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OUTSOURCING IN AN ELECTRONIC SECTOR COMPANY USING ANALYTIC NETWORK PROCESS

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ABSTRACT
In this paper, we evaluate key outsourcing factors for selecting convenient suppliers in an electronic sector company. Outsourcing decisions are important strategic decisions and affected by multi-criteria. When we evaluate outsourcing problem, we need to collect a group opinion because to know the importance of key factors in considered outsourcing problem is very important. Because of the interaction of key factors in the decision hierarchy, Analytic Network Process (ANP) and for making ANP calculations easier SuperDecisions Software Package are used. In the results, we demonstrated supplier alternative ranking for making best outsourcing contracts.
Keywords: Outsourcing; Analytic Network Process; Electronic Sector

1. INTRODUCTION
The outsourcing activities of a company constitute a very important part in the overall operation of the company. The quality and the delivery capabilities of any manufacturing firm depend heavily on the performance of its suppliers. When companies outsource a significant part of their business and become more dependent on outsourcers, the quality and delivery performance of the company depends totally on its outsourcers. The consequences of poor decision making become more severe. It is therefore too important for an outsourcing type manufacturer to evaluate, manage and select their suppliers [1].
This paper proposes a ANP methodology for outsourcing management utilizing information obtained from outsourcing selection process. In section 2 ANP methodology will be described. Case study performed in an electronic company. ANP criteria will be explained with detail and best candidate will be suggested to decision makers and managers.

2. ANP METHODOLOGY
The ANP is the most comprehensive framework for the analysis of public, governmental and corporate decisions. It allows the decision maker to include all the factors and tangible or intangible criteria that have a significant effect on making a best decision. The ANP allows both interaction and feedback within clusters of elements (inner dependence) and between clusters (outer dependence). Such feedback best captures the complex effects of interplay in human society, especially when risk and uncertainty are involved [2].
Actually the ANP consists of a combination of two parts. The first includes a control hierarchy of criteria and subcriteria controlling the interactions. The second is a hierarchy of influences among the elements and clusters. Generally, a hierarchy or network is divided into four kinds of sublevel hierarchies or subnetworks including benefits, opportunities, costs and risks, each of which represents the relationship of its own clusters and elements. Benefits and costs measure the positive and negative contributions or importance of the alternatives, if they happen. Risks and opportunities measure the likelihood that the alternatives will happen and make positive and negative contributions, respectively. Each one of these sublevel hierarchies is a hierarchy (or a network) by itself. The

overall priorities of the alternatives with respect to each of these are then combined by forming the ratios to obtain their final overall priorities for a decision [3, 4].

The process of the ANP is comprised of four major steps [5]:

(1) *Network model construction*. The problem is decomposed into a network where nodes correspond to clusters. The elements in a cluster may influence some or all the elements of any other cluster. These relationships are represented by arcs with directions. Also, the relationships among elements in the same cluster can exist and be represented by a looped arc. Fig. 1 shows an example of the network model in the ANP compared with a hierarchy in the AHP [6].

(2) *Pairwise comparisons and priority vectors*. Elements of each cluster are compared pairwisely with respect to their impacts on an element in the cluster. In addition, pairwise comparisons are made for interdependency among elements outside clusters. When cluster weights are required to weight the supermatrix at the next stage, clusters are also compared pairwisely with respect to their impacts on each cluster. The way of conducting pairwise comparison and obtaining priority vectors is the same as in the AHP. The relative importance values are determined with a scale of 1–9, where a score of 1 indicates equal importance between the two elements and 9 represents the extreme importance of one element compared to the other one. A reciprocal value is assigned to the inverse comparison; that is, $a_{ji} = 1/a_{ij}$, where aij denotes the importance of the ith element compared to the jth element. Also, $a_{ii} = 1$ are preserved in the pairwise comparison matrix. Then, the eigenvector method is employed to obtain local priority vectors for each pairwise comparison matrix[6].

(3) *Supermatrix formation and transformation*: The supermatrix concept resembles the Markov chain process. To determine global priorities in a system containing interdependent influences, the local priority vectors are entered in the appropriate columns of a matrix, known as a supermatrix. The supermatrix thus is a partitioned matrix, in which each matrix segment denotes a relationship between two system nodes clusters. The local priority vectors obtained in Step 2 are then grouped and located in appropriate positions in a supermatrix based on the flow of effect from one component to another, or from a component to itself as in the loop [5].

(4) *Final priorities.* When the supermatrix covers the whole network, the finial priorities of elements are found in the corresponding columns in the limit supermatrix. If a supermatrix only includes components interrelated, additional calculation should be made [6].

3. CASE STUDY

Company A is a Turkish manufacturing company and operates in a highly competitive TV production market. The company is a major manufacturer of CRT and LCD TVs, , PC and DVD and . speaker systems. Its business mission is to sell high quality products which are over the customer expectations with affordable prices.

The firm outsource most of the semi-products for TV production from its suppliers. The semi-products are grouped in there main classes; (1) metal group , (2) cable group, (3) plastic group. In this paper, three supplier for cable group; Company E, Company A, Company G, are the alternatives for outsourcing cable supplies. After making interviews with managers and decision makers within our company seven criteria are determined for ANP process. These criteria can be seen as the following:

i) **Downsizing** : The benefits extolled by downsizing supporters include decrease labor costs indirectly leading to increase productivity, streamlined operations, enhanced overall effectiveness, and increased competitive advantage. The best candidate will aid best downsizing performance after outsourcing cable group activities.

ii) **Just in Time Delivery**: Cable semi-products are very important for just in time production. Over the production line late deliveries are unacceptable because they directly affects the manufacturing schedule.

iii) **Low price**: Price of semi-products counts the main firm direct manufacturing costs. That is why the supplier who gives low price when meeting quality standards will be best choice.

iv) **Optimum resource allocation :** After outsourcing, supplier who ensure optimum usage of available resources of main facility will be best alternative.

v) **Compatibility to manufacturer:** Manufacturing interface and EDI connection compatibility are key factors with suppliers.

vi) **Suitable quality:** Meeting the main company quality standards with minimum prices will make the supplier best candidate when outsourcing.

vii) **Technology:** To be able to meet quality standards and measurements, alternative suppliers must have adequate technology level.

Relationship outline can be seen in Figure 1 as the following:

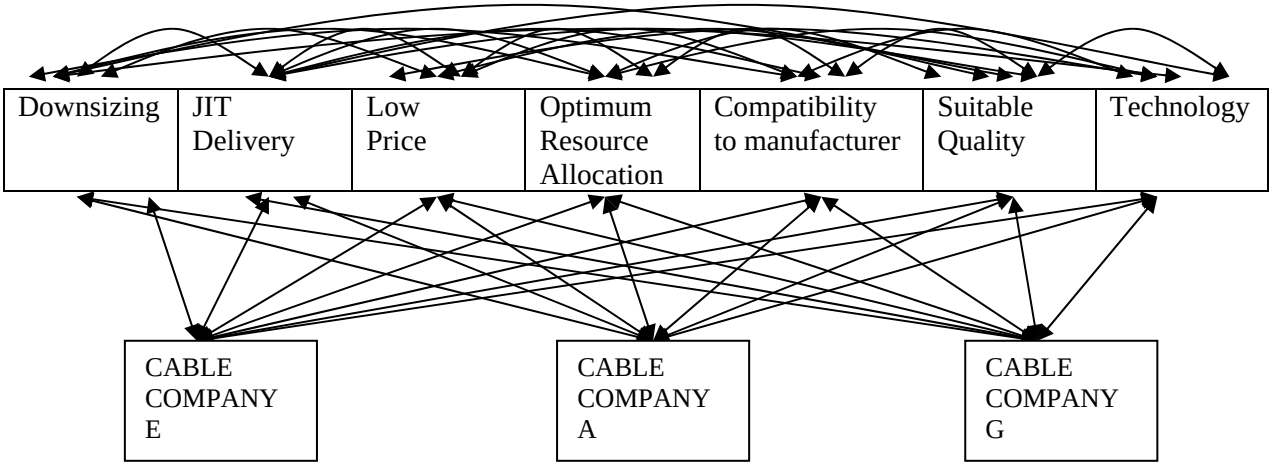

Figure 1. Alternative outsourcing companies and criteria relationships

To make effective judgment on the results of the ANP model analysis, five experts in survey are answered the questionnaire for pairwise comparisons. These calculations are made with aid of Superdecision 1.6.0 software. After the pairwise comparisons are made, weighted matrix are calculated for better understanding the relationships. With limit supermatrix final weights for the options are obtained. For our case study final scores shows that Cable Company A has %47, Company E has %29 and Company G has %23 weights. These scores will help decision makers when they want to outsource their business of cable group. Company A must be the first choice or must take biggest part of the business.

4. CONCLUSION

In this paper, we proposed an outsourcer evaluation and management methodology, in which outsourcers are evaluated and compared according to their performances on several criteria. Potential reasons for differences in outsourcer performance are identified. The proposed methodology is based on a well-known multicriteria decision aid method ANP.

5. REFERENCES

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