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Coopetition as a Business Strategy: Determining the Effective Partner Selection Criteria Using Fuzzy AHP

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Abstract

Coopetition refers to simultaneous competition and cooperation between rivals. For coopetition, firms collaborate with each other by not only coordinating their activities to achieve common targets but also due to conflict interests. Coopetition consists of three key dimensions namely, mutual benefit, trust, and commitment. These dimensions are vital for choosing the competitor to corporate with. Choosing the right and reliable partner is a critical process because of including some risks and uncertainties. The fuzzy AHP is one of the appropriate methods used in the partner selection process and also is used to overcome uncertainty. In this context, the purpose of the present study is to explain coopetition in a theoretical way and to analyze which criteria affect selection of partner among rivals. Data were obtained from the top managers of 4 businesses operating in Turkey. Face-to-face interview method was used so that top managers responded the questions. The data were analyzed using the fuzzy AHP method and the priority weights of the main and sub-criteria were obtained. According to the results; the most important main criterion was found as trust. Responsibility was found as the most important sub-criterion of commitment, trustworthy of the competitor was the most important sub-criterion of trust, and common (similar) benefits (goals) was the most important sub-criterion of mutual benefit. Finally, limitations of the current study and the areas for future research are discussed.

Key Words: *Coopetition, Fuzzy AHP, Selection of Partner.*

Introduction

Under the intense rivalry and environmental uncertainty, many companies do not have all the resources and capabilities that are needed for sustainable competitive advantages and sustainability. More importantly, they are not also willing to take all the risks alone to struggle against powerful competitors (Akdoğan & Cingöz, 2012). As a result of these new conditions, collaboration with competitors becomes very important,

thereby increasing the interest in business networks and coopetition over the last years (Bengtsson & Kock, 1999; Zineldin, 2004; Morris et al., 2007; Padula & Dagnino, 2007; Akdoğan & Cingöz, 2012).

Different from other kinds of collaboration, coopetition integrates and synthesizes competition and cooperation. Therefore, coopetition emphasizes the simultaneous competition and cooperation between firms (Levy, 2003). Coopetition is a situation that competing firms cooperate with one other by coordinating their activities to achieve common targets, but at the same time they compete with each other as well as other firms (Zineldin, 2004). In this context, firms can work together to attain their common goals. Furthermore, they compete with each other depending on conflicting benefits.

Firms can gain some advantages strategically by balancing competition and cooperation. Coopetition may enable firms to learn their partners' valuable know-how and skills along with protecting their own core-competence. Besides, it helps to gain global competitive advantage through building a resource pool and to improve the performance of firms through cooperative moves. The firms that cooperate and compete with each other acquire better financial results because cooperative arrangement with competitors reduce risk, costs and uncertainties associated with innovation or new product and, enable to access raw material. All these advantages are essential for firms to obtain sustainable competitive advantages and contribute the firm's sustainability (Ganguli, 2007; Luo, 2007; Walley, 2007; Rusko, 2011).

Coopetition includes three key dimensions: Mutual benefit, trust, and commitment. It is a joint effort that occurs between competitors for mutual gains (Akdoğan & Cingöz, 2012). A firm participating in cooperative relationship with its competitors wants to obtain some benefits. Trust has critical importance in successful long-term relationship. Commitment is a desire to maintain a valued relationship through ongoing investment (Morris et al., 2007). These dimensions can also be used for partner selection.

Partner selection is a difficult issue for firms in coopetitive relationship because it has many main and sub-criteria to deal with. When multiple criteria exist in a decision making process, multi-criteria decision making (MCDM) methods, like AHP, can be used effectively. In real life, decision making problems, like the partner selection problem that is subject of this study, include uncertainty and risk. The evaluations of decision makers reflect their subjective judgments. Therefore instead of exact numerical values, using intervals would be more appropriate to reflect the views of the decision makers when quantifying these judgments. Fuzzy logic can be used in order to cope with the uncertainty or vagueness. Fuzzy AHP, which is an integrated method of AHP and fuzzy logic, will be used in this study. It is thought that multiple criteria can be handled using AHP and uncertainty using fuzzy logic.

In this context, the purpose of this study is to explain coopetition in a theoretical way and to analyze which criterion(s) effect(s) the selection of partner among rivals. Fuzzy AHP is used as a decreasing method of uncertainty while determining the most important criterion or criteria for the firms. To our knowledge, such a study does not exist in the literature which deals with coopetition and uses fuzzy AHP in partner selection. Therefore, this study will become very useful to fill in this gap in the literature.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 explains the method of fuzzy AHP. Section 4 presents the data, findings, and results derived from the application. Finally, Section 5 concludes.

Literature Review

As coopetition integrates two different paradigms, namely competitive and cooperative, it is likely to be considered as a complex process. The competitive paradigm has focused on inter-firm rivalry in strategic management. In the complex 21st-century competitive landscape, every firm competing in an industry has a competitive strategy that enables value-creating competitive advantages for firm's survival (Porter, 1980;

Hitt & Hoskinsson, 2007; Yami et all., 2010). Traditionally, relationships among competitors are based on competition (Bengtsson & Kock, 1999).

Cooperative paradigm as an alternative that largely spread in strategic management literature emphasizes the need for cooperative interdependences across firms (Padula & Dagnino, 2007). According to this approach, the firm establishes and strengthens its competitive advantage through strategic alliances, business networks, co-branding, and clusters (Bengtsson & Kock, 1999; Amaldoss et all., 2000; Ganguli, 2007; Yami et all., 2010; Czakon, 2010). Cooperative relationships among firms may increase when they perceive increasingly competitive threats from other firms. To illustrate, in China, Siemens has increased cooperation with its rivals, Motorola, when it faced the threat of competition from followers such as Hitachi, 3Com, Acer, and Samsung (Luo, 2007). These cooperative relationships can differ in several ways. Firms might attempt to acquire greater efficiencies of scale by pooling resources within common functional areas and develop new products in parallel. For example, GM and Suziki have combined technological resources to manufacture cars. Also, Siemens and Corning have formed a cross-functional alliance to produce and trade fiberoptic cables (Amaldoss et all., 2000).

Each of these two paradigms offers only a partial view of reality. Competitive paradigm reflects a firm's orientation to achieve above-normal profits and obtain a competitive advantage over other firms. On the other hand, cooperative paradigm suggests that business world is made up by a network of relationships developed and fostered through strategic collaboration (Padula & Dagnino, 2007). Today's business environment requires firms to pursue both competition and cooperation simultaneously (Chai & Yang, 2011). As a consequence, coopetition has risen as an alternative concept that integrates and synthesizes competition and cooperation.

Coopetition has emerged as a relatively new concept. The term was first introduced in the 1980s by Raymond Noorda who is founder and CEO of Novell (Luo, 2007; Walley, 2007; Rusko, 2011). By 1996, the concept has become widespread through a study presented by Brandenburger and Nalebuff (Padula & Dagnino, 2007; Rusko, 2011). The most known definition of coopetition is presented by Bengtsson and Kock (2000), in which coopetition is defined as simultaneous appearance of competitive and cooperative relationship between competitors. In this relationship, partners believe that their own success does not depend on the failure of other firms (Tomski, 2011; Zineldin, 2004). Examples of coopetition are more common in the computer industry. Dell computer has a coopetitive relationship with IBM, IBM with Microsoft, and SAP with Oracle (Walley, 2007). Also Dell and Compaq simultaneously compete in hardware development and manufacture and, cooperate with software producers such as Netscape and Microsoft (Zineldin, 2004).

In a coopetitive relationship, two firms may cooperate to develop a new product and create value while competing to get a share of market or distribute the products (Chai and Yang, 2007). At this point, coopetition implies that firms can interact rivalry owing to conflicting interest, and at the same time cooperate owing to common interests (Zineldin, 2004).

According to Bengtsson and Kock (2000) there are three different types of coopetitive relationship between competitors: Cooperation-dominated relationships, equal relationships and competition-dominated relationships (Rusko, 2011). They suggested that if cooperation is more than competition, the relationship is "cooperative dominant"; if there is more competition than cooperation, the relationship is "competitive dominant". Where cooperation and competition is about the same, the relationship is an "equal relationship" (Walley, 2007). All types of coopetition provide some benefits to the firms due to the usage of competition and cooperation simultaneously.

One of the main motives for firms to practice cooperation with competitors is to get greater value or benefits (Rusko, 2011). Coopetition helps to obtain global competitive advantage through building a resource pool. A firm that has this resource pool is better positioned to struggle with a strong third party

(Ganguli, 2007; Luo, 2007; Walley, 2007; Rusko, 2011). Coopetition provides scale economy that a firm can't obtain by oneself. Furthermore, firms that balanced coopetition and corporation simultaneously obtain the entrance to geographically new markets by overcoming barriers more easily (Tomski, 2011). Not only has the coopetitive relationship some advantages for firms, but also for customers. This strategy can increase customer satisfaction and loyalty by developing and offering more quality products and services. In this condition, coopetition has produced a "win-win-win" situation (Walley, 2007). For example, Sears, Carrefour, Ahold, Metro, and Sainsbury established an e-procurement alliance among them to respond the increasing demands from global customers quickly by sharing complementary resources and purchasing systems (Luo, 2007).

Coopetition can sometimes fail owing to some reasons. To illustrate, one party does not get enough of a return, leakage of confidential information, different objectives and intensions, and general distrust (Walley, 2007; Chai & Yang, 2011). To overcome these issues, various conditions should be provided (Tomski, 2011):

- Partners possess complementary advantages and abilities.
- Partners have their own obligation and a specific level of trust. Furthermore, cultural adjustment between partners is essential.
- Partners define the principles and areas of responsibility.
- They are willing to solve problems, which may threat the relations.

Coopetition is a relationship in which two or more parties can add value by completing each other's activity or resources (Bonel & Rocco, 2007). Having supplementary resources is one of the important reasons that attract firms to compete and cooperate simultaneously.

Building a strong and long-term relationship between firms requires interaction, communication, mutual trust, mutual benefits, mutual respect, interdependence, commitment, common values, sharing and exchanging of resources (Zineldin, 1998). In this context, these dimensions are of great importance to select partner in coopetitive relationship.

According to Morris et al. (2007) there are three key dimensions of coopetition: Mutual benefit, trust, and commitment. Coopetition is a joint effort between competitors for mutual gains (Akdoğan & Cingöz, 2012). A firm participating cooperative relationship with its competitors want to obtain some benefits. Therefore, firms should be open to sharing resources and information (Morris et al., 2007). Benefits can derive both competition and cooperation. The difference is that the competitive side of relationship does not require a mutuality of benefit, while the cooperative side cannot occur without mutual benefit (Akdoğan & Cingöz, 2012). Trust has critical importance in successful long-term relationship. Commitment is a desire to maintain a valued relationship through ongoing investment. This desire includes a willingness to make financial and non-financial investments (Morris et al., 2007). There is an interaction among these dimensions.

Coopetitive relationship is based on trust and mutual interest (Bengtsson et al., 2003). The basic philosophy underlying coopetition is that management activities aim for the establishment of mutually beneficial relationship with competitors (Zineldin, 2004). If the trust is developed between partners, the mutual benefits and interests may be achieved. Also, trust is a primary determinant of commitment level. When partners trust each other and have high level of commitment each other, it is easier for them to accept the necessary of the relationship (Morris et al., 2007).

In coopetition, parties adapt their processes and products to achieve a better match by sharing information and experiences. This feature as a way to demonstrate commitment leads to a higher level of trust and creates a better atmosphere (Zineldin, 2004). Mutual benefits also influence the relationship of degree of

the commitment. Partners will be involved in relationships when they have advantages such as lower costs, improved performance, higher customer satisfaction (Morris et al., 2007).

Although coopetition creates some benefits for the firms, it may be difficult to decide and implement a coopetition strategy since coopetition includes relationships, interactions, motives, and needs. The partners initiate to participate in coopetitive relationship to meet their needs. The some preconditions may be listed, which stimulate firms to develop mutually beneficial business relationships and exchanges (Zineldin, 2004).

- Two or more organizations are willing to participate in an interactive exchange relationship.
- Each party has something of value that the other party wants.
- Each party is disposed to give up its something of value to receive in return of the something value belonging to other party.
- The parties are capable of communicating or interacting with each other.
- The parties consider that ethical values and norms, interdependence, and commitment are very important for the creation, development, and enhancement of a positive and sustainable long-term relationship.

Being in a cluster or social network may help to control risk in coopetitive relationships (Chai & Yang, 2011). Resources are significant for parties in coopetitive relationship. If two competitors have heterogeneous or complementary resources, they may cooperate with each other (Bengtsson et al., 2003). Briefly, these all criteria aforementioned above may be important for selecting partner in coopetitive relationships.

Fuzzy AHP

The Analytic Hierarchy Process (AHP) is a multi-criteria decision making method developed by Thomas L. Saaty (Saaty, 1980). It is a theory of relative measurement on absolute scales of both tangible and intangible criteria based on paired comparison judgment of knowledgeable experts (Özdemir & Saaty, 2006). AHP uses a scale ranges from 1/9 for "least valued than", to 1 for "equal", and to 9 for "absolutely more important than" covering the entire spectrum of the comparison (Vaidya & Kumar, 2006).

It can be applied to various areas, simplifying complicated problems into a hierarchical system, quantifying the indicators for evaluation and singling out the best scheme for decision makers at the cost of minimum mistakes (Kuo et al., 2010). However, the traditional AHP method has some shortcomings. For example it does not take into account the uncertainty associated with the process involved (Vinodh et al., 2014) and it is not capable to assign linguistic variables to judgments (Chen et al., 2011). In order to overcome these problems the fuzzy AHP method is developed. It is originated from traditional AHP and able to cope with the uncertainty and vagueness.

The triangular fuzzy membership function and its operational rules are introduced in the AHP to fuzzify and calculate the pairwise comparison results, and thus the traditional AHP becomes the fuzzy AHP (Ho et al., 2012). The membership function $\mu_A(x)$ of a fuzzy set operates over the range of real numbers [0, 1]. Subjective pairwise comparisons of experts' judgments are represented using triangular fuzzy numbers (TFNs). A TFN is designated as (l, m, u) where l is the minimum, u is the maximum and m is the most likely value of $\mu_A(x)$ (Somsuk & Laosirihongthong, 2014).

For the two triangular fuzzy numbers $M_1 = (l_1, m_1, u_1)$ and $M_2 = (l_2, m_2, u_2)$, main mathematical operations can be expressed as follows (Ho et al., 2012, 10842; Rezaie et al., 2014, 5037):

1. $M_1 \oplus M_2 = (l_1 + l_2,\ m_1 + m_2,\ u_1 + u_2)$

2. $M_1 - M_2 = (l_1 - l_2,\ m_1 - m_2,\ u_1 - u_2)$
3. $M_1 \otimes M_2 = (l_1 l_2,\ m_1 m_2,\ u_1 u_2)$ (1)
4. $M_1 \div M_2 = (l_1 / l_2,\ m_1 / m_2,\ u_1 / u_2)$
5. $\lambda M_1 = (\lambda l_1,\ \lambda m_1,\ \lambda u_1), \quad \lambda > 0, \lambda \in R$
6. $(M_1)^{-1} = (l_1,\ m_1,\ u_1)^{-1} = (1/u_1,\ 1/m_1,\ 1/l_1)$.

Different fuzzy AHP methods exist in the literature. In this study, one of the such methods, Chang's extent analysis is used due to its computational simplicity (Büyüközkan et al., 2008) and also it has been determinative that its steps are similar to the traditional AHP method (Kahraman et al, 2006).

Let $X = \{x_1, x_2, ..., x_n\}$ be an object set, and $U = \{u_1, u_2, ..., u_m\}$ be a goal set. According to the method of extent analysis (Chang, 1996), each object is taken and extent analysis is performed for each goal. Therefore, m extent analysis values for each object can be obtained with the following signs:

$$M_{g_i}^1, M_{g_i}^2, ..., M_{g_i}^m, \ i = 1,2,...,n$$

Where all the $M_{g_i}^j \ (j = 1,2,...,m)$ are TFNs.

The steps of the Chang's extent analysis method are described as follows (Chang, 1996):

Step 1. Let $M_{g_i}^1, M_{g_i}^2, ..., M_{g_i}^m$ be values of extent analysis of i-th object for m goals. Then the value of fuzzy synthetic extent with respect to the i-th object is defined as

$$S_i = \sum_{j=1}^{m} M_{g_i}^j \otimes [\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^j]^{-1} \quad (2)$$

Step 2. The degree of possibility of $M_1 \geq M_2$ is defined as

$$V(M_1 \geq M_2) = \sup_{x \geq y} [\min(\mu_{M_1}(x),\ \mu_{M_2}(y))]. \quad (3)$$

When a pair of $(x,\ y)$ exists such that $x \geq y$ and $\mu_{M_1}(x) = \mu_{M_2}(y) = 1$, then we have $V(M_1 \geq M_2) = 1$. Since M_1 and M_2 are convex fuzzy numbers we have that

$$V(M_1 \geq M_2) = 1 \Leftrightarrow m_1 \geq m_2,$$
$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_1}(d), \quad (4)$$

where d is the ordinate of the highest intersection point D between μ_{M_1} and μ_{M_2} (Figure 1).

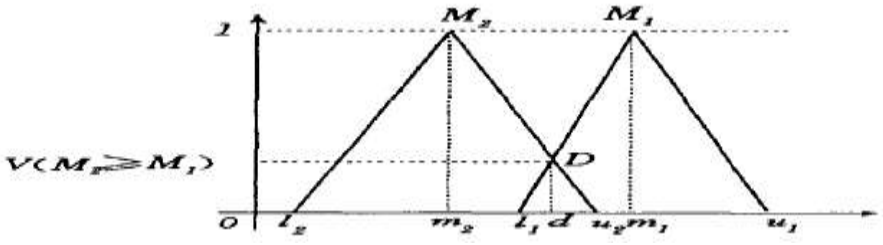

Figure 1. Intersection of M_1 and M_2

When $M_1 = (l_1,\ m_1,\ u_1)$ and $M_2 = (l_2,\ m_2,\ u_2)$, the ordinate of D is given by

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}. \quad (5)$$

To compare M_1 and M_2, we need both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$.

Step 3. The degree of possibility for a convex fuzzy number to be greater than *k* convex fuzzy numbers M_i *(i = 1, 2, ..., k)* can be defined by

$$\begin{aligned} &V(M \geq M_1,\ M_2,\ \ldots,\ M_k) \\ &= V\left[(M \geq M_1)\ and\ (M \geq M_2)\ and \ldots and\ (M \geq M_k)\right] \\ &= \min V(M \geq M_i),\ i = 1,\ 2,\ \ldots,\ k. \end{aligned} \quad (6)$$

Assume that

$$d'(A_i) = \min\ V(S_i \geq S_k), \quad (7)$$

for $k = 1, 2, \ldots, n$ and $k \neq i$. Then the weight vector is given by

$$W' = (d'(A_1),\ d'(A_2), \ldots,\ d'(A_n))^T,$$

Where A_i ($i = 1, 2, \ldots, n$) are n elements.

Step 4. Via normalization, the normalized weight vectors are found as

$$W = (d(A_1),\ d(A_2), \ldots,\ d(A_n))^T,$$

Where *W*, is a nonfuzzy number.

The triangular fuzzy conversion scale given in Table 1 (Büyüközkan et al., 2008) is used in this study.

Table 1. Triangular fuzzy conversion scale

Linguistic scale	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Equally important	(1/2, 1, 3/2)	(2/3, 1, 2)
Weakly more important	(1, 3/2, 2)	(1/2, 2/3, 1)
Strongly more important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly more important	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Absolutely more important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

Data and Methodology

The aim of this study is to determine the main and sub-criterions in partner selection of the firms which are in coopetition relationship using fuzzy AHP.

Sample and Data Collection

Four firms were determined and their partner selection processes were analyzed. Data were obtained from the top managers of these firms. The reason behind choosing these four firms is that these firms have coopetitive relationships and they are large sized exporters. These four firms are from Turkey and they operate in different industries such as automotive supply, electricity, furniture, and textile industry. All of the firms included in the sample have more than 250 employees.

A questionnaire form was used to determine which main criteria and sub-criterions effect the selection of coopetitive partner. We examined coopetition with dimensions of trust, commitment, and mutual benefit. These criterions were determined by using a scale that was developed by Morris et al. (2007). Dimensions of coopetition are taken into consideration in deciding on the choice of competitor to cooperate. Face-to-face interview method was used when the top managers answered the questions.

Analyses and Results

The decision making group consists of four experts who are the top managers of these firms. Each of these managers is asked to make pairwise comparisons for main and sub-criteria. As mentioned in the previous sections, there are three main criteria used in partner selection: Commitment (C), trust (T) and mutual benefit (MB). The sub-criteria of these main criteria are also taken into account.
The sub-criteria of commitment are determined as follows:

- Loyalty (C1),
- Willingness of the competitor (C2),
- Considering cooperation significant (C3),
- Willingness of the competitor to change (C4),
- Considering the benefit of the competitor (C5),
- Responsibility (C6).

The sub-criteria of trust are as follows:

- Trustworthy of the competitor (T1),
- Not to act at the expense of the partner (T2),
- Not to try to gain one-sided advantage (T3),
- Willingness to information sharing (T4),
- Not to misuse knowledge (T5).

The sub-criteria of mutual benefit are listed below:

- Strengthening the competitive position (MB1),
- Resource sharing (MB2),
- Having supplementary resources (MB3),
- Structural similarity (MB4),
- Common / similar benefits / goals (MB5).

Table 2 shows the fuzzy evaluation matrix of the main criteria with respect to the goal. The fuzzy values in Table 2 are the evaluation of the four decision makers who are the top managers of the firms. The first row in each cell of Table 2 includes the evaluation of the first firm's manager, the second row includes the evaluation of the second firm's manager, the third row includes the evaluation of the third firm's manager and finally the last row includes the evaluation of the fourth firm's manager.

Table 2. The fuzzy evaluation matrix of the main criteria with respect to the goal

	C	T	MB
C	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (2/5, 1/2, 2/3) (1/2, 2/3, 1) (2/5, 1/2, 2/3)	(2/7, 1/3, 2/5) (1/2, 2/3, 1) (1/2, 1, 3/2) (3/2, 2, 5/2)
T	(1/2, 2/3, 1) (3/2, 2, 5/2) (1, 3/2, 2) (3/2, 2, 5/2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(2/7, 1/3, 2/5) (1/2, 2/3, 1) (3/2, 2, 5/2) (5/2, 3, 7/2)
MB	(5/2, 3, 7/2) (1, 3/2, 2) (2/3, 1, 2) (2/5, 1/2, 2/3)	(5/2, 3, 7/2) (1, 3/2, 2) (2/5, 1/2, 2/3) (2/7, 1/3, 2/5)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)

Combined values are obtained from Table 2 by taking the averages of the cells that are above the diagonal. The reciprocals of these combined values give the values that are below the diagonal. Table 3 shows these combinations.

Table 3. The combined fuzzy evaluation matrix of the main criteria with respect to the goal

	C	T	MB
C	(1, 1, 1)	(0.58, 0.79, 1.08)	(0.70, 1, 1.35)
T	(0.93, 1.27, 1.72)	(1, 1, 1)	(1.20, 1.5, 1.85)
MB	(0.74, 1, 1.43)	(0.54, 0.67, 0.83)	(1, 1, 1)

The steps of the Chang's extent analysis are performed on the fuzzy values of Table 3 as follows:
By applying formula (2),

$$S_C = (2.28,\ 2.79,\ 3.43) \otimes \left(\frac{1}{11.26},\ \frac{1}{9.23},\ \frac{1}{7.69}\right) = (0.20,\ 0.30,\ 0.45)$$

$$S_T = (3.13,\ 3.77,\ 4.57) \otimes \left(\frac{1}{11.26},\ \frac{1}{9.23},\ \frac{1}{7.69}\right) = (0.28,\ 0.41,\ 0.59)$$

$$S_{MB} = (2.28,\ 2.67,\ 3.26) \otimes \left(\frac{1}{11.26},\ \frac{1}{9.23},\ \frac{1}{7.69}\right) = (0.20,\ 0.29,\ 0.42)$$

Using formulas (4) and (5),

$$V(S_C \geq S_T) = \frac{0.28 - 0.45}{(0.30 - 0.45) - (0.41 - 0.28)} = 0.61, \quad V(S_C \geq S_{MB}) = 1, \quad V(S_T \geq S_C) = 1, \quad V(S_T \geq S_{MB}) = 1,$$

$$V(S_{MB} \geq S_C) = \frac{0.20 - 0.42}{(0.29 - 0.42) - (0.30 - 0.20)} = 0.87,$$

$$V(S_{MB} \geq S_T) = \frac{0.28 - 0.42}{(0.29 - 0.42) - (0.41 - 0.28)} = 0.54.$$

Finally, by using formula (7), we obtain

$$d'(C) = V(S_C \geq S_T,\ S_{MB}) = \min(0.61,\ 1) = 0.61,$$
$$d'(T) = V(S_T \geq S_C,\ S_{MB}) = \min(1,\ 1) = 1,$$
$$d'(MB) = V(S_{MB} \geq S_C,\ S_T) = \min(0.87,\ 0.54) = 0.54.$$

Therefore, $W' = (0.61,\ 1,\ 0.54)^T$ and via normalization the weight vectors with respect to the main criteria is obtained as $W = (0.28,\ 0.47,\ 0.25)^T$.

It can be interpreted from these weights that the most important main criterion is "trust"; followed by "commitment" and "mutual benefit".
The weights of the sub-criteria of commitment, trust and mutual benefit are obtained in a similar way. Table 4 shows the fuzzy evaluation matrix of the sub-criteria of commitment with respect to commitment.

Table 4. The fuzzy evaluation matrix of the sub-criteria with respect to commitment

	C1	C2	C3	C4	C5	C6
C1	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1/2, 2/3, 1) (1/3, 2/5, 1/2) (1, 3/2, 2) (5/2, 3, 7/2)	(2/5, 1/2, 2/3) (1/2, 2/3, 1) (3/2, 2, 5/2) (2, 5/2, 3)	(1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (5/2, 3, 7/2) (3/2, 2, 5/2)	(1/2, 2/3, 1) (2/5, 1/2, 2/3) (2, 5/2, 3) (1, 3/2, 2)	(2/7, 1/3, 2/5) (1/3, 2/5, 1/2) (1, 3/2, 2) (1, 3/2, 2)
C2	(1, 3/2, 2) (2, 5/2, 3) (1/2, 2/3, 1) (2/7, 1/3, 2/5)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1/2, 2/3, 1) (3/2, 2, 5/2) (1/2, 1, 3/2) (1/2, 2/3, 1)	(2/5, 1/2, 2/3) (1, 3/2, 2) (3/2, 2, 5/2) (1/2, 2/3, 1)	(1, 3/2, 2) (1, 3/2, 2) (1, 3/2, 2) (2/5, 1/2, 2/3)	(1/3, 2/5, 1/2) (1, 3/2, 2) (1/2, 2/3, 1) (1/3, 2/5, 1/2)
C3	(3/2, 2, 5/2) (1, 3/2, 2) (2/5, 1/2, 2/3) (1/3, 2/5, 1/2)	(1, 3/2, 2) (2/5, 1/2, 2/3) (2/3, 1, 2) (1, 3/2, 2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1/2, 1, 3/2) (1/3, 2/5, 1/2) (1, 3/2, 2) (1, 3/2, 2)	(1, 3/2, 2) (3/2, 2, 5/2) (1/2, 1, 3/2) (1/2, 2/3, 1)	(1/3, 2/5, 1/2) (1/3, 2/5, 1/2) (1/2, 2/3, 1) (1/3, 2/5, 1/2)
C4	(2, 5/2, 3) (3/2, 2, 5/2) (2/7, 1/3, 2/5) (2/5, 1/2, 2/3)	(3/2, 2, 5/2) (1/2, 2/3, 1) (2/5, 1/2, 2/3) (1, 3/2, 2)	(2/3, 1, 2) (2, 5/2, 3) (1/2, 2/3, 1) (1/2, 2/3, 1)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(3/2, 2, 5/2) (3/2, 2, 5/2) (1, 3/2, 2) (1/2, 2/3, 1)	(1/3, 2/5, 1/2) (1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (1/3, 2/5, 1/2)
C5	(1, 3/2, 2) (3/2, 2, 5/2) (1/3, 2/5, 1/2) (1/2, 2/3, 1)	(1/2, 2/3, 1) (1/2, 2/3, 1) (1/2, 2/3, 1) (3/2, 2, 5/2)	(1/2, 2/3, 1) (2/5, 1/2, 2/3) (2/3, 1, 2) (1, 3/2, 2)	(2/5, 1/2, 2/3) (2/5, 1/2, 2/3) (1/2, 2/3, 1) (1, 3/2, 2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(2/7, 1/3, 2/5) (1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (1/3, 2/5, 1/2)
C6	(5/2, 3, 7/2) (2, 5/2, 3) (1/2, 2/3, 1) (1/2, 2/3, 1)	(2, 5/2, 3) (1/2, 2/3, 1) (1, 3/2, 2) (2, 5/2, 3)	(2, 5/2, 3) (2, 5/2, 3) (1, 3/2, 2) (2, 5/2, 3)	(2, 5/2, 3) (2, 5/2, 3) (3/2, 2, 5/2) (2, 5/2, 3)	(5/2, 3, 7/2) (2, 5/2, 3) (3/2, 2, 5/2) (2, 5/2, 3)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)

Table 5 shows the combined fuzzy evaluation matrix of the sub-criteria of commitment.

Table 5. The combined fuzzy evaluation matrix of the sub-criteria with respect to commitment

	C1	C3	C3	C4	C5	C6
C1	(1, 1, 1)	(1.08, 1.39, 1.75)	(1.10, 1.42, 1.79)	(1.18, 1.48, 1.79)	(0.98, 1.29, 1.67)	(0.65, 0.93, 1.23)
C2	(0.57, 0.72, 0.93)	(1, 1, 1)	(0.75, 1.08, 1.50)	(0.85, 1.17, 1.54)	(0.85, 1.25, 1.67)	(0.54, 0.74, 1)
C3	(0.56, 0.70, 0.91)	(0.67, 0.93, 1.33)	(1, 1, 1)	(0.71, 1.10, 1.50)	(0.88, 1.29, 1.75)	(0.38, 0.47, 0.63)
C4	(0.56, 0.68, 0.85)	(0.65, 0.85, 1.18)	(0.67, 0.91, 1.41)	(1, 1, 1)	(1.13, 1.54, 2)	(0.35, 0.43, 0.54)
C5	(0.60, 0.78, 1.02)	(0.60, 0.80, 1.18)	(0.57, 0.78, 1.14)	(0.50, 0.65, 0.88)	(1, 1, 1)	(0.34, 0.41, 0.52)
C6	(0.81, 1.08, 1.54)	(1, 1.35, 1.85)	(1.59, 2.13, 2.63)	(1.85, 2.33, 2.86)	(1.92, 2.44, 2.94)	(1, 1, 1)

The weight vectors of sub-criteria of commitment are obtained as $W = (0.22,\ 0.15,\ 0.12,\ 0.12,\ 0.06,\ 0.33)^T$.
According to these weights; the most important sub-criterion of commitment is "responsibility". The sub-criteria of commitment can be ranked in order of decreasing importance as follows: *Responsibility*, *loyalty*,

willingness of the competitor, *considering cooperation significant* and *willingness of the competitor to change*, and *considering the benefit of the competitor*.

Table 6 shows the fuzzy evaluation matrix of the sub-criteria of trust with respect to trust.

Table 6. The fuzzy evaluation matrix of the sub-criteria with respect to trust

	T1	T2	T3	T4	T5
T1	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(5/2, 3, 7/2) (2, 5/2, 3) (2, 5/2, 3) (5/2, 3, 7/2)	(5/2, 3, 7/2) (1, 3/2, 2) (1, 3/2, 2) (1, 3/2, 2)	(5/2, 3, 7/2) (2, 5/2, 3) (1, 3/2, 2) (3/2, 2, 5/2)	(5/2, 3, 7/2) (3/2, 2, 5/2) (3/2, 2, 5/2) (3/2, 2, 5/2)
T2	(2/7, 1/3, 2/5) (1/3, 2/5, 1/2) (1/3, 2/5, 1/2) (2/7, 1/3, 2/5)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (1, 3/2, 2) (1/2, 2/3, 1) (1/2, 2/3, 1)	(1, 3/2, 2) (1, 3/2, 2) (1/2, 2/3, 1) (2/5, 1/2, 2/3)	(3/2, 2, 5/2) (1/2, 1, 3/2) (1/2, 2/3, 1) (1/2, 2/3, 1)
T3	(2/7, 1/3, 2/5) (1/2, 2/3, 1) (1/2, 2/3, 1) (1/2, 2/3, 1)	(1/2, 2/3, 1) (1/2, 2/3, 1) (1, 3/2, 2) (1, 3/2, 2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (5/2, 3, 7/2) (1/2, 2/3, 1) (3/2, 2, 5/2)	(1, 3/2, 2) (3/2, 2, 5/2) (3/2, 2, 5/2) (1, 3/2, 2)
T4	(2/7, 1/3, 2/5) (1/3, 2/5, 1/2) (1/2, 2/3, 1) (2/5, 1/2, 2/3)	(1/2, 2/3, 1) (1/2, 2/3, 1) (1, 3/2, 2) (3/2, 2, 5/2)	(1/2, 2/3, 1) (2/7, 1/3, 2/5) (1, 3/2, 2) (2/5, 1/2, 2/3)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (1/3, 2/5, 1/2) (3/2, 2, 5/2) (1/2, 2/3, 1)
T5	(2/7, 1/3, 2/5) (2/5, 1/2, 2/3) (2/5, 1/2, 2/3) (2/5, 1/2, 2/3)	(2/5, 1/2, 2/3) (2/3, 1, 2) (1, 3/2, 2) (1, 3/2, 2)	(1/2, 2/3, 1) (2/5, 1/2, 2/3) (2/5, 1/2, 2/3) (1/2, 2/3, 1)	(1/2, 2/3, 1) (2, 5/2, 3) (2/5, 1/2, 2/3) (1, 3/2, 2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)

Table 7 shows the combined fuzzy evaluation matrix of the sub-criteria of trust.

Table 7. The combined fuzzy evaluation matrix of the sub-criteria with respect to trust

	T1	T2	T3	T4	T5
T1	(1, 1, 1)	(2.25, 2.75, 3.25)	(1.38, 1.88, 2.38)	(1.75, 2.25, 2.75)	(1.75, 2.25, 2.75)
T2	(0.31, 0.36, 0.44)	(1, 1, 1)	(0.75, 1.08, 1.50)	(0.73, 1.04, 1.42)	(0.75, 1.08, 1.50)
T3	(0.42, 0.53, 0.72)	(0.67, 0.93, 1.33)	(1, 1, 1)	(1.38, 1.79, 2.25)	(1.25, 1.75, 2.25)
T4	(0.36, 0.44, 0.57)	(0.70, 0.96, 1.37)	(0.44, 0.56, 0.72)	(1, 1, 1)	(0.83, 1.14, 1.50)
T5	(0.36, 0.44, 0.57)	(0.67, 0.93, 1.33)	(0.44, 0.57, 0.80)	(0.67, 0.88, 1.20)	(1, 1, 1)

The weight vectors of sub-criteria of trust is obtained as $W = (0.60,\ 0.10,\ 0.27,\ 0.03,\ 0)^T$.

According to these weights the most important sub-criterion is "*trustworthy of the competitor*" followed by "*not to try to gain one-sided advantage*", "*not to act at the expense of the partner*", "*willingness to information sharing*" and "*not to misuse knowledge*".

Table 8 shows the fuzzy evaluation matrix of the sub-criteria of mutual benefit with respect to mutual benefit.

Table 8. The fuzzy evaluation matrix of the sub-criteria with respect to mutual benefit

	MB1	MB2	MB3	MB4	MB5
MB1	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (1, 3/2, 2) (1, 3/2, 2) (2/5, 1/2, 2/3)	(1/2, 1, 3/2) (1/2, 1, 3/2) (2/5, 1/2, 2/3) (1, 3/2, 2)	(1, 3/2, 2) (2/5, 1/2, 2/3) (3/2, 2, 5/2) (2, 5/2, 3)	(1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (1/3, 2/5, 1/2) (1/2, 2/3, 1)
MB2	(1/2, 2/3, 1) (1/2, 2/3, 1) (1/2, 2/3, 1) (3/2, 2, 5/2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(2/5, 1/2, 2/3) (1/2, 2/3, 1) (2/5, 1/2, 2/3) (1, 3/2, 2)	(1, 3/2, 2) (2/5, 1/2, 2/3) (1, 3/2, 2) (3/2, 2, 5/2)	(1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (2/5, 1/2, 2/3) (1, 3/2, 2)
MB3	(2/3, 1, 2) (2/3, 1, 2) (3/2, 2, 5/2) (1/2, 2/3, 1)	(3/2, 2, 5/2) (1, 3/2, 2) (3/2, 2, 5/2) (1/2, 2/3, 1)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1, 3/2, 2) (1/2, 2/3, 1) (1, 3/2, 2) (1, 3/2, 2)	(1/3, 2/5, 1/2) (2/5, 1/2, 2/3) (1/2, 2/3, 1) (2/5, 1/2, 2/3)
MB4	(1/2, 2/3, 1) (3/2, 2, 5/2) (2/5, 1/2, 2/3) (1/3, 2/5, 1/2)	(1/2, 2/3, 1) (3/2, 2, 5/2) (1/2, 2/3, 1) (2/5, 1/2, 2/3)	(1/2, 2/3, 1) (1, 3/2, 2) (1/2, 2/3, 1) (1/2, 2/3, 1)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)	(1/3, 2/5, 1/2) (1/2, 1, 3/2) (2/7, 1/3, 2/5) (2/5, 1/2, 2/3)
MB5	(2, 5/2, 3) (3/2, 2, 5/2) (2, 5/2, 3) (1, 3/2, 2)	(2, 5/2, 3) (3/2, 2, 5/2) (3/2, 2, 5/2) (1/2, 2/3, 1)	(2, 5/2, 3) (3/2, 2, 5/2) (1, 3/2, 2) (3/2, 2, 5/2)	(2, 5/2, 3) (2/3, 1, 2) (5/2, 3, 7/2) (3/2, 2, 5/2)	(1, 1, 1) (1, 1, 1) (1, 1, 1) (1, 1, 1)

Table 9 shows the combined fuzzy evaluation matrix of the sub-criteria of mutual benefit.

Table 9. The combined fuzzy evaluation matrix of the sub-criteria with respect to mutual benefit

	MB1	MB2	MB3	MB4	MB5
MB1	(1, 1, 1)	(0.85, 1.25, 1.67)	(0.60, 1, 1.42)	(1.23, 1.63, 2.04)	(0.39, 0.49, 0.67)
MB2	(0.60, 0.80, 1.18)	(1, 1, 1)	(0.58, 0.79, 1.08)	(0.98, 1.38, 1.79)	(0.53, 0.73, 0.96)
MB3	(0.70, 1, 1.67)	(0.93, 1.27, 1.72)	(1, 1, 1)	(0.88, 1.29, 1.75)	(0.41, 0.52, 0.71)
MB4	(0.49, 0.61, 0.81)	(0.56, 0.72, 1.02)	(0.57, 0.78, 1.14)	(1, 1, 1)	(0.38, 0.56, 0.77)
MB5	(1.49, 2.04, 2.56)	(1.04, 1.37, 1.89)	(1.41, 1.92, 2.44)	(1.30, 1.79, 2.63)	(1, 1, 1)

The weight vectors of sub-criteria of mutual benefit is obtained as $W = (0.21,\ 0.16,\ 0.20,\ 0.08,\ 0.35)^T$.

According to these weights the most important sub-criterion of mutual benefit is "common (similar) benefits (goals)" and the less important one is "structural similarity". The sub-criteria of mutual benefit can be ranked in order of decreasing importance as follows: *Common (similar) benefits (goals)*, *strengthening the competitive position*, *having supplementary resources*, *resource sharing*, and *structural similarity*.
Finally, the overall priority weights of all of the sub-criteria are obtained by combining the weights of main criteria and sub-criteria. The ranking of the sub-criteria in order of decreasing importance is as follows: T1 (0.2820), T3 (0.1269), C6 (0.0924), MB5 (0.0875), C1 (0.0616), MB1 (0.0525), MB3 (0.0500), T2 (0.0470), C2 (0.0420), MB2 (0.0400), C3 and C4 (0.0336), MB4 (0.0200), C5 (0.0168), T4 (0.0141) and T5 (0.0000).

Discussion and Conclusions

The purpose of the present study is to explain coopetition in a theoretical way and to analyze which criterion(s) effect(s) selection of partner among rivals. Choosing the right and reliable partner is a critical process because of including some risks and uncertainties. The fuzzy AHP is one of the appropriate

methods to use in the partner selection process and also to overcome uncertainty included. Four firms were determined and their partner selection processes were analyzed. Data were obtained from the top managers of these firms.

The results showed that the most important main criterion was *trust* followed by *commitment* and *mutual benefit*. In addition, *responsibility* was found as the most important sub-criterion of commitment, *trustworthy of the competitor* was the most important sub-criterion of trust, and *common (similar) benefits (goals)* was the most important sub-criterion of mutual benefit. Furthermore, when all of the sixteen sub-criteria were taken into account, the ranking in order of decreasing importance was obtained as follows: Trustworthy of the competitor, not to try to gain one-sided advantage, responsibility, common (similar) benefits (goals), loyalty, strengthening the competitive position, having supplementary resources, not to act at the expense of the partner, willingness of the competitor, resource sharing, considering cooperation significant and willingness of the competitor to change, structural similarity, considering the benefit of the competitor, willingness to information sharing, and not to misuse knowledge.

These results are similar with the findings of previous studies. For example, according to Zineldin (2004) each partner has a trusting attitude. They should be able to share information required to enhance and sustain the relationship. Many partnerships have failed because partners have neither shared information nor allocated their best resources. When trust exists between competitors, it is much easier to maintain a successful coopetition strategy (Chai & Yang, 2011). Furthermore, Walley (2007) suggests that many coopetitive relationships end for many reasons such as leakage of confidential information, different objectives and intents, and general distrust.

"Having supplementary resources" is considered as one of the most important criterions in the literature (Bengtsson et al., 2003; Tomski, 2011). The results of this study differ from previous studies in terms of the importance of this criterion. According to the results obtained from the study, "having supplementary resources" criterion was not found as very important. This is like this because the firms which are in the same sectors have almost similar structural properties and resources in Turkey. The similarities of the resources include the similarity of human resources, technological and other resources, and the core competences.

Different from the criteria of this study, from the point of view of the managers, "commercial culture" was considered as one of the most important criteria in the partner selection process. According to them, commercial culture implies the similarity of working styles and experiences, having shared values, and keeping secret.

However; like other studies, this study has some limitations. The number of the companies included in analyses is limited. Although these are large scaled exporter firms and the findings can give some insights about coopetition; care must be taken when interpreting these results at country-wide fashion.

In future research country-wide studies can be made on this subject. Examples from other countries can be considered and comparative studies can be conducted. Apart from this study, other multi criteria decision making methods can be used alone or in an integrated way.

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