Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 9, September -2017

Learning from Research Methodology for Supplier Selection with Multi Attribute Decision Making Techniques

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Abstract — *In Today's Competitive Environment it is impossible to successfully produce low cost & high quality product, without satisfactory supplier. Thus one of the important purchasing decisions in smoothly running Supply Chain Management (SCM) is Supplier Selection. In this paper, the research paper pattern with the importance of SCM and its different Modelling areas, Supplier Selection Methodology (SSM) to learn the different research work carried out for supplier selection criteria evaluation and show the various methods for supplier criteria evaluation and ranking in SCM field have been discussed. In the current research paper authors aims to learning on the research carried out in the various the Multi Attribute Decision Making (MADM) techniques for supplier selection for supplier selection, same methodologies will be applied for selecting supplier in the Manufacturing, Pharmaceutical, Automobile, Ship Building, Agricultural Industries, FMCG (Fast Moving Consumer Goods), etc. where supplier plays vital role for the industries.*

Keywords- *Supply Chain Management (SCM), Supplier Selection Problem (SSP), Multi Attribute Decision Making (MADM), Machine Tool Selection, Decision Support System (DSS), Selection Methodology, Supplier Selection Problem (SSP)*

I. INTRODUCTION

Due to the recent responsive development of network technology and economic globalization, purchasing management has come to play a critical role as a key to business success in supply chain management (SCM). One of the vital challenges confronted by purchasing managers is the evaluation and selection of the right kind of suppliers compatible to agile systems. Researches carried out in the field of supplier selection have been applying multi-Attribute decision making methods, such as analytic hierarchy process (AHP), analytic network process (ANP), data envelopment analysis (DEA),and more numbers of mathematical programming [1, 2, 3]. The selection of right Supplier is very much important activity in SCM [4].

Supply chain management (SCM) consists of various components such as: supplier, manufacturer, factories, warehouses, distributions agents etc. These components are involved in various activities such as: supplying raw materials, manufacturing and distribution of the finished product to the final customer.

II. LITERATURES ON SUPPLIER SELECTION

The supplier selection process is divided into two stages like the formation of selection criteria, determination of supplier selection method. The various researches carried out with criteria and selection methodology.

2.1. Supplier Selection Criteria

In the today's competitive environment, a company is impossible to produce low-cost, High-quality products if you haven't the satisfactory suppliers. Selecting the right suppliers has always been one of the most important functions of the Purchasing Department of a company. Over the past 20 years, many studies have shown that supplier selection problem (VSP) is the key to establish the effective evaluation criterion. [5] has identified various 23 criteria's for supplier (such as price, delivery, quality, and so on), to evaluate and select the right supplier and decide each supplier's order quantity. Forty-seven out of seventy-six articles used more than one criterion (multi-criteria) in the supplier selection. There are twelve articles, which had shown that the cost, quality and response time are the main traditional continues criteria of the supplier selection.

2.2. Supplier Selection Method

At this stage, for getting the set of approved suppliers from all potential suppliers, decision makers divided all suppliers into two categories: agree or disagree. According to the supplier's selection criteria, [6] determined a set of approved supplier using the following methods: cluster analysis, data envelopment analysis and artificial intelligence methods (case-based reasoning approach).

When selecting supplier, the various decision methods under different situations are summarized as follows. Data envelopment analysis (DEA): [7] proposed DEA which had been extensively used to compare the efficiencies of non-profit and profit organizations by evaluating the relative efficiency of homogeneous units.

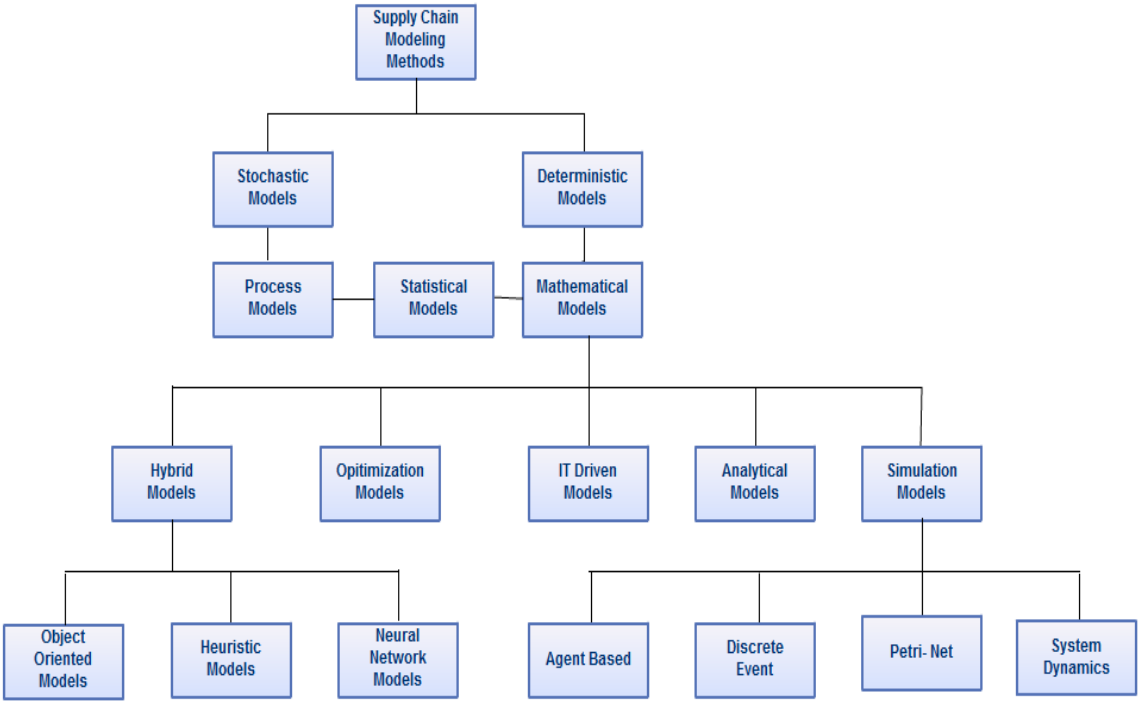

Fig.1 Classification of Supply Chain Modeling

2.2.1 Analytic hierarchy process (AHP):

[8] applied an Interactive Selection Model to determine the buyer-supplier relationships and selection criteria, and then implemented the Analytic Hierarchy Process with the Multi-Criterion Decision Making software.

2.2.2 Mathematical programming models:

Mathematical programming is a very important method to solve optimization problems, including multi-objective programming, linear programming, mixed integer programming and so on. [9] proposed a weighted linear program for the multi-criteria supplier selection and studied a transformation technique when there was no optimizer in this model.

2.2.3 Other approaches:

[10] developed an analytic network process (ANP) model by evaluating the relations between supplier selection criteria in a feedback systematic. [11] investigated the Fuzzy Expert Decision Support System for Vendor Selection with implementing and development in Matlab. A large amount of literature describes several modeling techniques that can assist decision makers in making the previously described supply chain decisions. Figure 1 represents the general supply chain modeling techniques, which can be divided into deterministic models, stochastic models [12, 13] . A synthetic evaluation index system in the environment of supply chain management, and classified the main factors into four kinds: Enterprise performance, professional structure and provide ability, quality, cost, and enterprise environment.

III. RESEARCH GAP IN LITERATURE REVIEW

There is a vast amount of literature on Supply Chain Management, Supplier (Supplier) Selection, Initially We can see that large amount of necessary work has been done but the comparison among different methodology for same problem must be carried out. Other gaps in the current literature on Supplier Selection are as follows:

- Generally 70% of the total cost really due to row material and products that are manufactured by suppliers or suppliers not given as much importance in the industry as, the more relation maintaining given to the logistic networking services providers (3PL- 3rd Party Logistics).
- The application of SCM in supplier selection methodology. The combination of other theory like: supplier selection approaches, which are applied in the deterministic situation. The supplier selection may utilize the fuzzy theory, Fuzzy AHP, Fuzzy ANN; because of the uncertainty of supply with comparative graphical representation.
- This modeling tool will make the supplier selection process simpler than other multi attribute decision making techniques.

IV. APPLICATION & CONCLUSION

As more significance arise in the field of Supply Chain Management (SCM) is supplier selection; the present given the basic approach of evaluation of supplier criteria, ranking of Supplier, selection of supplier which is the important decision for the Purchasing Process. This paper works for learning from research methodology for supplier selection which plays a vital role to smoothly running of supply chain management through MADM.

- Supplier Selection Criteria
  For the better selection of criteria; it is essential to make a trade-off between tangible and intangible factors, some of which may not conflict. The factors affecting the supplier selection on the basis of innovativeness are varied depending upon the type of supplier required, type of industry, type of product or service needed & time they spend to the industry. Hence the work carried out by Dickson (1966) showed 23rd criteria's are come in the focus and subsequently new criteria also come in the focus for enhancement.

- Supplier Selection Methods
  The paper contains the various methodologies carried out to select the supplier. this paper contains various mathematical programming, multi criteria decision making, artificial intelligence and hybrid techniques with relative work carried out by the different research work. Some techniques gives the shortest distance from positive ideal solution (PIS) which gives lowest cost of all alternatives and some techniques farthest from negative ideal solution (NIS) which bring towards lowest benefits and highest cost.

  Another contribution of this paper is the transfer of compiled information from researcher to their peers to assist in designing the robust supplier selection formation. So, Focusing on the mentioned issue and working on new methods which have no limitation on the number of criteria and supplier would be fertile area for future research.

  Same methodologies will be applied for selecting supplier in the manufacturing, pharmaceutical, automobile, ship building, agricultural industries, FMCG (Fast Moving Consumer Goods), etc. where supplier plays vital role for the industries. the method will also use to selection phase of different areas of SCM like, Logistics and transportation decision making, reverse supply chain management, related issues, Vendor Managed Inventory (VMI), strategic decision making and uses of information technology in SCM.

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