

# Supplier evaluation and selection criteria in business performance of small and medium scale enterprise

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**Abstract** - The aim of this study is to assist the company in assessing the potentials of identified suppliers. As a consequence, all the important qualities required for suppliers as per purchaser's interest are selected. These criteria are effective with respect to supplier point of view also because it will lead to better marketing of the supplier. All this are essential to improve effective business performance of firm and generate revenue. Selecting a supplier is a tailor made complex problem involving qualitative and quantitative multi-criteria decision making. The focused sector is small and medium enterprise which covers many garment units. First, the current conditions of the garment industry are analyzed and the key factors for a successful supply chain are discussed. An analytical hierarchy process (AHP) model that Garment Company can use for the selection of suppliers is presented. In addition, strategic priorities for the supplier selection problem are identified and weights are developed to select the right supplier that fits the company's strategy. Choosing the right supplier could give the right quantity and the right cost on the right timeline. Therefore it can be summarized that the aim of this study is to emphasize the importance the supplier selection problem and its relation to the supply chain strategy and goals. If suppliers are successful in adopting strategic marketing as per the research findings, then it will be helpful for suppliers to market their products effectively. Therefore it can be said that the present study is helpful in improving marketing management system of suppliers.

**Key Words:** Supplier selection and evaluation process, small and medium scale enterprise (SME), Supply Chain Management (SCM), Analytical Hierarchy Process (AHP)

## 1. INTRODUCTION

In today's world of globalization many garment retailers are building strong supply chains to gain advantage over their competitors by offering the best value to their customers. The supply-chain management (SCM) has become very critical to manage risk, dynamism, and complexities of global sourcing. One major aspect of the SCM is to select the right sources of supply in the global business environment that can support corporate strategy. Considering the rapidly changing market conditions and customer seeking the best value, long-term relationships with the suppliers became very critical in the garment industry. Therefore the garment

retailers are looking for the suppliers who can provide the best cost in the fastest way. Such a relationship is regarded as partnership since it includes activities such as information sharing, joint product design, or sharing storage spaces.

The purpose of this research is to emphasize the importance the supplier-selection problem and its relation to the supply-chain strategy and business performance of small and medium scale enterprise like garment industry. It presents a model, based on the analytical hierarchy process (AHP), that a garment company can use to select its suppliers, and create a strategy for supplier relationship management. The framework of the performance measurement is based on quantitative and qualitative measurements.

## 2. RESEARCH METHODOLOGY

The Research Methodology followed for present work can be primarily classified into two stages namely Exploratory and Descriptive. The stepwise details of the research are as follows:

### Stage - I

Exploratory Study: Since we always lack a clear idea of the problems one will meet during the study, carrying out an exploratory study is particularly useful. It helps to develop concepts more clearly, establish priorities and improve the final research design.

### Stage - II

Descriptive Study: After carrying out initial Exploratory studies to bring clarity on the subject under study, Descriptive study will be carried out to know the actual supplier selection method being followed for garment industry. The knowledge of actual supplier selection process is needed to document the process and suggest improvements in the current system to make it more effective. It is proposed to use an integrated approach using viable methodologies e.g. fuzzy set, cognitive mapping, Analytic Network Process (ANP), Analytic Hierarchy Process (AHP) etc. for solving the supplier selection problem. These methods not only consider the dependencies and feedback effect among criteria, but also consider the uncertainties on decision making process.

Supplier selection processes have been comprises of identifying suppliers, soliciting information from suppliers, setting contract terms, negotiating with suppliers, and

evaluating suppliers. It is proposed to critically evaluate the importance, interrelation and complexity of supplier selection process in corporate environment using a case study.

### 2.1 RESEARCH DESIGN AND DATA COLECTION

Both primary and secondary data will be collected by published sources, interview, document review and the author’s own observation. The theoretical framework of this study consists of mainly secondary data.

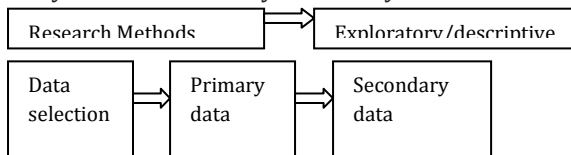


Figure1. Research method.

### 2.2 THE PROCESS OF SELECTING SUPPLIERS

Selecting the right supplier is always a difficult task for the purchasing manager. Suppliers have varied strengths and weaknesses, which require careful assessment by the purchasers before ranking, can be given to them. Therefore, every decision needs to be integrated by trading-off performances of different suppliers at each supply chain stage (Liu & Hai, 2005).

The supplier selection problem can be solved with Multiple-Criteria Decision Making (MCDM), out of which quantities criteria have been considered for supplier selection in the previous and existing decision models so far (Chen-Tung, Ching-Torng & Huanget, 2006). In MCDM, a problem is affected by several conflicting factors in supplying selection, for which a purchasing manager must analyze the trade-off among several criteria. MCDM techniques support the decision-makers (DMs) in evaluating a set of alternatives. Depending upon the purchasing situations, criteria have varying importance, and there is a need to weigh them (Dulmin & Mininno, 2003).

In early stage of research, the chosen producers are mostly required to have experience and specialize in producing garments. They should have some certifications for the quality. After the search, about 3 companies are selected based on their experience in trade and willingness to cooperate.

### 3. SUPPLIER SELECTION WITH AHP METHOD

Analytic Hierarchy Process (AHP), since its invention, has been a tool at the hands of decision makers and researchers, and it is one of the most widely used multiple criteria decision-making tools (Omkar prasad & Kumar, 2006). There are many strongest features of the AHP, for example it generates numerical priorities from the subjective knowledge. The method is surely useful in evaluating supplier’s weights in marketing. Developing a model by

using the AHP approach could decrease the delayed order. Giving other criteria the needed attention to select the supplier by focus on its financial stability, history, and other criteria could be the right way to choose the correct supplier. Giving weight to every criterion can defer each criterion. It is obvious that some criteria are more important than others. Supplier selection decisions are taken following the creation of a supplier shortlist during the pre-qualification phase of the supplier relationship framework. These are complicated decisions since various criteria are considered in the process. A significant number of quantitative and qualitative supplier attributes are examined. Assessments are made using objective and subjective criteria. A strategic approach towards purchasing may further emphasize the need to consider multiple criteria. The evaluation of vendors is a complicated decision problem. The complexity comes from:

- 1) The relative difficulty to conceptualize and structure the numerous components of the evaluation problem into an analytical framework.
- 2) The nature of the components in this process, some are quantitative whereas others are subjective and
- 3) The large number of alternatives as the competition in the marketplace increases.

AHP is a decision making tool that decomposes a complex problem into a multi-level hierarchical structure of objectives, criteria, sub-criteria and alternatives. The AHP provides a framework to cope with multiple criteria situations involving tangible and intangible, quantitative and qualitative aspects

It consists of three steps:

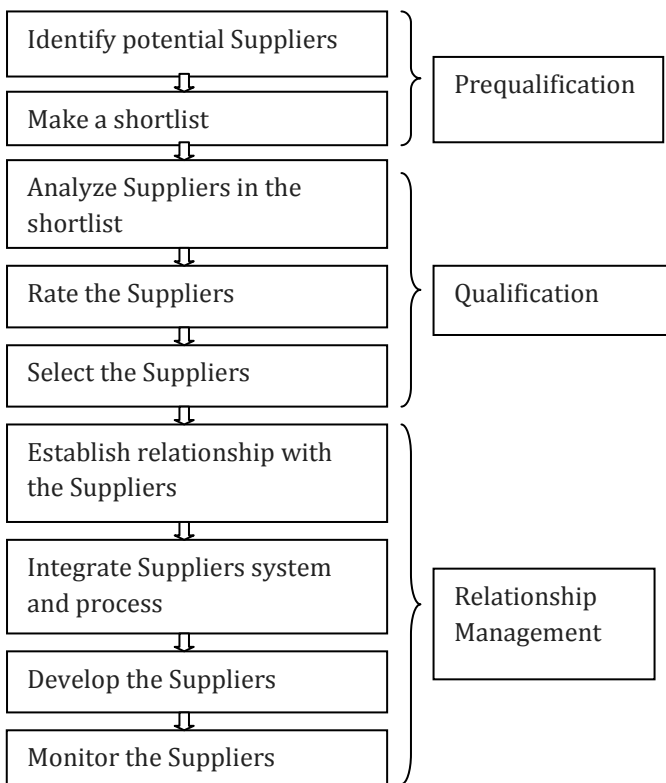
1. Decomposing the complex problems into a hierarchy of different levels of elements.
2. Using a measurement methodology to establish priorities among the elements.
3. Synthesizing the priorities of elements to establish the final decision.

First a complex problem is broken down into sub-problems in hierarchical levels, which is a set of criteria or attributes relative to each sub-problem.

In the present case, there are three vendors chosen in the suiting category who produce garments. The goal is to select the supplier that can provide the best material aligned with company strategies and is willing to build a collaborative relationship in the long-term. This goal is placed on the first level of the hierarchy. Thus criteria are identified to achieve this goal, and constitute the second level of the hierarchy. The third level of the hierarchy involves the sub-criteria that are chosen regarding the success factors for the supplier. Considering the shortening cycle times in fashion, speed is very important when evaluating the suppliers. This includes both the production lead time (cut-to-ship time) and sampling turn time.

Vendor’s ability to change order volumes and to change the mix of ordered items (style, color, size etc.) is very important

in the fashion industry. Also vendor’s capability of handling quick response (QR) orders is an important criterion however especially in the suiting category where the fabrics have long lead times, it is often impossible to implement the QR system.



**Figure 2.** A Model for Supplier Relationship Management (Lash & Janker, 2005)

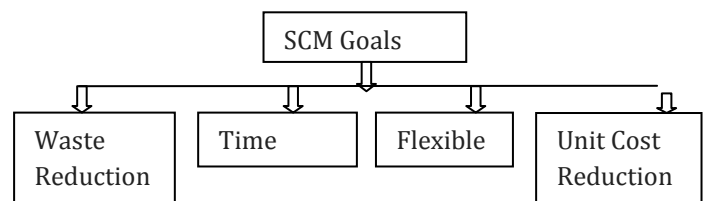
As far the trust between the company and its suppliers is considered, the dimensions of customer service include the vendor’s ability of handling complaints, following up the orders etc. The financial stability is strongly expected from the vendors as they are required to buy raw materials and so on.

**4. SUPPLY CHAIN IN GARMENT INDUSTRY**

With the fast changing local and global business environment, an advance strategic supply chain management (SCM) planning becomes very important for a successful business. A supply chain is a network of facilities and distribution operations to perform the functions of procurement of materials, transformation of these materials into intermediate and finished products, and distribution of these finished products to customers. It affects every business irrespective of size, age, sector or location. Thus success of purchasing function can be achieved by strategic collaboration with suppliers.

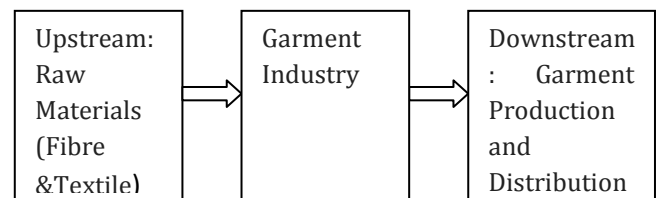
A supply chain is characterized by the flow of goods, services, money, and information both within and among business entities including suppliers, manufacturers, and customers. The ultimate goal of SCM is to meet customers’ demand more efficiently by providing the right product, in the right quantity, at the right location, on the right time, and in the right condition in order to improve the business performance of firms and generate revenue accordingly.

As Figure 1 shows, SCM aims four major goals: 1) waste reduction; 2) time compression; 3) flexible response; and 4) unit cost reduction. Overall, all of these goals help keeping the costs at the minimum for a given value for the customer (Brewer & Speh, 2000).



**Figure 3.** Supply Chain Management goals

As per figure shown the apparel-garment industry is divided into upstream and downstream segments where upstream activities include raw materials and downstream sectors are garment production and distribution. In recent decades, the multiple criteria of cost, quality, delivery time, reliability and flexibility are becoming critical for the industries. (Su & Gargeya 2011, 4)



**Figure 4:**GarmentIndustryProcess

The merits and demerits associated with supplier are responsible for the strategic sourcing of particular supplier. The fashion industry is characterized by a number of factors, namely a short lifecycle, high volatility, low predictability, and high impulse purchase. (Bruce, Daly & Towers 2004).

Retailers tend to leverage a portfolio of two types of vendors: Type 1 vendors are characterized by long lead times, lower unit costs and less flexibility whereas Type 2 vendors offer short lead times, high unit costs and more flexibility. This enables such strategies as exploiting lower cost production for the most predictable segment of demand, while sourcing the more speculative segment via the more flexible, but more costly, vendors. Operational zing this in multi-product, multi-vendor setting is nontrivial and is further complicated by many production and logistical constraints (Agrawal, Smith & Tsay, 2002). The relationship

between the company and suppliers are one of the most important factors to the stability of the firm. In recent years, development of a strong connection in communication and cooperation with both parties is the objective of many successful companies. (Eriksson & Lerenius 2004). Traditionally, companies find the needs of using multiple suppliers for a couple of reasons. Nowadays firms are more concentrating on strategic sourcing.

### 5. CRITERIA AND SUB CRITERIA IN SUPPLIER SELECTION PROCESS

Supplier selection decisions are complicated by the fact that it is influenced by various criteria and conditions in the decision making process and each company has their own requirements. Generally following are the important factors which are responsible for affecting the business performance of firm.

All these criteria (5) and sub-criteria (20) that are listed above can be put in the hierarchical tree as shown in following figures.

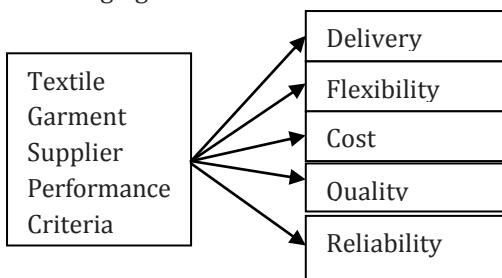


Figure 5: Supplier performance criteria

Further each Supplier selection and performance or evaluation criteria is divided into sub criteria which are given in table1. The supplier selection decision-making is usually long and complicated as discussed earlier and the selection criteria’s analysis has been studied by various scholars through the years. Each criterion for supplier selection and evaluation are discussed in subsequent paras.

#### 5.1 Cost factor:

Cost factor is one of the most important elements that influence strongly the face of the world of garment production’s flow nowadays as the purpose of sourcing is to obtain the maximum benefits for the company by cheaper product price. Cost includes supplier’s selling cost, internal cost and the charge for invoicing and ordering however features such as labor and materials cost needed to be concerned as well. Conventionally the supplier’s asking price is depends heavily on the labor and materials rate. So suppliers from countries which have cheaper labor rate have bigger advantage than other.

#### 5.2 Quality factor:

There is no doubt that quality is one of the most fundamental factors to evaluate when choosing a new supplier as the

price is now considered to be overwhelmed by the product’s quality. Poor quality product can have major impact on the company’s downstream sector as it causes higher rate of returns by unsatisfied customers, the cost of inventory, profit margins and business’s reputation etc.

Table1: Supplier selection sub-criteria.

| Sl. No. | Supplier selection criteria | Supplier selection sub-criteria |
|---------|-----------------------------|---------------------------------|
| 1       | Cost                        | Supplier selling price          |
|         |                             | Internal cost                   |
|         |                             | Ordering and invoicing          |
| 2       | Quality                     | Continous improvement programme |
|         |                             | Customer satisfaction           |
|         |                             | Certifications                  |
|         |                             | % of on time shipment           |
| 3       | Delivery                    | Geographic location             |
|         |                             | Freight term                    |
|         |                             | Total order lead time           |
|         |                             | Trade restrictions              |
| 4       | Reliability                 | Feeling of trust                |
|         |                             | Political situation             |
|         |                             | Price fluctuation               |
|         |                             | Warranty policies               |
| 5       | Flexibility                 | Capacity                        |
|         |                             | Inventory availability          |
|         |                             | Information sharing             |
|         |                             | Negotiability                   |
|         |                             | Customization                   |

#### 5.3 Delivery factors:

Delivery has a strong impact on the sourcing strategy especially in the garment industry which features short life-cycle products. Consequently, delivery time from the origin to destination place is crucial for the business. The delivery time is counted as the total time that is needed from ordering to production process and shipment. Generally the location between supplier and buyer influences the delivery time as it can take months for shipping from one place to another.

#### 5.4 Reliability factor:

The reliability factor needs to be judged under external and internal factors in which trust and warranty policies are considered to be internal whereas the sourcing country’s political and currency exchange situation are external factors. Feeling of trust differs from supplier to supplier and can be measured by the quality and on time delivery of the vendor. Warranty policies are different among suppliers as well however it still needs to be in the standard terms otherwise buyer should reconsider these suppliers.

#### 5.5 Flexibility factor:

In a supply chain, the suppliers flexibility is considered a tool to cope with the environmental uncertainties and the

changing of market demand. Flexibility is the possibility to respond to short term changes in demand or supply situations of other external disruptions together with the adaptability in the new environment. A firm should examine capacity, inventory availability, information sharing, negotiability and customization components in the supplier's flexibility.

The study was to determine, identify, and analyze what criteria are to be used in the selection and evaluation of a firm as a supplier. Method used was based on primary data and secondary data. Primary data are collected through questionnaire which was sent to 27 purchasing agents. Three suppliers are selected for supply of items to these purchasers and study is focused accordingly. Firms were asked to order the importance of each criterion on a four point scale: not important, somewhat important, important and very important. As stated earlier, this study will focus on exploring the potential supply market of garments industry.

Our objective was to grade each criterion by following weightage on a point scale and grading can be done on following point scale also (Tam and Tummala, 2001), experts of relevant field were requested to answer preference of selection criteria on 5 point likert scale i.e. Not important (1 to 3), Some-what important (4 to 5), Important (6 to 7) and Very important (8 to 9).

Based on the criteria that have been discussed earlier for the decision-making sourcing process, the author interviewed the suppliers and purchasing customers of different firms to describe the company's requirements in the suppliers. The author had chosen 5 most important factors of the supplier's evaluation process. They include quality, flexibility and cost. Minor issues such as flexibility and reliability are important as well however not to be considered as critical points.

In order to select the right supplier, the model is needed to develop through AHP approach. The following steps could be applied by Company in order to choose the supplier that is more appropriate than others after collecting quantitative and qualitative data for the supplier selection model:

- Step 1: Define criteria for supplier selection.
- Step 2: Define sub-criteria.
- Step 3: Structure the hierarchical model.
- Step 4: Prioritize the order of criteria or sub-criteria.
- Step 5: Measure supplier performance.
- Step 6: Identify supplier priority and selection.

Now let us discuss each step in detail:

### Step 1: Define criteria for supplier selection

The first step in any supplier rating procedure is to find the appropriate criteria to be used for assessing the supplier. To comply with the criteria for supplier selection and their importance, required data were collected based on the consideration of literature. Rate each factor by using the

four-category scale of "Not important (1 to 3)", "Some-what important (4 to 5)", "Important (6 to 7)" and "Very important (8 to 9)".

Finally, the five important criteria were selected are cost, quality, delivery, management and organization, and financial. They were selected at level (2) in supplier selection model (The goals factor in Level (1) for supplier selection model is to select the best overall supplier).

### Step 2: Define sub-criteria for supplier selection

In this step, the definition of the sub-criteria has been done for supplier selection based on the five important criteria selected as the results of the previous step. After gathering the needed sub criteria, they were identified and averaged. Twenty sub-criteria were identified.

### Step 3: Structure the hierarchical model

This phase involves building the AHP hierarchy model and calculating the weights of each levels of supplier selection model. The developed AHP model, based on the identified criteria and sub-criteria contains these levels: the goal, the criteria and sub-criteria.

Based on the consideration, the priority weight of each criterion in each level was determined. The pair-wise comparison judgments were used to find the important criteria. This approach is found to be very useful in collecting data. The function of the pair-wise comparisons is by finding the relative importance of the criteria and sub-criteria, which is rated by the nine-point scale proposed by Saaty (1980) indicating the level of relative importance from equal, moderate, strong, very strong, to extreme level by 1, 3, 5, 7, and 9, respectively. The intermediate values between two adjacent arguments were represented by 2, 4, 6, and 8.

The final score is defined as :

$FS_k = (Ad_k * Ak)$ , Where

$FS_k$  = Final score of enabler (sub criteria)  $k$

$Ad_k$  = Relative importance weight of dimension (criteria)  $d$  of enabler  $k$

$Ak$  = Relative importance weight of enabler  $k$

As mentioned, the priority weight was determined. Here is a sample of pair-wise comparison matrix (Table 3) that shows how to calculate criteria.

It is obvious that the cost criterion is the heaviest among other criteria. The first row illustrates how the cost weight strongly compares to the others. For example, the quality criterion is preferred to the cost by the value of 2, preferred to the delivery by the value of 4 and preferred to the management and organization and financial by the value of 5 for each of them. A good performance on quality, the criterion for the second row and column, is moderately more important than having good delivery, the management and organization and financial, (shown by the value of 2, 4 and 4 Sequentially). A value of 1 is assigned to the diagonal

elements since delivery (row) is equally preferred to delivery (column).

**Table 2.** Pair wise comparison Scale for AHP Preferences/ "Measurement scales". Source: Saaty (1980)

| SN o. | Verbal judgment or preference  | Numerical rating |
|-------|--|------------------|
| 1     | Extremely preferred  | 9                |
| 2     | Very strongly to extremely   | 8                |
| 3     | Very strongly preferred  | 7                |
| 4     | Strongly to very strongly  | 6                |
| 5     | Strongly preferred   | 5                |
| 6     | Moderately to strongly   | 4                |
| 7     | Moderately preferred   | 3                |
| 8     | Equally to moderately  | 2                |
| 9     | Equally preferred  | 1                |
| 10    | Intermediate values between two adjacent judgments (when compromise is needed) | 2, 4, 6 and 8    |

**Table 3:** Example for pair-wise comparison matrix

| Criteria for supplier selection | Delivery | Flexibility | Quality | Cost | Reliability |
|---------------------------------|----------|-------------|---------|------|-------------|
| Delivery                        | 1        | 2           | 4       | 5    | 5           |
| Flexibility                     | 0.5      | 1           | 2       | 4    | 4           |
| Quality                         | 0.25     | 0.5         | 1       | 2    | 2           |
| Cost                            | 0.2      | 0.75        | 0.5     | 1    | 2           |
| Reliability                     | 0.2      | 0.75        | 0.5     | 0.5  | 1           |

**Table 4:** Comparison and calculation of priority weights

| Sl. No. | Criteria for supplier selection | Average | Rank |
|---------|---------------------------------|---------|------|
| 1       | Delivery                        | 0.142   | 3    |
| 2       | Flexibility                     | 0.041   | 5    |
| 3       | Quality                         | 0.467   | 1    |
| 4       | Cost                            | 0.291   | 2    |
| 5       | Reliability                     | 0.061   | 4    |

**Step 4: Prioritize the order of criteria or sub-criteria**

Having completed mathematical calculations, comparisons of criteria and allocating weights for each criterion in each level is performed. As criterion weight becomes big, it would be more important to select the supplier than another criterion that is less. After calculating the global weights of each sub-criteria, the result are shown in Table 4. The ranking list of factors can be seen that cost and quality factors occupy the top and bottom most ranking in the list respectively.

**Step 5: Measure supplier performance**

Evaluating the alternative suppliers according to the used model to select the best supplier is the next step. Every supplier has to be evaluated factor by factor by the purchasing team in order to get the total score of all factors.

Given data were used to calculate the global weights of each alternative. After finding the local weights of each alternative, the global weights of each alternative in each level can be calculated. The global weights evaluation of each alternative can be obtained through multiplying the global weights of sub-criteria by the local weights of each alternative. It can be noted that among the three given suppliers, supplier "A" has the highest weight.

**Table 5:** Comparative supplier selection criteria for different suppliers

| Sl.No. /Rank | Supplier selection criteria | Numerical rating/GlobalWeights | Suppliers |       |       |
|--------------|-----------------------------|--------------------------------|-----------|-------|-------|
|              |                             |                                | A         | B     | C     |
| 1            | Quality                     | 0.467                          | 0.470     | 0.501 | 0.432 |
| 2            | Cost                        | 0.291                          | 0.243     | 0.342 | 0.289 |
| 3            | Delivery                    | 0.142                          | 0.121     | 0.161 | 0.145 |
| 4            | Reliability                 | 0.061                          | 0.051     | 0.056 | 0.078 |
| 5            | Flexibility                 | 0.041                          | 0.027     | 0.037 | 0.061 |

Table 5 shows the final score of each supplier s' results and ranking. Therefore, it is a major criterion to select the right supplier.

**Step 6: Identify supplier priority and selection**

Based on the global priority, weights of each alternative can be evaluated and summarized. The summaries of overall attributes are shown in Table 5. In short, the developed model helps to choose the right supplier. It consists of many steps which are in order defining criteria for supplier selection and defining sub-criteria structuring the hierarchical model, prioritizing the order of criteria, measuring supplier performance, and identifying supplier priority and selection.

**6. CONCLUSIONS**

In this study, five strategic priorities were identified as the criteria, and the priority measures as the sub-criteria, and then an AHP-based model was formulated to select the best supplier. After finding the global priority weights, they can be used to determine the final composite priority weights of supplier occupying the last level of hierarchy. If suppliers are successful in adopting strategic marketing as per the research findings, then it will be helpful for suppliers to market their products effectively. Therefore it can be said that the present study is helpful in improving marketing management system of suppliers.

Using the AHP model, the criteria for vendor selection are clearly identified and the problem is structured systematically. This enables decision makers to examine the strengths and weaknesses of the supplier by comparing them with respect to appropriate criteria and sub-criteria. It can significantly reduce the time and effort in decision making. During the study for supplier selection and evaluation in small and medium scale enterprise like garment

industry. the results shows that the quality is the most important criterion whereas the flexibility is the least important one. While following above results during supplier section and evaluation will lead to enhanced business performance and success of firms.

The above result is obtained after calculating the weights of each criterion. The result shows that the quality, delivery and trust are the most important strategic priorities to be considered in the supplier selection problem for suiting category, representing more than 65 per cent of the total weight. Since the suits category is mostly high-end products with the most expensive fabrics and the best fit, the quality is very important in the supplier selection decision. The vendors are expected to be equipped with most sophisticated machinery and the know-how to produce this high-quality products which is very important during both development and production stages.

Reliability and flexibility have almost the same importance: 0.061 against 0.041. The on-time shipment in the correct quantity rate is very critical in evaluating the vendor's performance in delivery whereas the customer service is the most important factor when evaluating the trust criteria. It is interesting that the cost has more weight than the delivery and trust. However variations in above result can occur when suppliers from other regions are considered giving the supplier decision. The quality will definitely have more importance in garment industry where there are a lot of global competitors capable of offering the same product.

The flexibility factor is ranking as fifth factor. It has a quite small importance in the weighting which can be explained that the suiting category is a more rigid category depending on the fabric lead times. Once a fabric is booked for a style, unless you can carry the liability you cannot decrease the quantity as the fabric mills are not willing to make these changes or it is not feasible to change the color or the quality. The most important factor is the sampling lead time and quality of the samples which has the weight of 68 per cent. Eventually Supplier A is the strongest supplier followed up by supplier B and supplier C. Finally it is proven in this work that AHP is a very practical tool that helps the stakeholders to gain a clear idea of selecting the best supplier considering all the aspects of the business which need to be aligned with the company strategy and goals. The regular usage of this tool will also help for checking the plans and ensure that there is no deviation from set-up goals.

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