services. According to this definition, all firms have a technological presence and use technology regardless of how extensive it is. Porter (1985) states, “Any firm involves a large number of technologies. Everything a firm does involves technology of some sort, despite the fact that one or more technologies may appear to dominate the product or the production process”.

Schoenecker and Swanson (2002) state that even though there are a number of different methods available to measure a firm’s technological capability, the ones that are most common fall into three categories:

1. Financial measures
2. Patent statistics
3. Statistics on new product introductions

Three patent citation-based measures are used in the study of technological capabilities of an organization.

1. The current impact index
2. Science linkage
3. Technology cycle time

The current impact index measures the actual quality of the patents issued to an organization including the frequency of the issuance of patents.
4.1.5 Production Facilities

Production facility is defined as requirement of the machines, equipments, man, capital, methods and emergency fitments which can be broadly discussed in two categories. First category is the ability to meet the demand volumes for the requirement of regular parts in the market. The second category is to face the demand in the variety of products from different types of industries for customer satisfaction. Production facility should be established to satisfy the two categorical requirements in the stipulated time.

The stage of a supplier’s technological development and his interest in keeping up with current methods are also considerations affecting service (Westing et al 1969). While it might be argued that a buyer is interested only in whether a supplier can supply the quality requested, which is a short-sighted attitude. As competitors make improvements and developments, the buyer will suffer from having chosen a technologically inferior supplier.

The inspection methods and the quality-control standards maintained by the prospective supplier are also important in evaluating service. Since assurance of supply means not only that the goods will be delivered, but also that they will be in usable condition, it is important that these two criteria- inspection and quality control – be carefully checked before the choice of supplier is made. A supplier who is careless about inspection will ship many items that must eventually be rejected and returned because they are not satisfactory for the purpose. If such a supplier is also negligent in his production quality control, the problem is aggravated because of some of these imperfections which may not be discovered until the item has been incorporated in to the finished product.
A closely related consideration that bears on supplier service is the “housekeeping” or plant-maintenance standards carried out by the supplier. A supplier who is careful and thorough in his plant-maintenance practices is likely to suffer from a minimum number of production disruptions resulting from machinery breakdowns and similar mishaps. Since production disruptions frequently lead to delays in shipments to customers, they decrease the assurance of supply, which is an important consideration in service.

Another consideration to be taken into account in the production facility is the reserve facility. This issue is of special importance during periods of high industrial activity. A supplier with a good reserve of productive facilities is in the best position to meet increased demand and to assure his customers that their demand will be met in terms of both quality and quantity.

4.1.6 Repair Service

“Service” is a term that varies in meaning depending on the nature of the product being purchased (Burt et al 2005). Specifically, good service always means delivering on time, treating special orders specially, filling back orders promptly, settling disputes quickly and fairly, and informing supply managers in advance of impending price changes or developing shortages. In some situation, it means exceptional post-sale service. Service also can include actions such as stocking spare parts for immediate delivery, extending suitable credit arrangements, or warranting the purchased item’s quality and performance to a degree beyond that normally required. In the aggregate, good service means that a supplier will take every reasonable action to ensure the smooth flow of purchased materials between the supplying and buying firms.
4.1.7 Geographical Location

The geographical location of the supplier is an important consideration in evaluating service (Westing et al 1969). Shipments from a supplier located at a great distance from the buyer’s plant are subjected to more and greater risks of interruption such as accidents, strikes, and floods, because of the greater distance and time involved in transportation. At the same time, the possibility of using substitute for transportation is lessened as distance increases. For example, if there has been a disruption to tail transportation on a shot haul, it is easier to substitute truck transport than it the shipment involves a long haul. This difficulty of finding substitute transportation for the long haul is still greater if the commodity to be transported is bulky or heavy.

Some companies overcome part of their geographical disadvantage by providing pool car shipments, branch warehouses, and make-and hold services. Pool car shipments refer to the practice of collecting a number of small orders from a given geographic region and combining them in to one shipment, thereby economizing on freight by obtaining the full car rather than the much higher Less than Car Load (LCL) rate. Pool car shipments may be used in conjunction with branch warehouses, which act as distributing points for shipments originating at the home plant.

The make-and hold service refers to the practice of the seller producing in anticipation of buyer’s needs and storing the merchandise. This allows the seller to ship immediately upon work from the buyer, and thereby minimizes total order time. The increased flexibility in providing immediate shipments may offset the disadvantage of a geographically inferior seller.
4.1.8 Just in Time (JIT)

The technique was first used by the Ford Motor Company as described explicitly by Henry Ford's My Life and Work (1922): "We have found in buying materials that are not worthwhile to buy for other than immediate needs. Materials will be bought only enough to fit into the plan of production, taking into consideration the state of transportation at the time. If transportation were perfect and an even flow of materials could be assured, it would not be necessary to carry any stock whatsoever. The carloads of raw materials would arrive on schedule and in the planned order and amounts, and go from the railway cars into production. That would save a great deal of money, for it would give a very rapid turnover and thus decrease the amount of money tied up in materials. With bad transportation one has to carry larger stocks." This statement also describes the concept of "dock to factory floor" in which incoming materials are not even stored or warehoused before going into production. The concept needed an effective freight management system (FMS); Ford's Today and Tomorrow (1926) describes one.

Just-in-time (JIT) manufacturing system received considerable attention since the early 1980s (Meybodi 2002). Some of the main benefits of JIT such as inventory reduction, quality improvement and quick delivery are well documented (Temponi and Pandya 1995, Deshpande and Golhar 1995, Handfield 1993, Lawrence and Hottenstein 1995, Golhar et al 1990, Moras and Dieck 1992). However, in a global competitive market, price, quality and quick delivery are not sufficient to stay ahead of competition once the product reaches the maturity stage of its lifecycle. To stay competitive in the market, in addition to price, quality and speed, organizations need to develop agility to innovate, design and introduce new products to the market quickly.

Introducing new products to the market early has several strategic and operational advantages. It often means charging premium price, building
name recognition, controlling a large market share and enjoying the bottomline profit. Better competitive position in the market also makes it difficult for competition to enter the market (Blackburn 1991, Cooper and Kleinschmidt 1994, Eppinger 2001, Krishnan and Ulrich 2001, Zahra and Ellor 1993).

During the last two decades, world class JIT manufacturers have dominated competition not only in the areas of price, quality and speed but also in the areas of innovation, design and quick new product development (Bebb 1989, Blackburn 1991, Clark and Fujimoto 1991, Ulrich and Eppinger 2000). The question of interest in this paper is to investigate if there is a link between successful implementation of JIT in manufacturing and successful management of new product development using simultaneous engineering (NPDSE) process using existing JIT and new product development data. Since the early 1980s, Meybodi (2003) showed that success in JIT has a positive impact on new product development. In a JIT system, elimination of waste is achieved by adopting elements such as total quality management, focused factory, reducing setup times, small lot sizes, flexible resources, group technology layout, pull production system and effective use of technology (Gargeya and Thompson 1994, Shunk 1992, Spencer and Guide 1995, Suzaki 1987). Respect for people includes elements such as teamwork, fair compensation, worker training, worker participation and new attitude towards suppliers (Shoal et al 1993).

Unfortunately, since it is beginning a narrow view of JIT, mainly inventory reduction and frequent deliveries, have been accepted and practiced by many manufacturing managers. Applications of JIT to reduce inventory and deliver frequently are only small fractions of the full potential benefits of a JIT system (Blackburn 1991, Gilbert 1994, Towner 1994). To take advantage of the full benefits of JIT, one needs to have a broader view of JIT.
principles (Blackburn 1991). Looking at JIT as a process to eliminate waste and to respect people rather than an inventory reduction and frequent delivery method, its principles can also be applied to other areas of business such as new product development, supply chain management, and even to service organisations in which there is no physical inventory.

4.1.9 **Vendor Managed Inventory (VMI)**

Vendor Managed Inventory, popularly known as VMI is gaining great momentum in retail business processes (Phani Kumar and Muthu Kumar 2003). In this era of tough competition retailers are implementing every supply chain optimization process that will reduce their costs, reduce inventory levels and increase profits. Efficient supply chain management requires the rapid and accurate transfer of information throughout a supply system. Vendor Managed Inventory (VMI) is designed to facilitate that transfer and to provide major cost saving benefits to both suppliers and retailers customers. Vendor Managed Inventory is a continuous replenishment program that uses the exchange of information between the retailer and the supplier to allow the supplier to manage and replenish merchandise at the store or warehouse level. In this program, the retailer supplies the vendor with the information necessary to maintain just enough merchandise to meet customer demand. This enable the supplier to better project and anticipate the amount of product it needs to produce or supply.

Vendor managed inventory process can be defined as “A mechanism where the supplier creates the purchase orders based on the demand information exchanged by the retailer/customer”. To say this in simple terms, VMI is a backward replenishment model where the supplier does the demand creation and demand fulfillment. In this model, instead of
the customer managing his inventory and deciding how much to fulfill and when, the supplier manages.

The VMI concept provides improved visibility across the supply-chain pipeline that helps manufacturers, suppliers and retailers improve production planning, reduce inventory, improve inventory turnover and improve stock availability. With information available at a more detailed level, it allows the manufacturer to be more customer-specific in its planning. The VMI concept is being widely used in many packaged consumer goods processes where the end-user’s demand for products is relatively stable with short-term fluctuations in supply chain. With the ability of supply-chain applications to manage inventories at retailer locations, VMI concepts are being applied at both the distribution center-level and the store-level.

The VMI process brings benefits for both retailers and suppliers. Some of those benefits are listed below.

**Retailer Benefits**

- Reduced inventory
- Reduced stock-outs
- Reduced forecasting and purchasing activities
- Increase in sales

**Supplier Benefits**

- Improved visibility results in better forecasting
- Reduced PO errors and potential returns
- Improvement in SLA
- Encouragement in supply chain cooperation
The knowledge about this supplier selection attribute will be much useful in finding out the perceived and actual importance of supplier selection attributes.

4.2 SUMMARY

Along with the top five attributes of supplier selection, Repair service, Geographical Location, Just In Time (JIT), and Vendor Managed Inventory (VMI) were also included. The reason for selecting the nine attributes for this research had been explained and description on each attribute was given for the explanation purpose. In the forthcoming chapters, approaches and findings of perceived and actual importance of supplier selection attributes were discussed.