Analytic Network Process (ANP) in Supplier Selection: A Case Study in Textile Sector

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Abstract

In the process of supply chain management, choosing the most effective supplier with respect to a firm's needs and requests, give a firm an advantage over sustainable competitive advantage. Getting this advantage is available only if correct selection of decisions is made and applied. The main purpose of this study is developing suitable solutions for a textile firm which is facing difficulty of choosing which supplier is the best and setting criteria to determine the best option among available alternatives. In this context, firstly the needed criteria are set and classified. Then with the ANP, which is among multi criteria decision techniques, selection of supplier problem is discussed and solution steps are applied and the output is evaluated in the conclusion part.

Keywords: supplier selection, multi criteria decision techniques, analytic network process

1. Introduction

Businesses operating both nationally and internationally have to perform with a principle which is to meet the customer requests right on time, in order to be sustainable under the existing circumstances in the market. Along with that, advancing technology and constantly raising customer awareness increase the variety of requests and it is becoming harder for businesses to keep up with these changing conditions (Cater, 2005). One of the ways to cope with this difficulty is through strong supply chain structures. The process, starting with the right supplier selection, continues with determining the right supplier. During this selection stage, the path that the companies follow starts with defining the problem, then, identifying the necessary criteria for the solution of the problem, determining the convenient alternative supplier, and finally ends with completing the selection (De Boer et al., 2001).

Supplier selection problem is similar to multi-criteria decision making method as of the structure of the solution process and it has main and sub-criteria of the problem; therefore, it leads decision makers to use multi-criteria decision making method for the solution of supplier selection problem (Ayağ and Özdemir, 2009). Determining criteria and seeking solutions in line with these criteria will eliminate negative situations and missed opportunities as a result of selection based on experience or only one criterion, and contribute to make selections appropriate for the significance level of determined criteria.

2. Literature Review of Criteria Used In Supplier Selection

Businesses have to protect and develop their values in order to survive and ensure sustainability in existing competitive environment. Under present conditions, achieving these goals is possible by taking part in strong supply chain structures. Likewise, taking part in strong supply chain structures which businesses need is possible by right selection decisions made by the businesses. At this point, businesses encounter "the right supplier and right supply network" problem. During the solution process of this problem, businesses make efforts based on scientific foundations or efforts which are not based on scientific foundations. Academic studies conducted on this area have great importance on the development and application of efforts based on scientific foundations and also they provide guidance for the implementation stage.

Businesses with different segments desire to use their "value chain" (Porter, 1998) agents effectively in order to gain superiority in the market which they operate in. In order to achieve this, they have to use their advantageous characteristics and market opportunities as a power along with developing strategies to eliminate environmental threats. In this context, businesses employ various supplier development methods in order to make supply chain activities, among support activities in value chain, efficient and sustainable. While Hartley and Choi (1996) tried to develop a supplier model in their study by describing the supplier development process with these five stages: i.) Promise of supplier top management, ii.) Choosing the supplier team leader, iii.) Creating a skilled development team in partnership, iv.) Effective data usage, v.) Creating a successful supplier network model; Quayle (2000) tried to create a supplier development model by introducing successful supplier development factors.

Choosing the right supplier, which is the first step of creating a successful supplier development model, is the leading problem that businesses encounter during this process (Kannan et al., 2013). But, employing multi-criteria decision making methods for the solution of this problem creates awareness in businesses. Reviewing the literature, it can be seen that multi-criteria decision making methods are used with different methods and different criteria. In the selection of supplier which is critically important for industrial computer manufacturers, *price, delivery reliability, speed of delivery, appropriate quality, increase in demands, product range, design, distribution, design leadership, being the current supplier, marketing and sales, brand name, technical support, and after-sales support* are used as criteria by Ho et al. (2012). In an application of supplier selection for a leader company in household appliance sector in Turkey, Büyüközkan et al. (2011) used the following criteria; *government and legislative regulations, customer pressure, and economic advantage* for the sustainable motivation; *time, cost, quality, and flexibility* for the performance goal; *environmental, economic, and social* for the sustainability dimension; *organization, financial performance, service quality, technology, and social responsibility* for the evaluation criteria.

While Deng et al. (2014) used *cost, quality, service performance, supplier profile, and risk factor* as criteria in their study conducted in order to develop an alternative method for supplier selection based on experiences, Lee et al. (2015) expressed the criteria for the selection of the best supplier as follows; *management and strategy, financial status, customer relations, prestige, background, language ability, certificates, and geographical location* from the point of view of general management; *product capacity, product range, research and development skills, security system, environmental relationships, quality control, and product price* from the point of view of production skills; *after-sales service, and secure delivery* from the point of view of cooperative skills; *speed of delivery, delivery flexibility, resource flexibility, customer response speed, partner cooperation, and informatics infrastructure* from the point of view of agility.

Rezaei et al. (2014) addressed supplier selection in airline retail sector with the application of supplier selection for Royal Dutch Airlines and used *cost, product quality, delivery, support service, flexibility, and responsiveness* as product related criteria; *financial stability, prestige, and communication activities* as supplier related criteria; and *diversity, market expertise, and management and organization* as strategic relationships related criteria. In an application of supplier selection for a company operating in automotive industry, Amin and Razmi (2011) grouped the criteria as *internal and external criteria* and determined the following sub-criteria *quality, percentage of delivery on time, management stability, and unit cost* as internal criteria, and *mutual trust, geographical location, and international communication* as external criteria.

Chen et al. (2006) emphasized the importance of selection criteria in choosing the best material supplier for a company manufacturing high technology products and developed the supplier selection proposal by determining the supplier selection criteria as follows; *supplier profitability, relationship proximity, technological skill, appropriate quality, and problem solving.* Kannan and Tan (2002), in the study which is conducted to measure the effect of supplier selection criteria on the performance of a firm operating in the USA, considered supplier selection criteria as; *supplier's strategic commitment to the buyer, ability to fulfill the needs of the buyer, capacity, buyer-supplier compatibility, honesty and truth*, and presented the intensity of relationship between supplier selection criteria and supplier evaluation.

In their study, Chan and Kumar (2007) stated the need for suppliers in global-scale based on the fact that global borders are disappearing and accessibility is increasing day-by-day, and determined the criteria to be used in the selection process of suppliers with mentioned specialties as *cost, quality, service performance, service profile, and risk factor.* With the same approach, Ku et al. (2009) applied the global-scale supplier selection in their study for a digital consumer products manufacturer and used the following criteria; *cost, quality, service, and risk factor*. Wang (2010) applied supplier selection on a company manufacturing high technology products in Taiwan and used the following criteria; *product performance and technology level* under the main criterion of product quality of the supplier; *status of the product at delivery, on time delivery performance, accuracy of order completion, and ability of urgent order fulfillment* under the main criterion of delivery skill of the supplier; *product and service price, financial power, cost usage ability* under the main criterion of cost reduction; and, *after-sales help and support, product design skill, ability/willing to be helpful, and communication convenience* under the main criterion of after-sales service.

Shen and Yu (2009) approached the supplier selection in terms of strategic and operational activities and determined supplier selection criteria, needed to preserve supplier efficiency and fulfill the new product development need, as follows; *reliability, reaction to demand, technical support, technological skills, innovativeness, customer-oriented, need recognition skills, and development speed.* Güneri et al. (2009) applied supplier selection on a textile firm and determined the following selection criteria based on the long term and close relationship factors that are necessary to create a successful supply chain; *close relationship, prestige and status in the industry, performance history, problem solving, and delivery capacity.* Liao and Kao (2011) presented supplier selection phase in supply chain management product flow phases (Figure-1), and used the following criteria in a supplier selection application on a watch manufacturer; *relationship proximity, product quality, delivery skills, guaranty level, and duration of experience.*

Besides, it can be seen in Figure-1 that, along with supplier selection applications, multi-criteria decision making methods are used in the literature for retailer selection applications, as well, the following phase of product flow. Criteria used in different studies in the literature are presented in Table-1.

3. Determination of Criteria with the Kano Value Model

Members of the supply chain networks are in the supplier role for the member in the next level of supply chain and in the customer role for the member in the previous level of supply chain. These mutual and bilateral relationships require businesses, which are in the customer role in the supplier selection problem, to think like a customer during the solution of the problem. Based on this perception, aiming to increase the value needed by the customer to the maximum level will lead to the right supplier selection.

The concept of "value", which is aimed to be taken to the highest level with customer point of view, shows up in the literature in different forms; *shareholder value* with financial point of view; *economic value* with economic point of view; *partner group value* with the viewpoint of environment theorists; and *customer value* with marketing point of view (Salem Khalifa, 2004). Customer value, which is generated with a marketing point of view, is defined as "belief that leads product and service characteristics, which meet desires, wants, and needs, to be preferred between alternatives" by Svensson (2003).

In the literature, it can be seen that various customer value models have been developed with the intent of creating customer value. Naumann (1995) developed a model and evaluated customer value in terms of benefits-sacrifices ratio and addressed the product or service characteristics as "benefits creating customer value", and sacrifices made by customers during the purchase and usage process of products or services as "sacrifices affecting customer value".

Woodall (2003) improved the model developed by Naumann and created customer value model that argues customer value benefits should be evaluated in two groups as "attributes" and "outcomes", and customer value sacrifices should be evaluated in two groups as "monetary" and "non-monetary". In the "Customer Value Hierarchy Model" developed by Woodruff (1997), product and performance attributes of product are considered as equipments in order to meet the customers' objective and a hierarchical structure with three levels was created. At the bottom level of this structure, there are product attributes indicating product and service characteristics; above this level, there are product benefits desired during the usage; and, at the top level, customer values that provide ultimate satisfaction of customer goals and objectives.

Even though each of the value models mentioned above attempts to present perceived value of customers, the application of the *Kano* model (Kano, 1984) in creating and categorizing criteria that aim to take the customer value to the maximum level in supplier selection problem, comes out to be a more effective model in discovering factors effecting logistic added values (Akyıldız and Tuna, 2007).

In the study conducted by Matzler et al. (1998), it can be seen that Kano model, developed by Kano (1984) and defined as "a model that has the ability to define customer needs and exceed customer expectation" by Hashim and Dawal (2012), deals with customer satisfaction with three components; I. *basic requirements*, II. *Performance requirements*, and, III. *Attractive service requirements.* (Figure-2).

In order to make these 3 components clear; *basic requirements* mean basic criteria of the product or service. Failing to meet these requirements will result in excessive dissatisfaction of the customer, but meeting these requirements fully or to some extent will not change the level of customer satisfaction (Matzler et al., 1998). About *performance requirements,* the more they are met, the more the customer satisfaction will be and the less they are met, the less the customer satisfaction will be (Matzler et al., 1996). Although meeting *attractive service requirements* will lead excessive customer satisfaction, not meeting these requirements or meeting them to a low level will not create any change in customer satisfaction.

If the businesses with the need of a supplier in supplier selection problem, in other words, business in the role of the customer, use these 3 value components accepted by *Kano value model* in dealing customer requirements that have an effective role in determining selection criteria, it will provide advantages in identifying its own needs and demands. Matzler et al. (1998) expressed these advantages as follows: I. Better understanding of product requirements, II. Determining the product that will ensure customer satisfaction, III. Developing customer specific solution problem, IV. Identifying and ensuring average customer value and attractive services by determining basic requirements and performance requirements, therefore, providing competitive advantage, V. Achieving optimum quality level.

In this study, Kano value model requirements are accepted as main criteria in order to gain advantages introduced by Matzler et al. (1998) and sub-criteria of main criteria are determined by buying specialists appointed by the textile firm approached in the study. Determined criteria are presented in Table 2.

4. Multi-Criteria Decision Making Models and Supplier Selection Application with ANP Model

4.1. Multi-Criteria Decision Making Models Used in Supplier Selection

Businesses that desire to be a part of strong supply chains should abandon traditional experience based supplier selections, find analytical solutions, and develop sustainable relationships by determining the right supplier under the market conditions. Considering the advantages provided to decision maker by multi-criteria decision making methods, its benefit to the businesses in selecting the right supplier will contribute them to gain superiority against their competitors.

Examining the studies dealing with supplier selection in the literature, we find that multi-criteria decision making methods are used in solution approaches of the problem. In the study conducted by Gencer and Gürpınar (2007), ANP method, one of the multi-criteria decision making methods, was employed in the supplier selection application of an electronics company and the right supplier, among 3 alternatives, was chosen according to the company's own criteria. In a study conducted by Mani et al. (2014), supplier selection criteria, social sustainability criteria, and AHP method, one of the multi-criteria decision making methods, were tested with three applications conducted with following companies; a heavy electronics manufacturer in India, an automotive manufacturer operating in Japan, and cement manufacturer operating in India and Middle East.

In a study conducted by Ng (2008), a mathematical model was developed in order to offer optimum solutions to the multi-criteria supplier selection problem; a solution model was developed by Choudhary and Shankar (2014) for supplier selection and carrier selection problem with multipurpose linear mathematical problem solution method; and Chen et al. (2006) applied fuzzy TOPSIS multi-criteria decision making method in order to select the right material supplier between alternatives for a high technology manufacturing company and developed a solution proposal for supplier selection problem.

VIKOR method, one of the multi-criteria decision making methods, was applied by You et al. (2015) for a third-grade university hospital operating in China (Shanghai) with anesthetic materials supplier selection which was significant for safety reasons. Dağdeviren and Eraslan (2008) used PROMETHEE method with half-product supplier selection application for a household appliances manufacturer operating in Ankara and determined the right supplier according to the determined criteria of the company out of 5 alternative suppliers.

Moreover, there are studies in which integrated multi-criteria decision making methods are employed. Ghodsypour and O'Brien (1996) used LP and AHP methods together to select the right supplier for a full-time manufacturing company among 5 alternative suppliers according to the determined criteria of the company; and Junior et al. (2014) employed AHP and fuzzy TOPSIS methods together in metal component supplier selection for a company manufacturing transmission cable to be used in motorcycle production.

Önüt et al. (2009) employed fuzzy ANP and fuzzy TOPSIS methods together in supplier selection for a GSM company in Turkey and developed a solution proposal for the right supplier selection among 6 alternative suppliers according to the criteria of the company. Sanayeia et al. (2008) used LP and MAUT methods together in supplier selection for an automobile manufacturing company and developed a solution proposal for the company to select the right supplier in competitive environment. In this study, application of the ANP model, one of the multi-criteria supplier selection models, in supplier selection will be presented.

4.2. Supplier Selection Application with ANP Model

ANP method, one of the multi-criteria decision making methods, helps with identifying interaction between main criteria and sub-criteria accepted during the selection phase. Meade and Sarkis (1999) express these relationships as internal dependency if it is within main criterion, and as external dependency if it is between main criteria. The application steps of the ANP model considering both internal dependency and external dependency relationships are as follows; I. Defining the problem, determining the criteria, and creating decision network, II. Creating paired comparison matrices, calculating priority vectors of the matrices, and checking consistency ratios, III. Creating super matrix, normalizing super matrix, and creating limit matrix, IV. Determining the best alternative.

4.2.1. Defining the Problem, Defining the Criteria, and Creating Decision Network

Companies in textile sector, in which the quality of the raw material used in the production directly affects the production stages and there is a constant requirement to respond to the progress of customer needs and desires, require strong suppliers in order to meet their raw material needs and gain competitive superiority. A supplier selection problem of a textile company operating in İstanbul, which has a high level of industrial development, is attempted to be solved successfully and with the help of the information gathered from the literature, main criteria and sub-criteria are presented to the buying specialist appointed by the company management, then these criteria are categorized by the specialists. Supplier selection decision network, created in the light of determined criteria, is presented in Figure-3.

4.2.2. Creating Paired Comparison Matrices, Calculating the Priority Vectors Of The Matrices, And Checking Consistency Ratio

After creating the decision network of the problem, paired matrices should be created in the light of determined criteria. In order to create the matrices, paired comparisons are made by buying specialist of the textile company by benefiting from the "1-9 Scale" developed by Saaty (1994). According to the "1-9 Scale", evaluations are carried out between pair wise compared criteria. Within these evaluations; "1" is used when the criteria have equal importance, "3" is used when one criterion has slightly more importance than other criterion, "5" is used when one criterion has strongly more importance than other criterion, "7" is used when one criterion has been opted very strongly and its dominance can be observed easily in the application, "9" is used when one criterion has been opted with highest possible validity, and "2,4,6,8" are used when compromise is needed between two consecutive judgments.

As a result of the evaluations; paired comparison matrices for the determination of main criterion weights are presented in Table 3, paired matrices showing the effect of sub-criteria of main criteria on main criterion are presented in Table 4, paired matrices showing the effect of each criterion on other criteria of the same main criterion are presented in Table 5 (only the data of the first sub-criterion of each main criterion is presented), and paired matrices showing the effect of alternatives of each criterion are presented in Table 6. Furthermore, consistency ratio, which shows the logical and mathematical relationships between the values obtained from paired comparisons, is calculated based on "Random Consistency Index" developed by Saaty (1980) and presented in the tables.

4.2.3. Creating Super matrix, Normalizing Super matrix, and Creating Limit Matrix

In order to reveal the relationship between sub-criteria of main criteria, a super matrix needs to be created. In order to serve the purpose and create the super matrix, data obtained from paired comparisons are transferred to "Super Decisions" software and put to super matrix analysis. On a side note, created super matrix is a 27*27 matrix, since there are 9 sub-criteria under the *Basic Requirements* main criterion, 8 sub-criteria under the *Performance Requirements* main criterion, and 10 sub-criteria under the *Attractive Service Requirements* main criterion (Table 7). Normalization (Weighting) of the created super matrix is presented in Table 8 and Limit Super matrix is presented in Table 9.

4.2.4. Determining the Best Alternative

Examining the analysis report obtained as a result of analysis of the gathered data with Super Decision software; when only the *Basic Requirements* criteria are considered, "Supplier-3" is ranked first, "Supplier-1" is ranked second, and "Supplier-2" is ranked third; when only the *Performance Requirements* criteria are considered, "Supplier-3"is ranked first, "Supplier-2" is ranked second, and "Supplier-1" is ranked third; when only the *Attractive Service Requirements* criteria are considered, "Supplier-1"is ranked first, "Supplier-3" is ranked second, and "Supplier-2" is ranked third, as can be seen in Table 10.

In *Overall* ranking obtained by adding the priority values of main criteria to the calculation, "Supplier-3"is ranked first, "Supplier-1" is ranked second, and "Supplier-2" is ranked third.

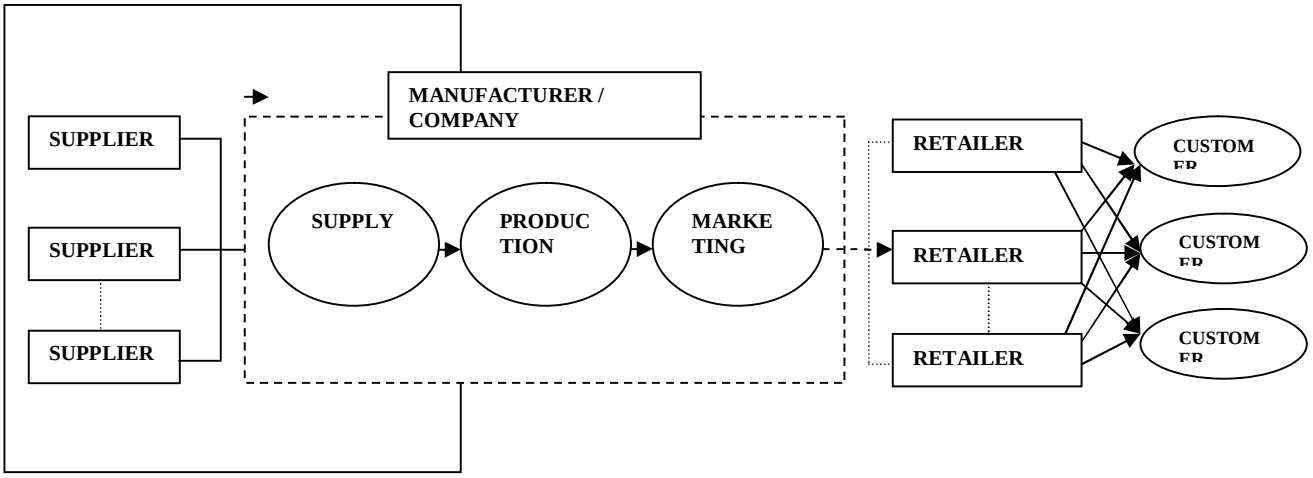
5. Conclusion and Evaluation

Selecting the right supplier is an efficient factor in terms of sustainability for business aiming to gain competitive superiority by taking part in strong and long term supply chains. Finalizing the supplier selection activity successfully can be realized by determining the critical criteria for the company and applying the supplier selection process in the light of determined criteria.

In this study, first, critical criteria for the company operating in textile sector are determined among the priorities identified by the company in accordance with the studies in the literature and sectoral requirements in order to make the right supplier selection for the company. Then, criteria are categorized using the *Kano Value Model* for the application of ANP method which is one of the multi-criteria decision making methods presenting the significance values of the criteria. During the application phase, paired comparison matrices that show the priority levels of criteria are created by a problem solving team with four members of buying specialists of the textile company. In order to obtain the desired optimum benefit, the best supplier is selected among three alternative suppliers, suggested to be successful in market conditions, according to the desired criteria.

Examining the findings of the analysis; "Supplier-3" is the company that meets the *basic requirements* and *performance requirements* most, and "Supplier-1" is the company that meets the *attractive service requirements* most. However, paired comparisons between main criteria show that main criteria *basic requirements* and *performance requirements* are more significant than the main criterion *attractive service requirements*; therefore, "Supplier-3" is concluded to be the right supplier. By making the right supplier selection with the help of the findings in accordance with the requirements of the operating company, awareness of the company has been raised and the reliability of the necessity of accurate determination of the criteria, accurate categorization, and paired evaluations to the purpose is attempted to be stressed for researches that will deal with supplier selection subject in the literature.

Figure-1: Product Flow in Supply Chain Management

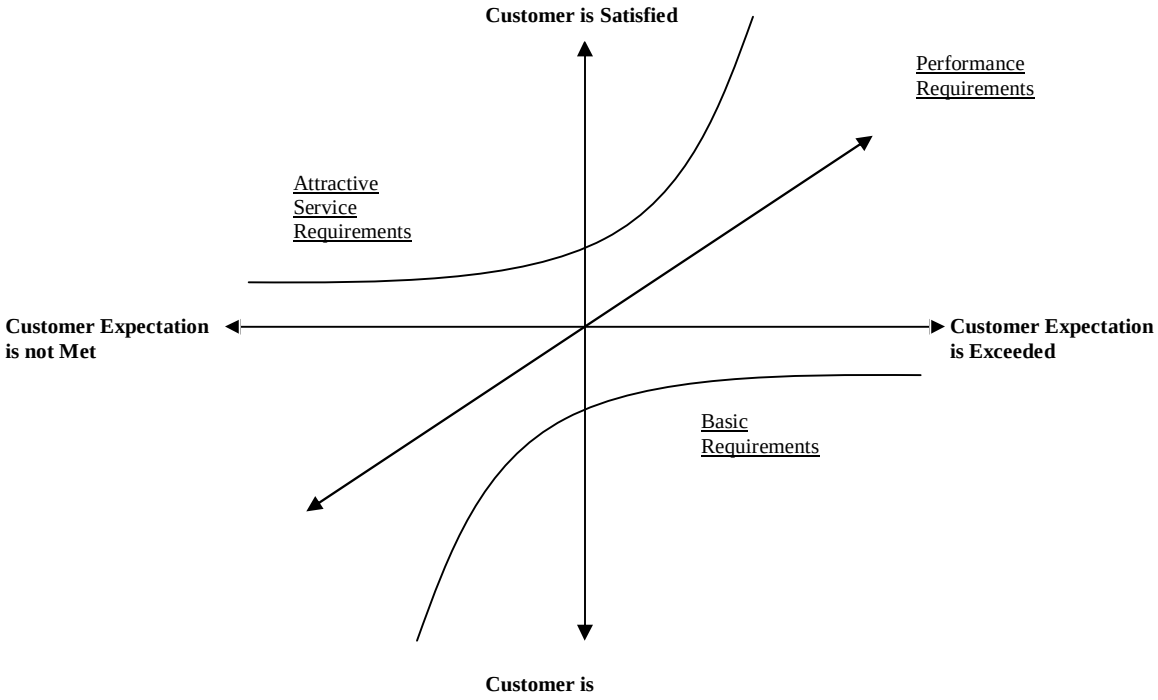


Source: Liao, Chin-Nung, and Hsing-Pei Kao, 2011:10803-10811.

Table 1: Supplier Selection Criteria Used in the Literature

CRITERION	EXPRESSION of the CRITERION
Price	Price of the product or service offered by the supplier
Delivery reliability	Supplier's providing the service as promised
Speed of delivery	Supplier's providing the service on the promised time
Quality	Value of the product or service offered by the supplier
Product range	Variety of the product or service offered by the supplier
Design	Technical capacity skill of the supplier with the product or service
Being the current supplier	Ongoing service exchange with the supplier
Brand name	Brand awareness of the supplier
Marketing and sales	Supplier's product marketing and sales skills
Legislative regulations	Political and environmental factors of the location in which the supplier operates
Customer pressure	The supplier demanded by the customer
Flexibility	Supplier's flexible attitudes with the service provided
Organizational structure	Organizational structure of the supplier
Service performance	Continuity of the service provided by the supplier
Supplier's profile	Recognition of the supplier in market conditions
Risk factor	The risk arisen from the product and service exchange with the supplier
Management and strategy	Management and strategies accepted by the supplier
Customer Relations	The connection between the supplier and its customers
Prestige	The level of recognition of the supplier in market conditions
Background	The results obtained from supplier's previous services
Geographical location	The distance between the supplier and manufacturer
Certificates	Quality certificates held by the supplier
Security system	Safety precautions applied during the supplier's activities
R&D skills	The capacity reserved by the supplier for R&D
After sales service	The after sales service provided by the supplier to the manufacturer
Customer response speed	Reaction of the supplier to customer demands
Informatics infrastructure	Supplier's implementing capacity of informatics technologies
Support service	Various support services provided by the supplier
Financial stability	Financial status changes of the supplier in the past
Market expertise	Expertise of the supplier in the market that it operates in
Mutual trust	Trust relationship between the supplier-manufacturer
Problem solving	Solution proposal provided by the supplier to encountered problem
Capacity	Supplying capacity of the supplier
Honesty and truth	The attitude of the supplier during its activities
Willingness to help	Willingness of the supplier to offer help
Green production	Environmental attitude of the supplier during the production
Guarantee	Duration of the guarantee promised by the supplier for its service

Figure 2: Kano Value Component Model



Source: Matzler, Kurt, and Hans H. Hinterhuber, 1998:25-38.

Table 2: Sub-Criteria of Main Criteria

MAIN CRITERION	SUB-CRITERIA
Basic Requirements	*Price, quality, service performance, risk factor, customer relations, after sales service, customer response speed, mutual trust, honesty and truth*
Performance Requirement	*Delivery reliability, delivery speed, being the current supplier, flexibility, geographical location, problem solving, capacity, guarantee*
Attractive Service Requirement	*Product range, design, brand name, supplier profile, prestige, background, certificates, R&D skills, market expertise, green production.*

Figure-3: Supplier Selection Problem Hierarchy (Decision Network)

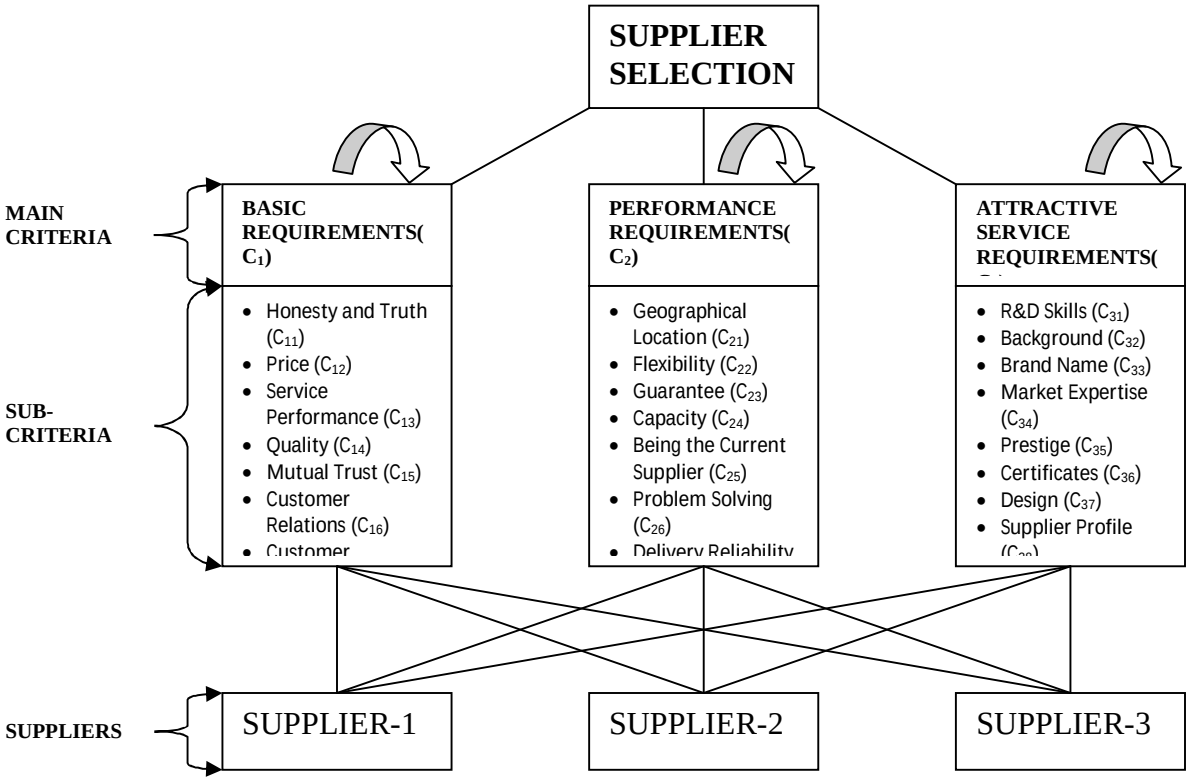


Table 3: Paired Comparison Matrices for the Determination of Main Criterion Weights

Main Criteria	C_1	C_2	C_3	Priority Vector (W)
Basic Requirements(C_1)	1,00	3,00	7,00	
Performance Requirement(C_2)	0,33	1,00	3,00	
Attractive Service Requirement(C_3)	0,14	0,33	1,00	
CR=0,00675 <0,1 Consistency				

Table 4: Paired Matrices Showing the Effects of Sub-Criteria of Main Criteria on Main Criterion

Basic Requirements(C_1)										
	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	W
C_{11}	1,00	0,33	0,33	0,20	0,33	0,33	3,00	0,33	0,33	0,0395
C_{12}	3,00	1,00	0,33	0,33	3,00	0,33	3,00	3,00	3,00	0,1097
C_{13}	3,00	3,00	1,00	0,33	3,00	3,00	5,00	5,00	5,00	0,2097
C_{14}	5,00	3,00	3,00	1,00	3,00	3,00	5,00	5,00	5,00	0,2775
C_{15}	3,00	0,33	0,33	0,33	1,00	0,33	3,00	3,00	3,00	0,0855
C_{16}	3,00	3,00	0,33	0,33	3,00	1,00	3,00	3,00	3,00	0,1407
C_{17}	0,33	0,33	0,20	0,20	0,33	0,33	1,00	0,33	0,33	0,0285
C_{18}	3,00	0,33	0,20	0,20	0,33	0,33	3,00	1,00	3,00	0,0612
C_{19}	3,00	0,33	0,20	0,20	0,33	0,33	3,00	0,33	1,00	0,0477
CR=0,09380 <0,1 Consistency										
Performance Requirement(C_2)										
	C_{21}	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	W	
C_{21}	1,00	3,00	0,33	0,33	0,33	0,33	0,33	0,20	0,0458	
C_{22}	0,33	1,00	0,33	0,20	0,33	0,33	0,33	0,20	0,0320	
C_{23}	3,00	3,00	1,00	0,20	3,00	0,33	0,33	0,33	0,0826	
C_{24}	3,00	5,00	5,00	1,00	3,00	3,00	3,00	0,33	0,2246	
C_{25}	3,00	3,00	0,33	0,33	1,00	0,33	0,33	0,33	0,0652	
C_{26}	3,00	3,00	3,00	0,33	3,00	1,00	3,00	0,33	0,1490	
C_{27}	3,00	3,00	3,00	0,33	3,00	0,33	1,00	0,33	0,1128	
C_{28}	5,00	5,00	3,00	3,00	3,00	3,00	3,00	1,00	0,2880	
CR=0,09777 <0,1 Consistency										
Attractive Service Requirement(C_3)										
	C_{31}	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{310}	W
C_{31}	1,00	0,33	0,33	0,33	1,00	0,33	0,33	3,00	3,00	0,33	0,0474
C_{32}	3,00	1,00	0,33	0,33	3,00	3,00	0,33	3,00	5,00	3,00	0,1163
C_{33}	3,00	3,00	1,00	0,33	3,00	3,00	0,33	5,00	5,00	3,00	0,1513
C_{34}	3,00	3,00	3,00	1,00	3,00	3,00	3,00	5,00	5,00	3,00	0,2334
C_{35}	1,00	0,33	0,33	0,33	1,00	0,33	0,20	3,00	3,00	0,33	0,0453
C_{36}	3,00	0,33	0,33	0,33	3,00	1,00	1,00	3,00	5,00	0,33	0,0829
C_{37}	3,00	3,00	3,00	0,33	5,00	1,00	1,00	3,00	5,00	3,00	0,1764
C_{38}	0,33	0,33	0,20	0,20	0,33	0,33	0,33	1,00	3,00	0,20	0,0308
C_{39}	0,33	0,20	0,20	0,20	0,33	0,20	0,20	0,33	1,00	0,33	0,0218
C_{310}	3,00	0,33	0,33	0,33	3,00	3,00	0,33	5,00	3,00	1,00	0,0944
CR=0,09707 <0,1 Consistency											

Table 5: Paired Matrices Showing the Effect of Each Criterion on Other Criteria of the Same Main Criterion

Honesty and Truth (C_{11})									
	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	W
C_{12}	1,00	0,33	3,00	3,00	3,00	0,33	3,00	0,33	0,1167
C_{13}	3,00	1,00	3,00	3,00	5,00	3,00	3,00	3,00	0,2796
C_{14}	0,33	0,33	1,00	0,33	3,00	0,33	0,33	0,33	0,0506
C_{15}	0,33	0,33	3,00	1,00	3,00	0,33	3,00	0,33	0,0883
C_{16}	0,33	0,20	0,33	0,33	1,00	0,33	0,33	0,20	0,0323
C_{17}	3,00	0,33	3,00	3,00	3,00	1,00	3,00	0,33	0,1542
C_{18}	0,33	0,33	3,00	0,33	3,00	0,33	1,00	0,33	0,0668
C_{19}	3,00	0,33	3,00	3,00	5,00	3,00	3,00	1,00	0,2116
CR=0,09813 <0,1 Consistency									
Geographical Location (C_{21})									
	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	W	
C_{22}	1,00	0,33	0,33	0,33	0,33	0,20	3,00	0,0591	
C_{23}	3,00	1,00	3,00	5,00	3,00	1,00	3,00	0,2648	
C_{24}	3,00	0,33	1,00	3,00	0,33	0,33	3,00	0,1150	
C_{25}	3,00	0,20	0,33	1,00	0,33	0,20	3,00	0,0762	
C_{26}	3,00	0,33	3,00	3,00	1,00	0,33	3,00	0,1580	
C_{27}	5,00	1,00	3,00	5,00	3,00	1,00	3,00	0,2800	
C_{28}	0,33	0,33	0,33	0,33	0,33	0,33	1,00	0,0468	
CR=0,09741 <0,1 Consistency									
R&D Skills (C_{31})									
	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{310}	W
C_{32}	1,00	3,00	3,00	1,00	0,20	0,20	3,00	3,00	0,33	0,0896
C_{33}	0,33	1,00	0,33	0,33	0,20	0,33	1,00	3,00	0,33	0,0427
C_{34}	0,33	3,00	1,00	3,00	0,33	0,33	1,00	3,00	0,33	0,0749
C_{35}	1,00	3,00	0,33	1,00	0,33	0,20	0,33	3,00	0,33	0,0577
C_{36}	5,00	5,00	3,00	3,00	1,00	3,00	5,00	5,00	3,00	0,2828
C_{37}	5,00	3,00	3,00	5,00	0,33	1,00	3,00	5,00	3,00	0,2132
C_{38}	0,33	1,00	1,00	3,00	0,20	0,33	1,00	3,00	0,20	0,0608
C_{39}	0,33	0,33	0,33	0,33	0,20	0,20	0,33	1,00	0,20	0,0260
C_{310}	3,00	3,00	3,00	3,00	0,33	0,33	5,00	5,00	1,00	0,1522
CR=0,09993 <0,1 Consistency										

Table 6: Paired Matrices Showing the Effect of Alternatives of Each Criterion

Honesty and Truth (C_{11})	Supplier-1	Supplier-2	Supplier-3	W
Supplier-1	1,00	3,00	2,00	0,5278
Supplier-2	0,33	1,00	0,33	0,1396
Supplier-3	0,50	3,00	1,00	0,3325
CR=0,05156 <0,1 Consistency				
Geographical Location (C_{21})	Supplier-1	Supplier-2	Supplier-3	W
Supplier-1	1,00	0,20	0,33	0,1047
Supplier-2	5,00	1,00	3,00	0,6370
Supplier-3	3,00	0,33	1,00	0,2583
CR=0,03733 <0,1 Consistency				
R&D Skills (C_{31})	Supplier-1	Supplier-2	Supplier-3	W
Supplier-1	1,00	3,00	3,00	0,6000
Supplier-2	0,33	1,00	1,00	0,2000
Supplier-3	0,33	1,00	1,00	0,2000
CR=0,00000 <0,1 Consistency				

Table 10: Supplier Ranking

	Basic Requirements		Performance Requirement		Attractive Service Requirements		Overall	
	Priority	**Rank**	**Priority**	**Rank**	**Priority**	**Rank**	**Priority**	**Rank**
Supplier-1	0,1100	2.	0,0634	3.	0,1436	1.	0,2873	2.
Supplier-2	0,0605	3.	0,1208	2.	0,0792	3.	0,1661	3.
Supplier-3	0,1628	1.	0,1491	1.	0,1105	2.	0,7696	1.

Table 7: Super matrix

	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	C_{21}	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{31}	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{310}
C_{11}	0,0000	0,085 69	0,046 59	0,022 78	0,306 66	0,048 43	0,085 03	0,132 67	0,046 68																		
C_{12}	0,116 69	0,000	0,149 27	0,055 70	0,124 46	0,025 61	0,045 57	0,049 66	0,084 43																		
C_{13}	0,279 57	0,292 99	0,000	0,037 79	0,213 96	0,150 54	0,029 88	0,075 73	0,157 17																		
C_{14}	0,050 56	0,157 77	0,315 51	0,000	0,035 31	0,085 05	0,112 75	0,175 60	0,060 39																		
C_{15}	0,088 30	0,061 31	0,112 87	0,150 46	0,000	0,295 04	0,301 61	0,387 36	0,031 03																		
C_{16}	0,032 29	0,034 24	0,197 42	0,079 60	0,080 23	0,000	0,207 92	0,037 52	0,211 37																		
C_{17}	0,154 20	0,113 19	0,035 23	0,214 78	0,063 30	0,118 58	0,000	0,041 23	0,289 96																		
C_{18}	0,066 82	0,208 41	0,081 49	0,120 27	0,124 46	0,211 30	0,060 42	0,000	0,118 98																		
C_{19}	0,211 56	0,046 41	0,061 62	0,318 62	0,051 61	0,065 44	0,156 81	0,100 24	0,000																		
C_{21}										0,000	0,209 28	0,040 74	0,082 98	0,150 91	0,054 25	0,028 26	0,361 85										
C_{22}										0,059 08	0,000	0,051 88	0,036 34	0,341 81	0,036 10	0,043 98	0,171 61										
C_{23}										0,264 83	0,038 67	0,000	0,154 37	0,109 63	0,106 24	0,100 86	0,071 52										
C_{24}										0,114 99	0,116 16	0,152 68	0,000	0,231 47	0,247 07	0,063 83	0,201 59										
C_{25}										0,076 24	0,079 50	0,110 82	0,107 76	0,000	0,080 66	0,159 00	0,040 22										
C_{26}										0,115 804	0,057 34	0,343 08	0,222 35	0,082 09	0,000	0,238 05	0,051 56										
C_{27}										0,280 01	0,119 249	0,225 06	0,335 81	0,049 35	0,150 66	0,000	0,101 65										
C_{28}										0,046 80	0,306 56	0,075 73	0,060 38	0,034 73	0,325 01	0,366 01	0,000										
C_{31}																		0,000 0	0,056 42	0,047 08	0,038 36	0,052 18	0,197 12	0,179 39	0,029 90	0,041 31	0,009 854
C_{32}																		0,089 63	0,000 0	0,287 48	0,029 92	0,200 010	0,040 417	0,063 16	0,123 42	0,021 13	0,039 07
C_{33}																		0,042 72	0,160 01	0,000 0	0,188 23	0,307 84	0,117 63	0,080 92	0,067 21	0,077 19	0,136 07
C_{34}																		0,074 91	0,258 60	0,180 84	0,000 0	0,149 56	0,151 27	0,307 55	0,196 81	0,039 75	0,259 78
C_{35}																		0,057 72	0,053 93	0,116 87	0,054 55	0,000 0	0,042 80	0,049 30	0,275 19	0,148 16	0,053 87
C_{36}																		0,282 77	0,102 60	0,043 28	0,096 35	0,104 88	0,000 0	0,144 51	0,088 84	0,308 29	0,122 31
C_{37}																		0,213 23	0,187 59	0,055 90	0,109 85	0,047 51	0,008 679	0,000 0	0,129 40	0,129 40	0,195 78
C_{38}																		0,060 79	0,035 01	0,084 03	0,146 80	0,077 35	0,028 06	0,038 48	0,000 0	0,062 07	0,069 19
C_{39}																		0,026 01	0,025 40	0,026 11	0,066 13	0,024 90	0,067 49	0,027 25	0,040 27	0,000 0	0,025 39
C_{310}																		0,025 39	0,120 44	0,158 40	0,269 80	0,035 69	0,268 68	0,109 42	0,048 96	0,189 88	0,000 0

Table 8: Normalization Super matrix

	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	C_{21}	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{31}	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{310}
C_{11}	0,00000	0,04428	0,02333	0,01114	0,15333	0,02242	0,04425	0,06663	0,02333																		
C_{12}	0,05584	0,00000	0,07046	0,02279	0,06622	0,01128	0,02228	0,02248	0,04222																		
C_{13}	0,13998	0,14665	0,00000	0,01889	0,10670	0,07053	0,01449	0,03979	0,07886																		
C_{14}	0,02253	0,07889	0,15778	0,00000	0,01777	0,04225	0,05564	0,08878	0,03002																		
C_{15}	0,04442	0,03007	0,05564	0,07552	0,00000	0,14775	0,15008	0,19337	0,01555																		
C_{16}	0,01162	0,01171	0,09887	0,03998	0,04401	0,00000	0,10440	0,01888	0,10557																		
C_{17}	0,07771	0,05566	0,01676	0,10774	0,03717	0,05593	0,00000	0,02606	0,14550																		
C_{18}	0,03334	0,10442	0,04808	0,06601	0,06622	0,10757	0,03002	0,00000	0,05595																		
C_{19}	0,10858	0,02232	0,03808	0,15993	0,02858	0,03727	0,07884	0,05101	0,00000																		
C_{21}										0,00000	0,10464	0,02037	0,04149	0,07546	0,02713	0,01413	0,18093										
C_{22}										0,02954	0,00000	0,02594	0,01817	0,17091	0,01805	0,02199	0,08581										
C_{23}										0,13242	0,01934	0,00000	0,07719	0,05482	0,05312	0,05043	0,03576										
C_{24}										0,05749	0,05808	0,07634	0,00000	0,11574	0,12354	0,03191	0,10080										
C_{25}										0,03812	0,03975	0,05541	0,05388	0,00000	0,04033	0,07950	0,02011										
C_{26}										0,07902	0,02867	0,17154	0,11118	0,04105	0,00000	0,19103	0,02578										
C_{27}										0,14000	0,09624	0,11253	0,16791	0,02467	0,07533	0,00000	0,05083										
C_{28}										0,02340	0,15328	0,03787	0,03019	0,01736	0,16250	0,18301	0,00000										
C_{31}																		0,00000	0,02821	0,02354	0,09856	0,02609	0,09856	0,08970	0,01495	0,02066	0,04927
C_{32}																		0,04482	0,00000	0,14374	0,01496	0,10005	0,02008	0,03158	0,06171	0,01056	0,01954
C_{33}																		0,02136	0,08000	0,00000	0,09414	0,15392	0,05881	0,04046	0,03361	0,03859	0,06803
C_{34}																		0,03745	0,12930	0,09042	0,00000	0,00074	0,07563	0,15377	0,09841	0,01988	0,12989
C_{35}																		0,02886	0,02697	0,05844	0,02727	0,00000	0,02140	0,02465	0,03759	0,07408	0,02694
C_{36}																		0,14139	0,05130	0,02164	0,04818	0,05244	0,00000	0,07226	0,04442	0,05415	0,06115
C_{37}																		0,10661	0,09380	0,02795	0,05493	0,02375	0,04343	0,00000	0,06470	0,05611	0,09789
C_{38}																		0,03039	0,01751	0,04202	0,07340	0,03868	0,01403	0,01924	0,00000	0,03104	0,03460
C_{39}																		0,01300	0,01270	0,01305	0,03307	0,01245	0,03375	0,01363	0,02014	0,00000	0,01270
C_{310}																		0,07611	0,06022	0,07920	0,13490	0,01784	0,13434	0,05471	0,02448	0,09494	0,00000

Table 9: Limit Super matrix

	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	C_{21}	C_{22}	C_{23}	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{31}	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}	C_{37}	C_{38}	C_{39}	C_{310}
C_{11}	0,04358	0,04358	0,04358	0,04358	0,04358	0,04358	0,04358	0,04358	0,04358																		
C_{12}	0,04061	0,04061	0,04061	0,04061	0,04061	0,04061	0,04061	0,04061	0,04061																		
C_{13}	0,08161	0,08161	0,08161	0,08161	0,08161	0,08161	0,08161	0,08161	0,08161																		
C_{14}	0,11709	0,11709	0,11709	0,11709	0,11709	0,11709	0,11709	0,11709	0,11709																		
C_{15}	0,08693	0,08693	0,08693	0,08693	0,08693	0,08693	0,08693	0,08693	0,08693																		
C_{16}	0,06583	0,06583	0,06583	0,06583	0,06583	0,06583	0,06583	0,06583	0,06583																		
C_{17}	0,08038	0,08038	0,08038	0,08038	0,08038	0,08038	0,08038	0,08038	0,08038																		
C_{18}	0,05597	0,05597	0,05597	0,05597	0,05597	0,05597	0,05597	0,05597	0,05597																		
C_{19}	0,09465	0,09465	0,09465	0,09465	0,09465	0,09465	0,09465	0,09465	0,09465																		
C_{21}										0,06985	0,06985	0,06985	0,06985	0,06985	0,06985	0,06985	0,06985										
C_{22}										0,05908	0,05908	0,05908	0,05908	0,05908	0,05908	0,05908	0,05908										
C_{23}										0,06831	0,06831	0,06831	0,06831	0,06831	0,06831	0,06831	0,06831										
C_{24}										0,06874	0,06874	0,06874	0,06874	0,06874	0,06874	0,06874	0,06874										
C_{25}										0,05464	0,05464	0,05464	0,05464	0,05464	0,05464	0,05464	0,05464										
C_{26}										0,09482	0,09482	0,09482	0,09482	0,09482	0,09482	0,09482	0,09482										
C_{27}										0,10458	0,10458	0,10458	0,10458	0,10458	0,10458	0,10458	0,10458										
C_{28}										0,14663	0,14663	0,14663	0,14663	0,14663	0,14663	0,14663	0,14663										
C_{31}																		0,04603	0,04603	0,04603	0,04603	0,04603	0,04603	0,04603	0,04603	0,04603	0,04603
C_{32}																		0,05391	0,05391	0,05391	0,05391	0,05391	0,05391	0,05391	0,05391	0,05391	0,05391
C_{33}																		0,09	0,09	0,09	0,09	0,09	0,09	0,09	0,09	0,09	0,09

3																		445	445	445	445	445	445	445	445	445	445
C34																		0,09493	0,09493	0,09493	0,09493	0,09493	0,09493	0,09493	0,09493	0,09493	0,09493
C35																		0,05128	0,05128	0,05128	0,05128	0,05128	0,05128	0,05128	0,05128	0,05128	0,05128
C36																		0,06475	0,06475	0,06475	0,06475	0,06475	0,06475	0,06475	0,06475	0,06475	0,06475
C37																		0,05279	0,05279	0,05279	0,05279	0,05279	0,05279	0,05279	0,05279	0,05279	0,05279
C38																		0,05487	0,05487	0,05487	0,05487	0,05487	0,05487	0,05487	0,05487	0,05487	0,05487
C39																		0,04340	0,04340	0,04340	0,04340	0,04340	0,04340	0,04340	0,04340	0,04340	0,04340
C310																		0,11026	0,11026	0,11026	0,11026	0,11026	0,11026	0,11026	0,11026	0,11026	0,11026

References

Akyıldız, M,, & Tuna, O, (2007), "Lojistik Değer ve Ek Değer: Bir Odak Grup Çalışması", Ege Üniversitesi, İİ BF, ***Akademik Bakış Dergisi***, 7(2), 653-667,

Amin, S, H,, & Razmi, J, (2009), "An integrated fuzzy model for supplier management: A case study of ISP selection and evaluation", ***Expert systems with applications***, 36(4), 8639-8648,

Ayağ, Z,, & Özdemir, R, G, (2009), "A hybrid approach to concept selection through fuzzy analytic network process", ***Computers & Industrial Engineering***, 56(1), 368-379,

Büyüközkan, G,, & Çifçi, G, (2011), "A novel fuzzy multi-criteria decision framework for sustainable supplier selection with incomplete information", ***Computers in Industry***, 62(2), 164-174,

Cater, J, J, (2005), "The rise of the furniture manufacturing industry in Western North Carolina and Virginia", ***Management Decision***, 43(6), 906-924,

Chan, F, T,, & Kumar, N, (2007), "Global supplier development considering risk factors using fuzzy extended AHP-based approach", ***Omega,*** 35(4), 417-431,

Chen, C, T,, Lin, C, T,, & Huang, S, F, (2006), "A fuzzy approach for supplier evaluation and selection in supply chain management", ***International Journal of production economics***, 102(2), 289-301,

Choudhary, D,, & Shankar, R, (2014), "A goal programming model for joint decision making of inventory lot-size, supplier selection and carrier selection", ***Computers & Industrial Engineering***, 71, 1-9,

Dağdeviren, M,, & Eraslan, E, (2008), "Promethee Siralama Yöntemi ile Tedarikçi Seçimi", ***Gazi Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi***, 23(1),

De Boer, L,, Labro, E,, & Morlacchi, P, (2001), "A review of methods supporting supplier selection", ***European Journal of Purchasing & Supply Management***, 7(2), 75-89,

Deng, X,, Hu, Y,, Deng, Y,, & Mahadevan, S, (2014), "Supplier selection using AHP methodology extended by D numbers", ***Expert Systems with Applications***, 41(1), 156-167,

Hartley, J, L,, & Choi, T, Y, (1996), "Supplier development: customers as a catalyst of process change", ***Business Horizons***, 39(4), 37-44,

Ho, L, H,, Feng, S, Y,, Lee, Y, C,, & Yen, T, M, (2012), "Using modified IPA to evaluate supplier's performance: Multiple regression analysis and DEMATEL approach", ***Expert Systems with Applications***, 39(8), 7102-7109,

Gencer, C,, & Gürpinar, D, (2007), "Analytic network process in supplier selection: A case study in an electronic firm", ***Applied Mathematical Modelling***, 31(11), 2475-2486,

Ghodsypour, S, H,, & O'Brien, C, (1998), "A decision support system for supplier selection using an integrated analytic hierarchy process and linear programming", ***International journal of production economics***, 56, 199-212,

Guneri, A, F,, Yucel, A,, & Ayyildiz, G, (2009), "An integrated fuzzy-lp approach for a supplier selection problem in supply chain management", ***Expert Systems with Applications***, 36(5), 9223-9228,

Hashim, A, M,, & Dawal, S, Z, M, (2012), "Kano model and QFD integration approach for ergonomic design improvement", ***Procedia-Social and Behavioral*** *Sciences*, *57*, 22-32,

Junior, F, R, L,, Osiro, L,, & Carpinetti, L, C, R, (2014), "A comparison between Fuzzy AHP and Fuzzy TOPSIS methods to supplier selection", ***Applied Soft Computing***, 21, 194-209,

Kannan, V, R,, & Tan, K, C, (2002), "Supplier selection and assessment: Their impact on business performance", ***Journal of Supply Chain Management***, 38(3), 11-21,

Kannan, D,, Khodaverdi, R,, Olfat, L,, Jafarian, A,, & Diabat, A, (2013), "Integrated fuzzy multi criteria decision making method and multi-objective programming approach for supplier selection and order allocation in a green supply chain", ***Journal of Cleaner Production***, 47, 355-367,

Kano, N,, Seraku, N,, Takahashi, F,, & Tsuji, S, (1984), "*Attractive quality and must-be quality"*. Hinshitsu**: *The Journal of Japenese Society For Quality Control*** (April), 39-48

Ku, C, Y,, Chang, C, T,, & Ho, H, P, (2010), "Global supplier selection using fuzzy analytic hierarchy process and fuzzy goal programming", ***Quality & Quantity***, 44(4), 623-640,

Lee, J,, Cho, H,, & Kim, Y, S, (2015), "Assessing business impacts of agility criterion and order allocation strategy in multi-criteria supplier selection", ***Expert Systems with Applications***, 42(3), 1136-1148,

Liao, C, N,, & Kao, H, P, (2011), "An integrated fuzzy TOPSIS and MCGP approach to supplier selection in supply chain management", ***Expert Systems with Applications***, 38(9), 10803-10811,

Mani, V,, Agarwal, R,, & Sharma, V, (2014), "Supplier selection using social sustainability: AHP based approach in India", ***International Strategic Management Review***, 2(2), 98-112,

Matzler, K,, Hinterhuber, H, H,, Bailom, F,, & Sauerwein, E, (1996), "How to delight your customers", ***Journal of Product & Brand Management***, 5(2), 6-18,

Matzler, K,, & Hinterhuber, H, H, (1998), "How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment", ***Technovation***, 18(1), 25-38,

Naumann, E, (1995), *Creating customer value: the path to sustainable competitive advantage* (p, 140), Cincinnati, OH: Thomson Executive Press,

Ng, W, L, (2008), "An efficient and simple model for multiple criteria supplier selection problem", ***European Journal of Operational Research***, 186(3), 1059-1067,

Önüt, S,, Kara, S, S,, & Işik, E, (2009), "Long term supplier selection using a combined fuzzy MCDM approach: A case study for a telecommunication company", ***Expert Systems with Applications***, 36(2), 3887-3895,

Porter, M, E, (2008), *Competitive advantage: Creating and sustaining superior performance*, Simon and Schuster,

Rezaei, J,, Fahim, P, B,, & Tavasszy, L, (2014), "Supplier selection in the airline retail industry using a funnel methodology: Conjunctive screening method and fuzzy AHP", ***Expert Systems with Applications***, 41(18), 8165-8179,

Salem Khalifa, A, (2004), "Customer value: a review of recent literature and an integrative configuration", ***Management decision***, 42(5), 645-666,

Sanayei, A,, Mousavi, S, F,, Abdi, M, R,, & Mohaghar, A, (2008), "An integrated group decision-making process for supplier selection and order allocation using multi-attribute utility theory and linear programming", ***Journal of the Franklin Institute***, 345(7), 731-747,

Shen, C, Y,, & Yu, K, T, (2009), "Enhancing the efficacy of supplier selection decision-making on the initial stage of new product development: A hybrid fuzzy approach considering the strategic and operational factors simultaneously", ***Expert Systems with Applications***, 36(8), 11271-11281,

Svensson, G, (2003), "Consumer driven and bi-directional value chain diffusion models", ***European Business Review***, 15(6), 390-400,

Quayle, M, (2000), "Supplier development for UK small and medium-sized enterprises", ***Journal of Applied Management Studies***, 9(1), 117-133,

Tam, M, C,, & Tummala, V, R, (2001), "An application of the AHP in vendor selection of a telecommunications system", ***Omega,*** 29(2), 171-182,

Wang, W, P, (2010), "A fuzzy linguistic computing approach to supplier evaluation", *Applied* ***Mathematical Modelling***, 34(10), 3130-3141,

Woodall, T, (2003), "Conceptualising 'value for the customer': an attributional, structural and dispositional analysis", ***Academy of Marketing Science Review***, 12(1), 1-42,

Woodruff, R, B, (1997), "Customer value: the next source for competitive advantage", ***Journal of the Academy of Marketing Science***, 25(2), 139-153,

You, X, Y,, You, J, X,, Liu, H, C,, & Zhen, L, (2015), "Group multi-criteria supplier selection using an extended VIKOR method with interval 2-tuple linguistic information", ***Expert Systems with Applications,*** 42(4), 1906-1916,