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VENDOR SELECTION USING AHP

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Abstract

This paper proposes a Analytic Hierarchy Process model for selecting the best vendor among the alternatives. The choice of the right vendor is a crucial decision with wide ranging implications in a supply chain. The proposed model can help the firm in selecting the efficient vendor. AHP is multicriteria decision making tool that takes into account both qualitative and quantitative criteria’s.

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1. Introduction

1.1 Vendor Selection

The choice of the right vendor is a crucial decision with wide ranging implications in a supply chain. Vendors play an important role in achieving the objectives of the supply chain management. Hence, strategic partnership with better performing vendors should be integrated within the supply chain. Selected vendors need to be evaluated on more than one criterion. Individual vendors may have different performance characteristics for different criteria. The right source is one which can provide the right quality of material on time at a reasonable price. Selection of a wrong vendor or source could be enough to upset the company’s financial and operational position. In upstream echelons of supply chain, vendor selection (VS) continues to be a key element in the industrial purchasing process, and appears to be one of the major activities of the professionals in the industry. Vendors are considered as the best intangible assets of any organization.

Today buying firms are demanding a higher level of performance from their vendors while maintaining a good relationship with each other. In this context, the VS problem is associated with deciding how one vendor should be selected from a number of potential alternatives. Hence, the buying
firms select their vendors methodically, and thus, the vendor selection becomes a very important strategic decision.

2. Background of AHP

   AHP is systematic method for using hierarchies to structure a decision problem. The first step is to determine the criteria’s .AHP is a theory of measurement when dealing with both quantifiable and intangible criteria’s .AHP uses pair wise comparison which is more accurate than scoring method. The pair-wise comparison procedure is a part of Analytic Hierarchy Process (AHP) and the details are as follows (Satty 1994)

   (1) Define the problem and specify the solution desired
   (2) Structure the hierarchy from the overall managerial purposes (the highest levels) through relevant intermediate levels to the level where control would alleviate — or solve — the problem
   (3) Construct a pairwise comparison matrix of the relative contribution or impact of each element on each governing objective or criterion in the adjacent upper level. In such a matrix of the elements by the elements, the elements are compared in a pairwise manner with respect to a criterion in the next level. In comparing the i, j elements, people prefer to give a judgement which indicates the dominance as an integer. Thus, if the dominance does not occur in the i, j position while comparing the ith element with jth element then it is given in the j, i position as aij and its reciprocal is automatically assigned to aij
   (4) Obtain all n(n-1)/2 judgements — specified by the set of matrices developed in (3)
   (5) Having collected the pairwise comparison data and entered the reciprocals together with n unit entries down the main diagonal, the eigenvalue problem \( \lambda = \lambda_{\text{max}} \) is solved and consistency is tested
   (6) Steps (3), (4) and (5) are repeated for all levels and clusters in the hierarchy
   (7) Hierarchical composition is now used to weight the eigenvectors by the weights of the criteria and the sum is taken over all weighted eigenvector entries corresponding to each element to obtain the composite priority of the element in a level. These are then used to weight the eigenvectors corresponding to those in the next lower level and so on, resulting in a composite priority vector for the lowest level of the hierarchy.
   (8) Consistency is then evaluated for the entire hierarchy by simply multiplying each consistency index by the priority of the corresponding criterion and adding overall such products. The result is divided by the same type of expression using the random consistency index corresponding to the dimensions of each matrix weighted by the priorities as before. The ratio should be about 10 per cent (0.10) or less for acceptable overall consistency. Otherwise, the quality of the judgemental data should be improved.

3. Application of the AHP for the Case Study

There are three potential vendors (Vendor A, vendor B and Vendor C) identified for evaluation. Based on the opinion of internal and external experts in the organization, five critical business metrics are identified. The critical evaluation metrics are Cost, Relationship, Agility, Risk avoidance, Quality. The explanation of evaluation metrics are given below;

Cost : The total cost including unit price, freight charges, warranty are considered.

Relationship : Years of contact, their attitude, trust are to be noted.

Agility : Their ability to respond to varying demands both in terms of quantity and design.

Risk avoidance : The extent to which delivery delays are avoided.

Quality : Quality of the product, service are considered.
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