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Supplier Selection in Supply Chain Management: A Review

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Abstract- In today's highly competitive environment, an effective supplier selection process is very important to the success of any organization. Supplier selection represents one of the most important decisions in a company to remain competitive, especially nowadays, where markets are changing very fast. The main idea of each method and it develops alternatives for each method that were proposed by different authors. There is no one proven best method in evaluating and selecting suppliers and companies deploy a variety of different approaches. Choosing the best supplier should meet the goal of receiving the right quantity on the right time with the right cost. In this paper, different supplier selection methods, supply chain in supply chain management are discussed.
Keywords-Supply chain, Supply chain management, Supplier selection process, Supplier selection methods, application &advantages of some methods

I. INTRODUCTION

Effective and efficient supply chain management now has become a very valuable and important way to remain competitive in the market and to improve the organizational performance. It plays a very important role in staying competitive because the competition among the organizations is effected by the SCM. In supply chain supplier selection process determine the suitable suppliers who provide the right quality products at the right price, at the right time and in the right quantities to the buyer. In order to maintain a competitive position in the global market, organizations have to follow strategies to achieve shorter lead times, reduced costs and higher quality. Therefore, suppliers play a key role in achieving corporate competitiveness, and as a result of this, selecting the right suppliers is a critical component of these new strategies.

Supplier selection is one of the most important components of purchasing and supply chain management for many companies. Supplier selection is of particular importance if companies spend a high portion of capital on supply and supply costs count a significant part of the total cost.

A. Supply Chain

A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service. [2]

1) Lee ,et al. (1995) "The integration activities taking place among a network of facilities that procure Raw material, transform them into intermediate goods and then final products, & deliver Products to customers through a distribution system"
2) Christopher, et al. (1998) "The supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer".
3) Handfield ,et al. (1999) "A supply chain encompasses all activities associated with the flow and transformation of goods from the raw material stage, through to the end-user, as well as the associated information flows".
4) Chopra ,et al. (2001) "A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request". [2]

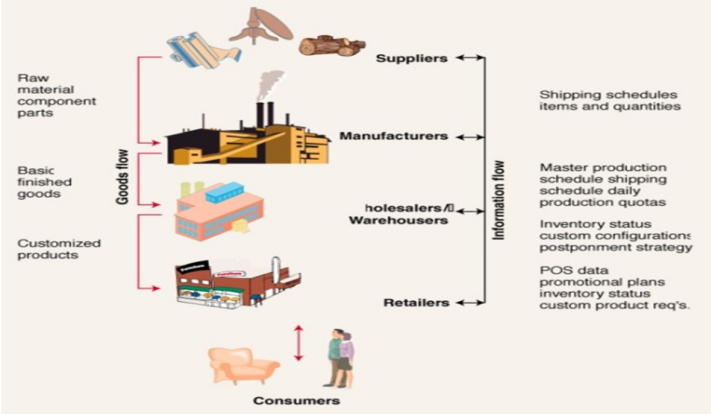

Fig 1. Supply Chain [6]

B. Supply Chain Management

A Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements.

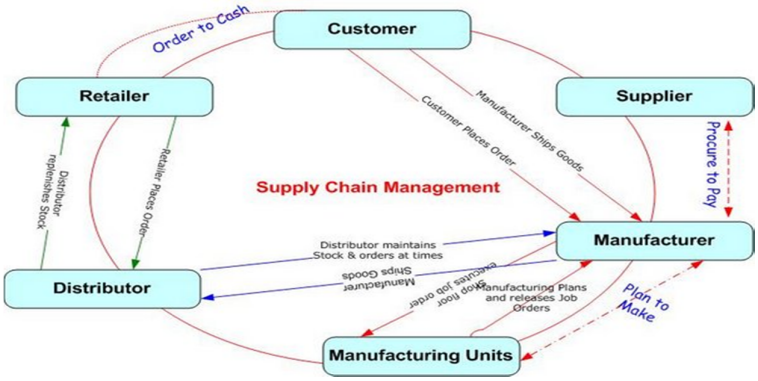

Fig 2. Supply Chain Management

1) Oliver, et al. (1982). "Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible. Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption."
2) Tan, et al. (1998) "Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilise their suppliers' processes, technology and capability to enhance competitive advantage."
3) Sweeney, et al. (2007) "Supply Chain Management is the systemic, strategic coordination of the traditional business function and tactics across these business functions within a particular company and across business within the supply chain, for the purpose of improving the long term performance of the individual companies and the supply chain as a whole."
4) Krajewski, et al. (2007) "Supply Chain Management consists of developing a strategy to organize, control and motivate the resources involved in the flow of services and materials within the supply chain."
5) Bozarth, et al. (2008) "Supply Chain Management is the active management of supply chain activities and relationships in order to maximize customer value and achieve a sustainable competitive advantage."
6) Wisner, et al. (2012) "Supply chain management is the integration of trading partners' key business processes from initial raw material extraction to the final or end customer, including all intermediate processing, transportation and storage

activities and final sale to the end product customer."[9, 10]

II. SUPPLIER SELECTION PROCESS

Experts agree that no best way exists to evaluate and select suppliers, and thus organizations use a variety of approaches. The overall objective of the supplier evaluation process is to reduce risk and maximize overall value to the purchaser. An organization must select suppliers it can do business with over an extended period of time.

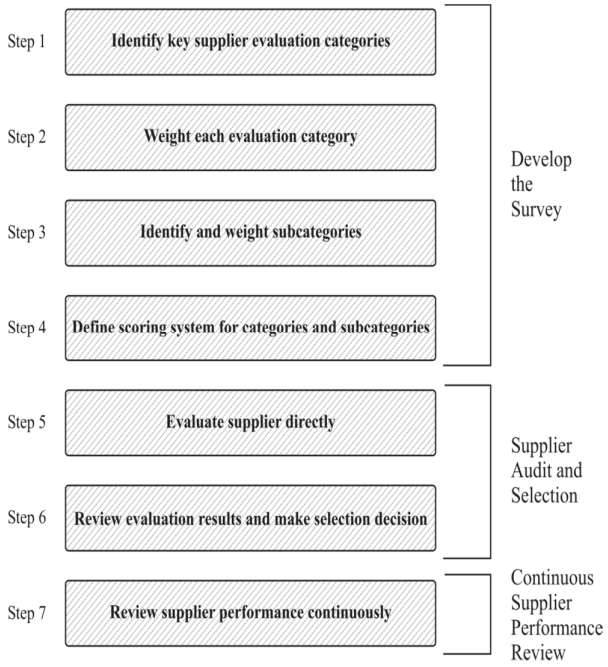

Figure: Initial Supplier Evaluation and Selection Audit Development. [4]

A. *Step 1: Identify key supplier evaluation categories*

One of the first steps when developing a supplier survey is for the purchaser to decide which performance categories to include. The primary criteria are cost/price, quality and delivery, which are generally the most obvious and most critical areas that affect the buyer. For many items, these three performance areas would be enough, however for critical items needing an in-depth analysis of the supplier's capabilities, a more detailed supplier evaluation study is required.

B. *Step 2: Weight each evaluation category*

The performance categories usually receive a weight that reflects the relative importance of the category. The total of each weight must equal 1.0. An important characteristic of an effective evaluation is flexibility. One way that management achieves this flexibility is by assigning different weights or adding or deleting performance categories as required.

C. *Step 3: Identify and weight subcategories*

This process requires identifying any performance subcategories, if they exist, within each broader performance category. The sum of the subcategory weight must equal the total weight of the performance category.

D. *Step4: Define scoring system for categories and subcategories*

A clearly defined scoring system takes criteria that may be highly subjective and develops a quantitative scale for measurement. Scoring metrics are effective if different individuals interpret and score the same performance categories under review.

E. *Step 5: Evaluate supplier directly*

A purchaser can compare objectively the scores of different suppliers competing for the same purchase contract or select one supplier over another based on the evaluation score. It is also possible, based on the evaluation that a supplier does not qualify at

this time for further purchase consideration. Purchasers should have minimum acceptable performance requirements that suppliers must satisfy before they can become part of the supply base.

F. Step6: Review evaluation results and make selection decision

The primary output from this step is a recommendation about whether to accept a supplier for a business. A purchaser may evaluate several suppliers who might be competing for a purchaser contract. The purpose of the evaluation is to qualify potential suppliers for current or expected future purchase contracts.

G. Step7: Review supplier performance continuously

When a purchaser decides to select a supplier, the supplier must then perform according to the purchaser's requirements. The emphasis shirts from the initial evaluation and selection of suppliers to evidence of continuous improvement by suppliers. [4]

III. SUPPLIER SELECTION METHODS

1) *Analytical Hierarchic Process* (AHP): The Analytical Hierarchic Process (AHP) is a decision-making method for prioritizing alternatives when multiples criteria and sub-criteria must be used. It is developed by Saaty in 1980[1]. The main features of AHP method can be summarized as follow:
   a) Creating a hierarchy reflecting the selection problem, including the goal, the evaluation criteria and sub-criteria, and the alternatives.
   b) Giving preference values to the elements of the hierarchy based on expert judgments through pair-wise comparisons. Then the overall priorities for each alternative can be calculated.
   c) Checking the consistency ratio of every pair-wise comparison to check the consistency of the subjective judgments. [8]

Uses and Application of AHP

As a method of measuring intangible factors, the AHP has many areas of application. Among them are:

- Conflict Resolution
- Environmental Applications
- General Resource Allocation & Optimization
- Group Decision Making
- Human Resources
- Marketing Decisions
- Medical Decision Making
- Military Applications [13]

2) *Analytic Network Process* (ANP): The Analytic Network Process (ANP) is a generalization of the Analytic Hierarchy Process (AHP) and can be used to treat more sophisticated decision problem than the AHP. It was developed by Saaty in 1996. [12]

Many decision problems cannot be built hierarchically because they involve the interaction and dependence of higher-level elements in a hierarchy on lower level elements. ANP provides a general framework to deal with decisions without making assumptions about the independence of higher-level elements from lower level elements and about the independence of the elements within a level. Therefore, ANP is represented by a network without the need to specify levels as in a hierarchy. [12]

Analytical Hierarchical Process (AHP) is a decision-making method developed for prioritizing alternatives when multiple criteria must be considered and allows the decision maker to structure complex problems in the form of a hierarchy, or a set of integrated levels. This method incorporates qualitative and quantitative criteria. The hierarchy usually consists of three different levels, which include goals, criteria, and alternatives. Because AHP utilizes a ratio scale for human judgments, the alternatives weights reflect the relative importance of the criteria in achieving the goal of the hierarchy. [12]

3) *Technique for the Order Performance by Similarity to Ideal Solution* (TOPSIS): TOPSIS method was introduced for the first time by Yoon and Hwang and was appraised by surveyors and different operators. TOPSIS is a decision making technique. It is a goal based approach for finding the alternative that is closest to the ideal solution. In this method, options are graded based on ideal solution similarity. If an option is more similar to an ideal solution, it has a higher grade. Ideal

solution is a solution that is the best from any aspect that does not exist practically and we try to approximate it. Basically, for measuring similarity of a design (or option) to ideal level and non-ideal, we consider distance of that design from ideal and non-ideal solution. [13]

For supplier selection problem, composed of TOPSIS method, consists of three Steps [3]:

(1) Identify the criteria to be used in the model;
(2) Weigh the criteria by using expert views;
(3) Evaluation of alternatives with TOPSIS and determination of the final rank; [5]

The main advantages of using TOPSIS method are:-

- It is simple to use.
- It takes into account all types of criteria.
- It is rational and understandable.
- The computation processes are straight forward.
- The concept permits the pursuit of best alternatives criterion depicted in a simple mathematical calculation.

4) *Multiple Attribute Utility Theory* (MAUT): The MAUT proposed is also considered a linear weighting technique. The MAUT method has the advantage that it enables purchasing professionals to formulate viable sourcing strategies and is capable of handling multiple conflicting attributes. However, this method is only used for international supplier selection, where the environment is more complicated and risky. Multiple Attribute Utility Theory (MAUT), enables the decision maker to structure a complex problem in the form of a simple hierarchy and to evaluate a large number of factors associated with uncertainty Compared to multiple objective programming, MAUT requires more data and poses less computational difficulty, which makes it advantageous.[11]

IV. CONCLUSION

The issues of supplier selection have attracted the interest of researchers since the 1960s, and research studies in this area have increased. The contribution of this paper was the identification of the importance the supplier selection process and methods in SCM. Through reviewing relevant literature and research projects on supplier selection methods are helpful to select the best supplier for any industry. In this paper the various steps of supplier selection process are also described.

Supplier selection is crucial in supply chain management in today's global environment. In supply chains, co-ordination between a manufacturer and suppliers is typically a difficult and important link in the channel of distribution.

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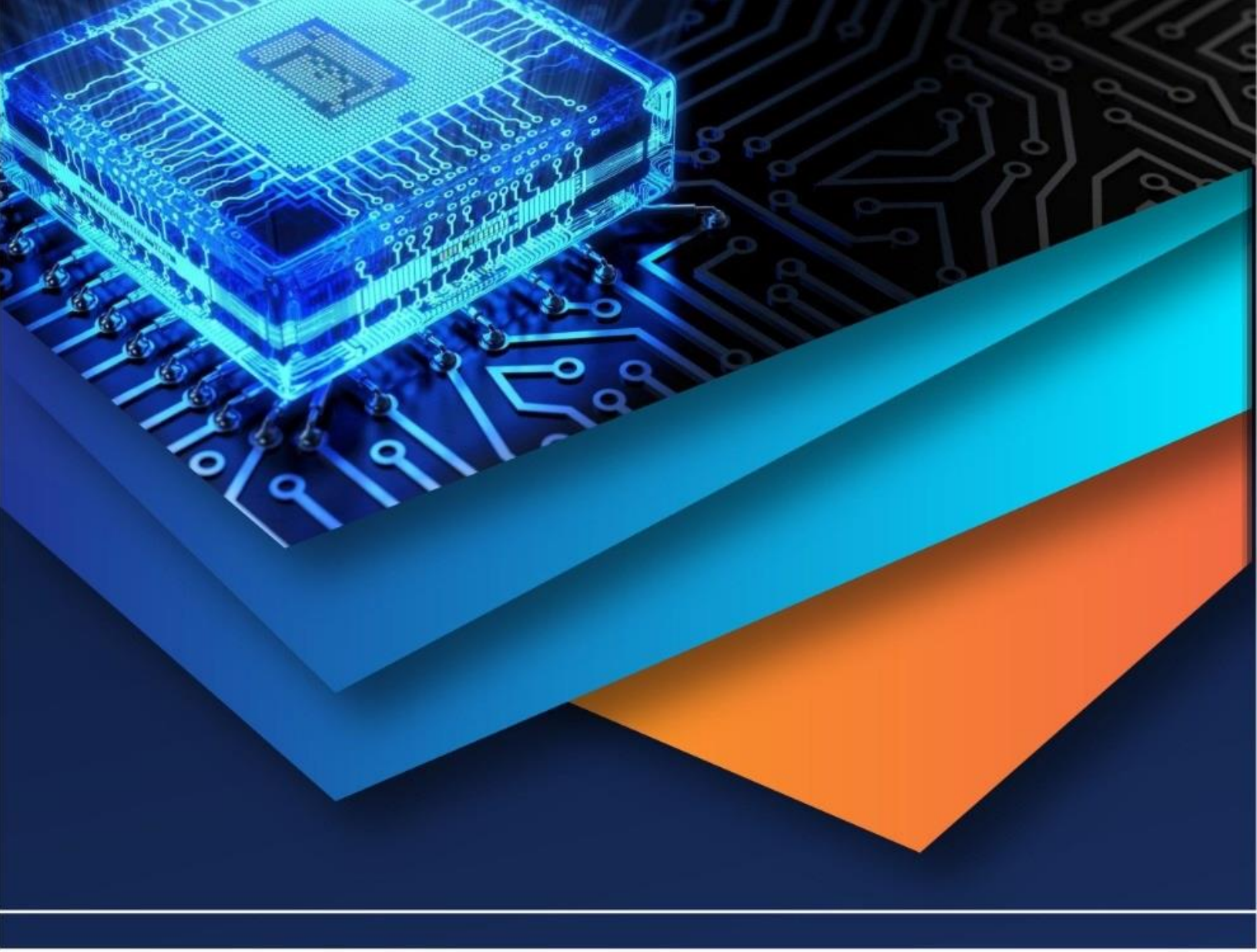

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