

## A SOLUTION TO CUSTOMER SELECTION PROBLEM IN LOGISTICS USING THE ANALYTIC NETWORK PROCESS (ANP)

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### ABSTRACT

*Logistics is a fast growing business sector in Turkey as well as the rest of the world. The need businesses have to transport, store and deliver goods is now acknowledged as a core factor building the product cost. Thus companies offering service in this sector basically combine needs of different customers and cater to all of them to take down the logistics costs, and therefore the product costs.*

*This kind of logistics service is called 3<sup>rd</sup> Party Logistics (3PL) and some companies in this sector are distinguished with the high quality of their service, and thus, are dealing with growing demands from customers. At one point, the demand from the customers exceeds the capacity of the 3PL service supplier, forcing the supplier to select some customers from among others to work with.*

*Since there are many criteria concerning the customer selection problem in logistics, this is handled with a multi-criteria decision making (MCDM) method. In this paper, we use analytical network process (ANP) to determine the best alternative to work with, for this method allows considering the importance of a criterion in a cluster over another one in a different cluster.*

*We get the view of an expert professional in 3PL sector to determine the clusters and the sub-criteria of this problem and the relations between them, and make pairwise comparisons.*

*Three customers are determined as alternatives. At the end of our work, the alternative with the highest rank is the customer which the company should select.*

**Keywords:** logistics, customer selection, analytic network process

### 1 INTRODUCTION

There are a few studies that deal with customer selection so far. Yorke and Wallace used the Pareto curve for that purpose [1]. Kim and Lee took the existence of network externalities into consideration [2]. Bhatnagar et al. dealt with customer prioritization within the scope of customer relationship management (CRM)[3].

We focus on the customer selection problem in the logistics sector. 3PLS (3<sup>rd</sup> Party Logistics Service) is highly demanded by customers of various sectors. Behind this demand lies profitability and the need

of professional assistance in logistics issues. We refer the interested reader to Waters [4] or Mills and Camek [5]. Consequently, there are many service providers in 3PLS sector, but some of them are more desired by customers, as they provide better service. Our study deals with such a situation in which the 3PLS provider needs to select a customer out of three.

## 2 CUSTOMER SELECTION WITH ANP

ANP is a MCDM method which was introduced by Saaty (1996)[6]. The steps of ANP can be summarized as follows: First we define the goal, the criteria, the sub-criteria and the alternatives. Then, we define the relations between criteria, sub-criteria and alternatives. We do the pairwise comparisons of alternatives with respect to criteria and of criteria with respect to related criteria. For those comparisons, the scale which is shown in Table 1 can be used. This scale was also introduced by Saaty (1980)[7]. Results of these comparisons form a super matrix. We transform the super matrix into a weighted super matrix which's sum of the weights in each column is equal to one. After that, we raise the weighted super matrix to a larger power until we get the limit matrix, the matrix in which the values in each column are equal. The priorities of alternatives can be seen in that limit matrix.

*Table 1. Scale of relative importance*

<b>Intensity of importance</b>	<b>Definition</b>
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong or demonstrated importance
9	Extreme importance
2,4,6,8	Intermediate values between adjacent scale values

For our model, we worked with an expert professional and defined three criteria and nine sub-criteria. These criteria and sub-criteria are as follows.

### 2.1 Beneficial Criteria

The criteria, other than the profit and such advantages it brings to work with a customer, which get an alternative chosen are the beneficial criteria.

#### 2.1.1 Customer's reputation

A reputed customer would let the logistics company's name be well-known, in other words, it's free publicity. It also affects customer's reliability.

#### 2.1.2 Number of customer's suppliers

Working with a customer means working also with its suppliers. Thus, the firm has relations with suppliers and the chance to include them in its portfolio in the future. It also affects amount of loads.

#### 2.1.3 Regularity of loads

It allows the logistics firm to know how many vehicles and how much storage it'll need and thus make sound planning. It also affects amount of loads.

### 2.2 Operational Criteria

These are the criteria that form the physical requirements of working with a customer.

#### 2.2.1 Amount of loads

This is the amount requested by the customer to be transported and stored. It affects regularity of loads, amount of loads, required storage, and profit.

### 2.2.2 Frequency of loads

It represents the frequency of loads from the supplier to the customer and from the customer to other points (its customers, etc.). It affects regularity of loads, amount of loads, required storage, and profit.

### 2.2.3 Required storage

It's the area that's necessary to store the customer's goods. It affects the profit.

## 2.3 Strategic Criteria

These are the criteria that affect the decision of working with a customer and yet are not among either beneficial or operational criteria. These include criteria that should be considered for a long term.

### 2.3.1 Customer's position in its sector

It defines the situation of the customer in the business in which it operates. It affects customer's reputation, amount of loads, frequency of loads, required storage and reliability.

### 2.3.2 Profit

It defines the financial advantages of working with a customer.

### 2.3.3 Reliability

It's the customer's success in carrying out obligations. It affects customer's reputation and customer's position in its sector.

Three potential customers, namely A, B and C, were considered as alternatives for the selection. The relations between the criteria, sub-criteria and alternatives are given in Figure 1.

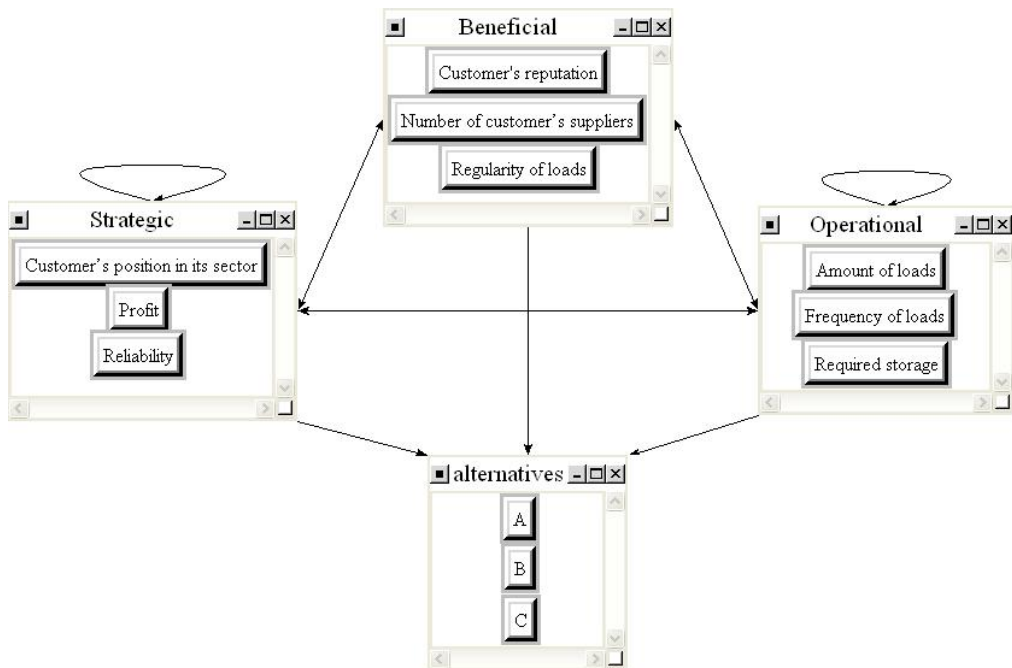


Figure 1. Selection network

The decision making procedure was handled with Super Decisions software, which calculates all the necessary matrices once the relations and comparisons based on the priority scale are defined.

Following the steps mentioned above, we obtained the super matrix, the weighted super matrix and finally the limit matrix.

At the end, we have the rankings of alternatives shown in Table 2.

*Table 2. Priorities and rankings of alternatives*

Alternatives	Total	Normal	Ideal	Ranking
A	0.1673	0.2025	0.4884	3
B	0.3425	0.4147	1.0000	1
C	0.3162	0.3828	0.9233	2

As seen in Table 2, customer B has the highest ranking. This means customer B is the one that should be selected.

### 3 CONCLUSION

In this study, we aimed to handle a customer selection problem in logistics and thus, offer a set of criteria and sub-criteria. While defining those, we collaborated with an expert professional who was working for the 3PLS provider.

We defined the relations and made pairwise comparisons of these elements. Then we followed the steps of ANP and reached the priorities and rankings of alternatives.

As the result of our ANP model, customer B has the highest ranking, which means that it's the best-fit customer to our provider's conditions. An important issue seen in Table 2 is that difference between the priorities of customer B and customer C is very little, which verifies that it was a hard decision to choose between these two customers and using ANP was appropriate.

The criteria and sub-criteria can be modified with opinions of other experts for further research. Also other MCDM methods may be applied to the same problem.

### 4. REFERENCES

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