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### AHP BASED SELECTION OF THIRD-PARTY LOGISTICS SERVICE PROVIDER

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#### ABSTRACT

Today, as in all other sectors, competition in the logistics sector is getting harder day by day. In order to be successful, firms should be able to take the right decisions and fast as they can to be able to catch changing competition conditions. The first stage of making the right decisions is to reach the correct and necessary data quickly. Although the concept of big data, which is one of the innovations brought by the Industry 4.0 revolution, has significantly facilitated access to information, it is still considered an important challenge to analyze this data obtained by companies during daily business processes in a meaningful way. Like many other sectors, the import / export sector has difficulties in the selection process of third party logistics companies in outsourcing activities. Hence, the purpose of this study is to decide the criteria that import export companies should pay attention while choosing a 3rd party logistics company and to determine the priority and importance of these criteria. Both qualitative and quantitative methods used in the study, in the criteria selection phase, one of the directors of Turkey's leading import / export company's was interviewed, in the second phase of the study, obtained criteria were prioritized using the AHP methodology. As a result of the study, a total of 16 criteria, 4 main and 12 sub-criteria were determined, and cost was determined as the most important main criterion in 3<sup>rd</sup> party logistics company selection process.

**Keywords:** 3<sup>rd</sup> Party Logistics Provider, Multi Criteria Decision Making, Import/Export Companies, Selection Process.

## 1. INTRODUCTION

The concept of outsourcing, which means that companies are outsourcing some of their activities which is not their core activities, such as supply chain or logistics activities, in order to focus more on their main/core activities, has been used extensively in developed countries in recent years (Aktaş and Ulengin, 2005). With the increasing competition conditions, enterprises not only responsible of the quality of the products, but also products must be presented to the consumers at the desired place and desired time while providing cost advantages (Barlın, 2009). In the 1970s, companies which aim to increase their productivity, started to hire outside companies to manage less important processes. The experience of the companies has been successful, and many manufacturers now supply 70% to 80% of the finished product from external sources (Corbett, 2004). About 90% of companies see the outsourcing as an important growth strategy globally, even Peter Drucker, who is a famous management expert, defines the outsourcing as fastest-growing industry (Çakır, 2009). Developing countries, on the other hand, started to become attractive markets in the globally integrated world due to their geographical location, low wages and high market potentials, but when it is come to outsourcing mainly transportation comes to mind in developing countries (Ulengin and Ulengin, 2003). With the impact of globalization, companies whose powers are highly equalized in areas such as raw material supply and production methods have begun to look for different ways to gain advantage over their competitors, and logistics services at every stage of the supply chain cycle have come to the fore as the area where companies can make this difference successfully (Barlın, 2009).

Logistics services, which aim to improve the service of many steps from warehouse design to inventory management, mean not only to take the order from the manufacturer and deliver the products to the order point, but to add value to the product in this process with the help of outsourcing concept (Aktaş and Uluengin). In addition to be an important factor of customer satisfaction, logistics services are also an important cost factor for businesses, hence in today's market conditions it becomes an important item for outsourcing (Barlın, 2009). While gaining competitive advantage, logistics capabilities of companies becomes important, Razzaque and Sheng (1998) suggested three basic options that companies choose while handle their logistics activities;

- Providing the function in-house
- Setting up their own logistics subsidiary and buying a logistics firm
- Outsourcing the service from an external provider.

There are several advantages and disadvantages of logistics outsourcing, such as reduction of the cost, capital investments, workforce as advantages (Çakır, 2009), and loss of control (Wentworth, 2003) is mainly cited as disadvantage.

In the literature, it is possible to see multi-criteria decision making methods in studies on logistics service provider selection. Çakır *et al.*, (2018) mentioned the necessity of decision makers to evaluate multiple options such as quality, cost, and delivery time at the same time

and to find the best option in the logistics service provider selection and suggested multi-criteria decision making methods for the solution.

## 2. LITERATURE REVIEW

Baltacıoğlu (2003) has defined third party logistics companies as external suppliers that perform all or part of the logistics functions of a company that produces products and / or services. 3PL companies work in harmony with the businesses they serve, and they provide a broad logistics services to coordinate the delivery of goods from one place to another (Karaman, 2014). Defined as an independent economic asset that creates value for his customer by Yıldız and Turan, (2015), 3rd PL is considered to be more economic and more efficient by many businesses today. Main differences between traditional transportation and 3<sup>rd</sup> PL Providers demonstrated in Table 1.

Table 1. Comparison of 3PL and Traditional Transportation

Traditional Transportation	3 <sup>rd</sup> Party Logistics Provider
Standard Services	Customer-Specific Services
One-Way: Transportation and Storage	Versatile: Integrated System Approach and Logistics Services
Minimizing shipping cost	Service Quality - Flexibility
Short Term Simple Contracts (0-2 Year)	Intermediate and High Level Decisions, Strategic Contracts (2-5 Years)
Limited Expertise	Wide-ranging Expertise and Analytic Thinking
Weak Inter-Firm Bond	Strong Inter-Firm Bond

Source: Mersin, 2003; Hergüllü, 2009.

According to Hergüllü (2009), there are ten main service areas that can outsourced from 3PL companies, such as, shipping/ transportation, forwarding services, product tracking service and logistics information system, cross-docking terminal activities/ consolidation transactions, recycling logistics, inventory (stock) management, warehouse management, customer service and export and import documentation/customs transactions value-added transactions. 3<sup>rd</sup> party logistics (3PL) providers are one of the important types of logistics value chain related strategic alliances with the retailer-supplier partnerships and distributor integration (Çakır, 2009). The alliance between businesses and 3PL is important because, in this way, businesses use the resources and capacity of 3PL to reduce logistics costs per unit and reduce logistics facility investments, as well as increase overall operational efficiency and customer satisfaction. All these reasons enable them to establish an important advantage in gaining competitive advantage in today's conditions (Çakır, 2009).

The supplier selection has become one of the most important decision making problems for businesses as they contribute to the reduction of purchasing costs and the development of common talent capabilities (Hergüllü, 2009). For this reason, although it is considered as an important variable, only buyer and supplier relations

depending on price factor are not suitable for supply chain management. In the 3PL selection process, in addition to the price, quality, delivery, flexibility and other strategic and operational factors should be taken into account (Hergüllü, 2009).

In the current literature there are various studies that investigate 3PL service providers with different perspectives. In 2004, Akyıldız aimed to examine the current situation on outsourcing logistics activities of manufacturer companies in Turkey, he conducted questionnaire on 125 companies and analyzed obtained data with statistical methods. Most outsourced logistics services have been identified as transport and customs procedures as a result of the study. In addition, the fact that logistics outsourcing is 75% is one of the remarkable results of the study.

In the study conducted by Yıldız and Turan in 2015, data conducted from 14 steel pipe production company managers with face to face interview method, and obtained data analyzed by the content analysis. As a result of the study, the procurement and distribution functions determined as the logistics functions with the most outsourcing. In the study, the most important factors in the selection of logistics service providers were determined as service quality, reliability and price.

Sahay and Moran (2006), aimed to measure effect of using 3PL services on business outputs and analyzed the data collected in India by using survey method with statistical methods. As a result of the study, it has been determined that the use of 3PL has a significant and positive effect on the business performance of enterprises.

In 2004, Aguezzoul examined the 3PL selection decisions and the criteria used in the process by using academic articles published between 1994-2013. In the study, in which 67 articles were examined, 11 basic criteria were determined. Cost was the most adopted criterion for these 11 criteria, while relationship, services and quality followed it. In addition, the most used methods in the studies are determined as; MCDM techniques, statistical approaches, artificial intelligence, mathematical programming and hybrid methods respectively.

When current literature analyzed it is seen that various studies suggest 3PL supplier selection criteria such as; relationship, services, professionalism (Aguezzoul, 2014), geographical spread (Aguezzoul, 2014; Boyson et al., 1999; Maltz, 1994; Bradley, 1995), performance measurement (Bhatnagar et al., 1999; Lynch, 2000; Langley et al., 1999), quality (Aguezzoul, 2014; Andersson and Norman, 2002; Lynch, 2000; Boyson et al., 1999; Razzaque and Sheng, 1998; Thompson, 1996; Langley et al., 1999; Stock et al., 1998), flexibility (Aguezzoul, 2014; Bradley, 1995), cost, (Aguezzoul, 2014; Lynch, 2000; Langley et al., 1999; Boyson et al., 1999; Stock et al., 1998; Tam and Tummala, 2001), reputation (Aguezzoul, 2014; Lynch, 2000; Thompson, 1996; Boyson et al., 1999), Long-term relationships (Lynch, 2000; Boyson et al., 1999; Maltz, 1994; Stank and Daugherty, 1997), Information sharing (Lynch, 2000; Stock, 1990; Bagchi and Virum, 1996), information & equipment system (IT Capability) (Aguezzoul, 2014; Andersson and Norman, 2002); Lynch, 2000; Langley et al., 1999; Boyson et al., 1999; Langley et al., 2002; Rabinovich et al., 1999), financial position (financial performance) (Aguezzoul, 2014; Andersson and Norman, 2002; Boyson et al., 1999; Gattorna and Walters, 1996),

market share (Thompson, 1996) and risk management (Boyson et al., 1999; Gupta et al., 2011).

### 3. METHODOLOGY

The aim of this study is to, define the importance degree of 3PL service provider selection criteria for an import/export companies, and select the most appropriate 3PL company for one of the most important production, import/export company that serves in Turkey. To reach this specific aim, first face to face interview was conducted with an import specialist who worked in selected case company. As a result of this interview, the 3PL company selection criteria that gathered from the literature was analyzed and the importance degree of each main and sub-criteria decided with the binary comparisons of import specialist of the company. Then, with the AHP (Analytical Hierarchy Process) method, importance degree of the chosen criteria was determined via the Microsoft Office Excel program. In the third step, four different logistics company and the case company itself evaluated according to these criteria by 16 industry expert from different industries. The expertise area of the participants is given Table 2. In the last step, alternatives of the logistics companies analyzed via Super Decision Program to choose the best alternative.

Table 2. The Expertise Area of the Participants

Industry	Percent (%)
Freight Forwarders	75%
Liner Companies	12%
Port Operators	7%
Shippers	6%

#### 3.1. Analytical Hierarchy Process (AHP)

The AHP method, which is used when there are more than one criteria to be evaluated when making a decision and the effects of these criteria not equal each other on the decision to be made, was developed by Thomas P. Saaty in 1977 (Dündar and Ecer, 2008). In this study, AHP method was preferred because of its advantages as, ease of use, scalable and hierarchical nature that can easily adjust its size to accommodate decision-making problems, and although it requires sufficient data to properly perform binary comparisons, alternatives with the ability to solve larger problems that do not require as much data as other multi-criteria decision-making methods (Velasquez and Hester, 2013). In the method based on binary comparisons, the scale developed by Saaty is completed by evaluating the decision options with a value between 1 and 9 for each decision criterion (Saaty, 1994). In the method, the data obtained through the matrices used to get CI (Consistency Index) value, by using the Eq (1);

$$CI = \frac{-\lambda ma}{n-1} \quad (1)$$

then Random Index (RI) values, which is given in Table 3, used to calculate reliability of the results by using the Eq. (2) (Tzeng and Huang, 2011).

$$CR = \frac{CI}{RI} \quad (2)$$

Table 3. Random Value Index

n	1	2	3	4	5	6
RI	0	0	0,52	0,89	1,11	1,25

Source: Tzeng and Huang, 2011.

#### 4. FINDINGS

In the AHP method, CR value should be smaller or equal to 10%, to accept that the results are consistent (Aykın, 2007). Table 4 demonstrates that the CR values of main and sub criteria, and according to the results our findings found consistent and reliable except sub-criteria of quality.

Table 4. Reliability of Results

	CR Value
Main Criteria	0,0644
Sub-criteria of Cost	0,0725
Sub-criteria of Quality	0,2128
Sub-criteria of Delivery	0,0725
Sub-criteria of Technical Capability	0,0537

According to results of the Analytical Hierarchy Process, cost determined as the most important 3PL selection criteria, and cost followed by quality, delivery and technical capability respectively.

Figure 1 demonstrates the hierarchy and the priority values of all decision criteria and sub-criteria. Accordingly, total cost, experience in production, reliability and information technology is determined as the most important sub-criteria in the 3PL selection process for the chosen company. Priority values of all other criteria can be seen in Figure 1.

After defining the importance of each criteria and sub-criteria, alternative logistics companies' performance in line with these criteria were analyzed via face to face interviews and e-mail responses. Experts form different expertise areas which summarized in Table 2, answered the questions according to their experiences in the sector and their personal networks. Obtained data analyzed with the help of Super Decision program and the results are given in Table 5.

Study results demonstrate that Alternative 1's performance is above average in all segments, while Alternative 2 is very good in technical capability also. Alternative 3 is above average in cost and technical capabilities but it found below average in quality and delivery dimensions. According to experts' opinions, Alternative 4 get the highest scores with two above average and 2 very good performances. Company itself, however, gets the worst results and it stayed below the average in all segments. This result also revealed the positive effect of outsourcing on business performance.



Fig. 1. Importance Degree of Criteria

Table 5. Evaluation of Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Company Itself
<b>Cost</b>					
Transport Cost	AA*	AA	AA	AA	BA
Labor Cost					
Fixed Cost					
<b>Quality</b>					
Experience					
Communication	AA	AA	BA*	AA	BA
Employee Quality					
<b>Delivery</b>					
Lead time	AA	AA	BA	VG	BA
Loading Time					
Reliability					
<b>Technical Capability</b>					
Fleet Capacity	AA	VG*	AA	VG	BA
It					
Age of Vehicles					
<b>Priority Ratings</b>	0,20	0,22	0,17	<b>0,30</b>	0,09
<b>Total Ratings</b>	0,33	0,36	0,27	<b>0,49</b>	0,15

\* AA= Above Average  
BA= Below Average  
VG= Very Good

## 5. CONCLUSION

This study aims to, define the importance degree of 3PL service provider selection criteria for an import/export companies, select the most appropriate one for a case company. With the impact of globalization, gaining a competitive power becoming harder and harder every day for the businesses, because of the limitless opportunities of technology, science, production improvement, supply raw materials, etc. All these innovations and improvements we encounter in the 21st century compel businesses to make difficult decisions to survive. The concept of outsourcing, which means that specializing in the areas where businesses are the best, uses outsourcing for tasks that are not very good, or purchases functions that it does not invest in, while providing its investments to certain areas, provides this competitive power to businesses. However, this process has become a decision-making challenge for businesses today. Namely, companies that decide to outsourcing after comparing all the advantages and disadvantages of outsourcing, have to make more decisions about the outsourcing process. One of the examples that we frequently encounter in the literature is that businesses tend to outsource especially for their logistics activities (Barlın, 2009; Aktaş and Uluengin, 2005; Razzaque and Sheng, 1998). Again in the literature, it is argued that 3PL companies that provide this service to businesses do this job more successfully than the companies themselves (Yıldız and Turan, 2015; Mersin, 2003; Hergüllü, 2009). In line with the literature this study also proved this argument with the results have shown in Table 5, which demonstrates the company itself has below average

scores in all dimensions with the 0,09 priority ratings.

In the literature several study, suggests the cost as the most important criteria (Aguzzoul, 2014; Lynch, 2000; Langley et al., 1999; Boyson et al., 1999; Stock et al., 1998; Tam and Tummala, 2001) in the 3PL selection process of businesses. In this study, in parallel with the literature cost has been chosen as the most important 3PL selection criteria and followed by quality, delivery and technical capability of service providers. However, Alternative 4, the best option as a 3PL company, revealed the importance of other criteria such as delivery and technical capability, as chosen because of its performance in that fields.

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