

A MODEL PROPOSAL FOR SUPPLIER SELECTION IN AUTOMOTIVE INDUSTRY

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ABSTRACT

In contemporary business life, firms can not be considered as stand-alone bodies, trying to compete independently from their suppliers. Their success directly relies on the quality of their suppliers, and the relationship in between. This fact highlights the vitality of selecting "the right" supplier at the very beginning. The automotive industry, which is the arena of intense international competition, has always been the pioneer of novelty, because of its intolerance to failures. This study aims at proposing a model for supplier selection in automotive industry. Since it requires a detailed comparison among the suppliers from several different facets, multi-attribute decision making methods should be preferred. Thus, the methodology of this study is based on fuzzy analytic hierarchy process (FAHP). The model is applied to one of the most prestigious multinational automobile companies in Turkey, and the results achieved are discussed briefly.

Keywords: Supplier selection, automobile, fuzzy, AHP.

1. INTRODUCTION

The automotive industry is the principal customer for many industrial branches such as iron & steel, light metals, petro-chemicals, glass, tires, etc. Moreover, it creates vast business volume and employment together with its suppliers as well as the auxiliary sectors of marketing, distribution, services, fuel, finance and insurance which supply automotive products/services to customers. This is why it can be considered as the flagship of the economy in all industrialized nations, and the overall success in this industry is extremely important especially for developing countries.

Businesses jump over the local boundaries with great advancements in technology and Internet channels. In this global competitive environment, organizations face sophisticated customers that expect different specifications on products, lower cost, higher quality and faster response [1]. To cope with this, firms try to work with suppliers which can provide the best quality of products, at reasonable cost and desired flexibility.

This paper aims at building a model for supplier selection in automotive industry. Because of the complex structure of the decision criteria, a hierarchical model is proposed. The priority weights of the criteria are calculated separately for two different experts from a multinational OEM by using fuzzy AHP.

2. TURKISH AUTOMATIVE INDUSTRY

Automotive is one of the top industries in Turkey and obviously the "locomotive" of the economy. To give a brief idea to the readers, some of the numbers related to this industry are listed below [2]:

- The automotive industry procures over \$20 billion of foreign resources annually.

- It employs over 250,000 people (59,000 in the OEM industry and around 200,000 in the suppliers). Including logistics, tires, insurance, fuel, authorized services and special services, employment adds up to 1,250,000.
- This large family of the Turkish automotive industry accounts for one fifth of Turkey's exports by an annual output of 1.2 million and annual exports of 830,000 vehicles.
- The automotive industry currently produces at international standards, and has carved up an important place in the global market by its quality. At the same time, Turkey has become a production base for world automotive behemoths.
- Every year, the automotive industry outstrips the average export growth in Turkey. It is especially a prominent player in the European market.

3. SUPPLIER SELECTION PROCESS

ISO16949, *Automotive sector quality management system* standards, requires the organization to evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements and to establish criteria for selection, evaluation and re-evaluation [3].

The supplier selection process varies depending on the nature of the products and services to be procured. The selection process usually consists of a number of stages some of which do not apply to simple purchases. At each stage the number of potential suppliers is whittled down to end with the selection of what is hoped to be the most suitable that meets the requirements. Each company must first meet the order qualifiers. After that, the selection process goes on with evaluating the potential suppliers against order winners.

For one-off purchases periodic re-evaluation would not be necessary. Where a commitment from both parties is made to supply products and services continually until terminated, some means of re-evaluation is necessary as a safeguard against deteriorating standards. The re-evaluation may be based on supplier performance, duration of supply, quantity, risk or changes in requirements and conducted in addition to any product verification that may be carried out. [6]

4. A MODEL PROPOSAL FOR SUPPLIER SELECTION

A research on supplier selection criteria and methods by Weber et al. [4] claims that 47 of the 76 articles reviewed addressed more than one criterion. Siguaw and Simpson [5] identify an extensive list of 84 supplier evaluation items in their study. Kahraman et al. [6] divide their supplier criteria under four main titles such as Supplier Criteria, Product Performance Criteria, Service Performance Criteria and Cost Criteria. Considering these and many other studies, a model proposed for supplier selection in automotive industry as in Figure 1.

Two experts from a multinational OEM completed a survey having pair-wise comparisons with linguistic variables to define the priority weights of the criteria within the model. After having initial scores, they were asked to review some of their comparisons to increase the consistency level. Their final priority weights are listed in Table 1.

The evaluations of the experts are quite similar. Their main criteria are almost in the same order (i.e., from most important to the least important: Quality, Price and promotions, Delivery and service, Company capabilities, and Company structure), besides the second expert's evaluation claims an equity between the 2nd and the 3rd criteria, and between the 4th and the 5th one. However, they have some differences in detail. Since both of the experts are from the same organization and the same position, these differences are most likely based on their past experiences. For example, whilst "conditions of returns", "quantity restriction in delivery", "e-business capability" and "production capacity" are not important at all for the first expert, the second one's unimportant criteria are "e-business capability", "adherence to quality tools and personnel" and "green product".

Table 1. Priority weights for the criteria and sub-criteria

Criteria	Weights (Expert #1)	Weights (Expert #2)
a. Quality	0.34	0.40
a.1. Product / Service Quality	0.17	0.27
a.1.1. Reject Percent Rate (Overall)	0.17	0.18
a.1.2. Conditions of Returns (Refund,...)	0	0.09
a.2. Supplier's Overall Quality	0.17	0.13
a.2.1. ISO Certification Status (QI)	0.12	0.13
a.2.2. Adherence to Quality Tools & Personnel	0.05	0
b. Price & Promotions	0.29	0.24
b.1. Product Price	0.13	0.12
b.2. Quantity Discount Rate	0.06	0.08
b.3. Payment Terms	0.08	0.02
b.4. Transportation & Insurance Fees	0.02	0.02
c. Delivery & Service	0.26	0.24
c.1. Delivery-on-time every time	0.095	0.125
c.2. Quantity Restriction in Delivery	0	0.01
c.3. Length of Lead Time	0.03	0.085
c.4. After Sales Service	0.06	0.01
c.5. Spare Parts Accessibility	0.075	0.01
d. Company Capabilities	0.09	0.06
d.1. Engineering & Tecnological Capabilities	0.06	0.04
d.1.1. Engineering and Technological Support Resources	0.015	0.0056
d.1.2. Supply Chain Management	0.016	0.0168
d.1.3. Research &Development	0.024	0.0088
d.1.4. Management Information System (IT)	0.005	0.0088
d.1.5. E-Business Capability	0	0
d.2. Production Capabilities (Productivity)	0.03	0.02
d.2.1. Production Capacity	0	0.0136
d.2.2. Production Variety	0.03	0.0064
e. Company Structure	0.02	0.06
e.1. Corporate Culture (Professionalism)	0.006	0.0174
e.2. Financial Stability	0.0068	0.0252
e.3. Relationship	0.0004	0.0174
e.4. Green Product	0.0068	0

5. CONCLUSION

Defining the most appropriate suppliers is vital for the highly competitive industries like automotive. This paper proposes a hierarchical model to help automotive companies with supplier selection process. The criteria and sub-criteria within the model are prioritized by two experts in a multinational automotive OEM by using fuzzy AHP. The main criteria are prioritized from most important to the least important as; Quality, Price and promotions, Delivery and service, Company capabilities, and Company structure. The differences between the priority sets of the two experts are not huge, but yet there is a possibility of choosing different suppliers in the same case. Thus, it will be hard for the company to provide consistency in supplier selection. For further research, an aggregated priority set for the company, and the industry as a whole will be calculated by group fuzzy AHP.

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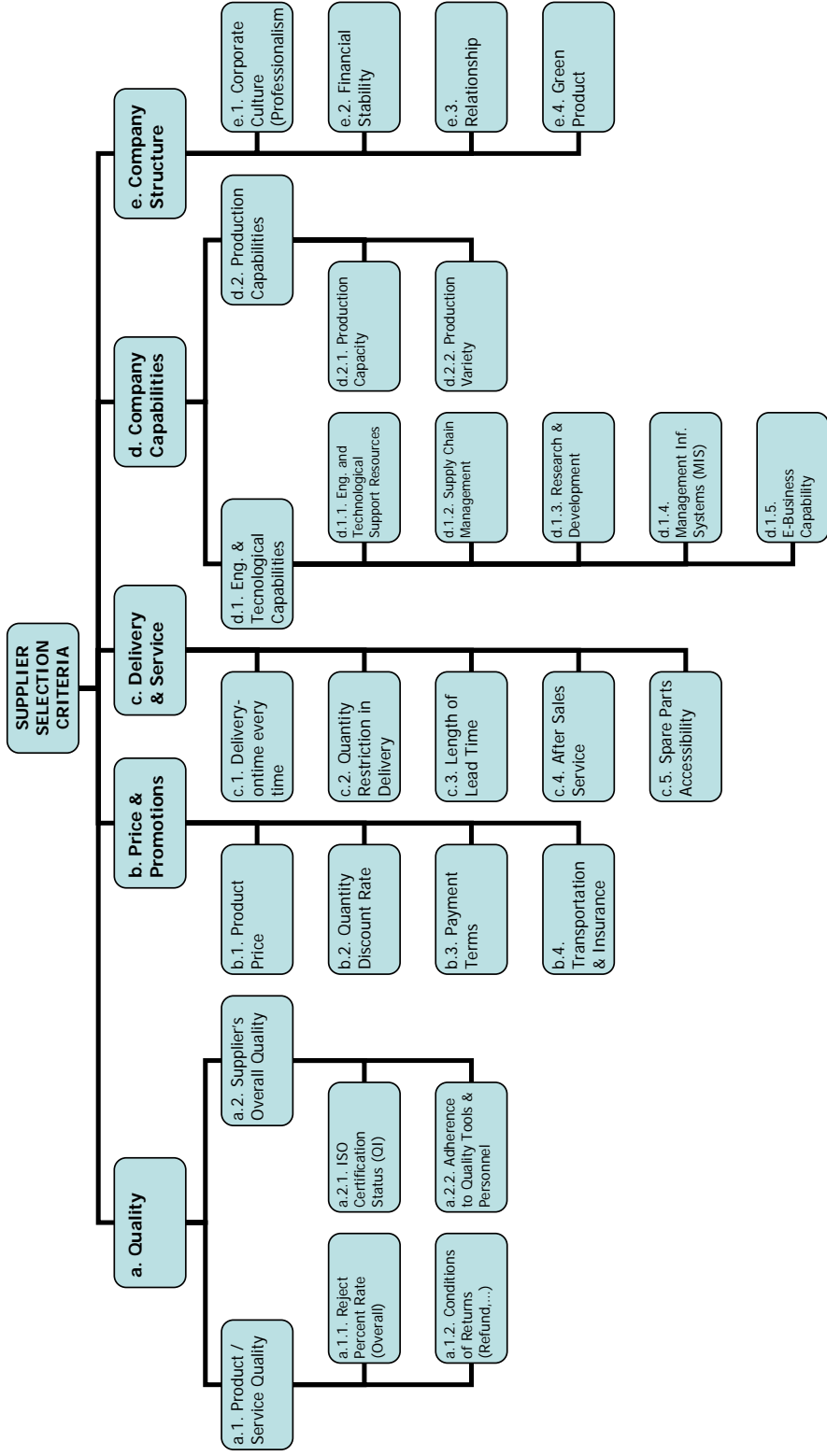


Figure 1. A Hierarchical model of criteria for supplier selection in automotive industry