



A Fuzzy TOPSIS Approach for Prioritizing the Preeminent Manufacturing Brands of Isfahan Province Based on the Critical Success Factors of Knowledge Management

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ABSTRACT

A main factor of competitive advantage of present organizations is knowledge. Knowledge management (KM) is a conscious attempt as a new approach to create, disseminate, and apply knowledge in a way that valuable results were achieved for the organizations. The critical success factors (CSFs) of knowledge management have a considerable effect on the competitive position of the organizations. The aim of this article is to prioritize preeminent manufacturing brands of Isfahan Province based on the critical success factors of knowledge management. 12 critical success factors of knowledge management and their sub-factors were determined with reviewing the literature review. The questionnaire was designed based on these factors. 80 questionnaires were completed by senior managers, middle-level managers, executive managers, and employed supervisors. Data were analyzed with the use of fuzzy TOSIS technique and were prioritized based on the critical factors of organizations. According to the obtained results, Iran smelting company was placed in the first place with the similarity index of 0.5561 and Pars electric company was placed in the second place with the similarity index of 0.5366. Other companies were placed in the next places. Sepahan Cement Company was placed on the last place.

1. Introduction

The current post-industrial societies are the information societies that the information technologies are replaced by the amplifier technologies. In the business community, there is a growing recognition about the significance of knowledge as a main resource of organizations (Benjamin, 2003). Knowledge itself is the much of the capital and the most powerful engine of the production of the organizations (Boisot,1998). Therefore, organizations should focus on the management (Rockart, 1997). There are some main areas in any organization or organizational unit. If the success is achieved in that areas, that organization will become successful in its work. Identifying these critical factors is an important step for planning the future of organizations. Organizations have not had appropriate programs for the future without identifying these critical factors. According to the Rukert point of view, critical success factors are specific and confined scopes and if satisfied results are achieved in the organizations, the performance of the organizations will become competitive. Therefore, identifying these factors will have an important role in the optimal performance of organizations or even organizational unit.

Nowadays, knowledge management has been become increasingly important and widespread due to different reasons. Organizations should reduce their cycle time in production and produce products with minimum costs and assets and also promote labors and employees' performance for the purpose of succeeding in the present global economy (Wu, 2008). One of the advantages of prioritizing the knowledge management is that it provides the features of the organizations based on the knowledge. Knowledge management determines the development, the environment, and the specific features like internal structure and management systems of the current situation of an organization along the external requirements of the market and technology (Bornemann and Sammer, 2003). In management science, knowledge management is considered as a paradigm. Therefore, organizations have to identify the critical success factors of knowledge management for the purpose of performing the knowledge management. Most of the organizations are not familiar with these effective factors. It seems that critical success factors of knowledge management have not been examined yet with fuzzy TOPSIS technique for the purpose of prioritizing the preeminent manufacturing brands.

Therefore, in this article, the researcher was forced to identify the critical factors and prioritize the preeminent manufacturing brands with the fuzzy TOPSIS technique. Major effective factors of the knowledge management success were determined with the review of the research results. So, on one hand, the researchers could access to the critical success factors and on the other hand, the managers could become aware about the features that the organizations should have for the purpose of implementing the knowledge management. Each year, the top Companies were introduced in the festival with the cooperation of quality management research group of Isfahan University and the house of industry and mining. These brands were selected based on the indexes of the variety of the products, the volume of the exchanges, the volume of the exports, and the number of the manpower and etc..... So, these companies should be examined and prioritized based on their performance in knowledge management. Also, the position and the preeminence of these companies should be surveyed. On the other hand, identifying the critical success factors of knowledge management used in all organizations were considered generally, but identifying the preeminent manufacturing brands of Isfahan Province were considered specifically.

The critical success factors of knowledge management which were used in this study were achieved from the research of Valmohammadi in 2010. In this study, 12 critical factors affecting the knowledge management were identified. Also, in this study, the preeminent manufacturing brands of Isfahan were examined. The instrument of this study was a questionnaire. The data were analyzed with the fuzzy TOPSIS technique which was one of the multi-criteria fuzzy decision making techniques. Finally, the surveyed companies were ranked with the fuzzy TOPSIS technique. Also, the SPSS software was used in this study.

2. Literature Review

Most studies were conducted in the field of the key success factors of knowledge management in different industries. It seems that in most studies, there is not an effective key success factor of knowledge management in different industries. In this part, we examine the studies were done in the field of the identification and the prioritization of the key success factors of knowledge management. The summary of the conducted studies was shown in table1.

Table 1. The summary of the conducted studies

Author	Method	Comments
Valmohammadi (2010)	Statistical analysis	Identify and Prioritizing twelve critical success factors of knowledge management.
Altaher (2010)	Internal consistency test, statistical tests, and the reliability of the structures.	Identify the critical success factors Process knowledge management, Study the important pharmacy companies of Jordan.
Linder and wald (2011)	Analyzing with the method of Partial least squares and SMART software.	Identify the success factors of knowledge management through interview, literature review, and Hanych study for the purpose of studying the transport, automotive, building, and insurance industries.
Huang and Lai (2012)	Structural equation modeling, confirmatory factor analysis, and the tests AMOS.	Identify the factors and the dependent variables affecting the knowledge management success, the case study Taiwan's life insurance enterprises
Saedi et al. (2012)	TOPSIS Fuzzy and SPSS software.	Identify the five main criteria and 32 sub-criteria and also prioritize the factors affecting the implementation of knowledge management for the purpose of studying the different managerial levels in Behnosh company.
Anggia et al. (2013)	This study constructs Partial Leas Squares Structural Equation Modeling (PLS-SEM) and SMART PLS software.	Identify the five critical success factors of knowledge management, reject one of them, and accept four other ones for the purpose of studying the doctors of teaching hospitals.
Asgari(2013)	TOPSIS Fuzzy and SPSS software.	Use a model for the purpose of studying the Universities of the west of Mazandaran.
Ramezani et al. (2013)	Factor analysis, test Statistical, Index KMO and SPSS software.	Investigating critical success factors of knowledge management a case study concerning one of the research organizations of Iran
Farzin et al. (2014)	Structural equation and Lisrel software	Investigating critical success factors for Strategic Knowledge Management implementation, the case study is banking industry of Iran.
Arif and bin Shalhoub (2014)	Delphi techniqe	Critical success factors with its effective role in Knowledge Management Initiatives in Public and private organizations in Saudi Arabia: Experts Perspectives

Margilaj and Bello (2015)	Design 2 questions and use frequency and percentage	Identify and Prioritizing the importance of critical success factors (CSFs), of knowledge in Albania business organizations
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With regard to literature review, it was found out that many studies were done on the field of critical success factors of knowledge management in different industries with the use of statistical tests. It seemed that surveying some manufacturing organizations in different industries was done less at the same time with the use of this approach and fuzzy TOSIS technique. Also, the obtained indexes were more comprehensive and complete than the indexes of other researchers' studies. Therefore, the researcher used these indexes in this study.

3. Critical Success Factors

Since one of the aims of this study is to identify the critical factors, these factors were found out with the study of the proposed critical factors which were expressed by the experts and authors and were written in the valid international journals. Finally, twelve key success factors of knowledge management were found out from Valmohammadi research (2010). These factors and the name of the researchers who used some of these factors were given in table 2.

Table 2. List of KM success factors

CSF (KM)	Research
Management leadership and support	Askyrme and Amidon (1997), Holsapple and Joshi (2000), Davenport et al. (1998), Liebowitz (1999), Hasanali (2002), Wong and Aspinawall (2006), Chong (2006), Akhavan et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Anggia et al. (2013), Margilaj and Bello (2015)
Organizational culture	Askyrme and Amidon (1997), Holsapple and Joshi (2000), Davenport et al. (1998), Liebowitz (1999), Hasanali (2002), Wong and Aspinawall (2006), Chong (2006), Akhavan et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Anggia et al. (2013), Margilaj and Bello (2015)
Information technology	Askyrme and Amidon (1997), Davenport et al. (1998), Liebowitz (1999), Hasanali (2002), Wong and Aspinawall (2006), Chong (2006), Akhavan et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Anggia et al. (2013), Margilaj and Bello (2015)
Knowledge management strategy	Askyrme and Amidon (1997), Davenport et al. (1998), Liebowitz (1999), Wong and Aspinawall (2006), Chong (2006), Akhavan and et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Margilaj and Bello (2015)
Performance measurement	Davenport et al. (1998), Holsapple and Joshi (2000), Hasanali (2002), Wong and Aspinawall (2006), Chong (2006), Valmohammadi (2010), Margilaj and Bello (2015)
Organizational infrastructure	Davenport et al. (1998), Liebowitz (1999), Hasanali (2002), Wong and Aspinawall (2006), Akhavan et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Margilaj and Bello (2015)
Processes and activities	Askyrme and Amidon (1997), Holsapple and Joshi (2000), Davenport et al. (1998), Wong and Aspinawall (2006), Akhavan et al. (2006), Valmohammadi (2010),
Rewarding and motivation	Davenport et al. (1998), Liebowitz (1999), Wong and Aspinawall (2006), Akhavan et al. (2006), Valmohammadi (2010),
Training and education	Wong and Aspinawall (2006), Chong (2006), Akhavan et al. (2006), Valmohammadi (2010), Yaghoubi and Maleki (2012), Anggia and et al. (2013),
Removal or resource constraints	Davenport and et al. (1998), Holsapple and Joshi (2000), Wong and Aspinawall (2006), Chong (2006), Valmohammadi (2010),

Human resources management	Wong and Aspinawall (2006), Valmohammadi (2010), Anggia et al. (2013),
Benchmarking	Chong (2006), Valmohammadi (2010),

Table 2 shows the list of the critical success factors of the knowledge management from some of the authors and researchers' point of view.

The critical success factors of the knowledge management which were found out from the Valmohammadi research were introduced and defined. These factors were:

1) Management leadership and support

A leader provides the requirements for the effective senior management (Skyrme and Amidon, 1997). To realize the potential of knowledge management implementation, leaders in companies should provide the appropriate environment to motivate its workers to enable the creation, organization and sharing of knowledge (Anggia et al., 2013).

2) Organizational culture

Organizational culture is a vital factor to an organization's ability to create value through leveraging knowledge assets. It is often cited as one of the most difficult factors to achieve as well as one of the biggest barriers to KM success. An organizational culture that encourages knowledge sharing, creation, and contribution to organizational knowledge structures is critical to the success of KM (Conley and Zheng, 2009). Organizational culture as a concept is considered to be a key element of managing organizational change and renewal. Therefore, organizational culture is necessary for an implementation of knowledge management in organizations (Anggia et al., 2013).

3) Information technology

Knowledge management process is impossible to implementation without effective information system and technologies IT that enable information acquisition, retention, and sharing (Altaher, 2010). Increasingly, the emphasis on an organization's technology infrastructure is shifting from a focus on the collection and codification of knowledge to enabling personal connections between employees (Conley and Zheng, 2009). Information technology can provide an edge in harvesting knowledge. An effective information technology is necessary for the organization to implement the knowledge management process (Anggia et al., 2013).

4) Knowledge management strategy

The relationship between KM and strategy is often discussed in two separate, but connected ways within the literature. First, to be successful and truly meaningful to the organization, KM should support corporate and business strategies and be integrated within the strategic planning process of the organization. Second, to carry out these goals, there should be an identified KM strategy in place, for example, codification or personalization strategies (Conley and Zheng, 2009).

5) Performance measurement

Measurement provides milestones and benchmarks from which targets, goals, and improvements can be calculated (Conley and Zheng, 2009). A good performance measurement system must also be able to capture the intangible assets of a firm (Choy chong, 2006).

6) Organizational infrastructure management

Organizational structure provides a snapshot of organizational life. It indicates an enduring configuration of tasks and activities and it provides guidance in determining whom people interact with in conducting organizational tasks. More formalized and centralized structure dampens KM success whereas a flexible informal structure facilitates it (Conley and Zheng, 2009).

7) Processes and activities

Processes must be established that capture or facilitate the building and dissemination of organizational knowledge. Processes should be implemented that support the organization's KM strategy. Without such systematic processes in place, the success of KM initiatives is left to Chance (Conley and Zheng, 2009).

8) Rewarding and motivation

Encouraging employees to contribute to and participate in KM efforts is an important step in developing a knowledge-sharing culture. Both financial and nonfinancial rewards are often suggested as means of encouraging employees to participate in KM efforts. Davenport et al. (1998) stated that offering incentives as a means of enticing staff to engage in KM activities is one of the most common success factors; however, it is also one of the most difficult factors to sustain during the lifetime of a KM initiative (Conley and Zheng, 2009).

9) Removing the resource limitations

It is important that senior managers must attempt to remove all organisational constraints that create barriers to successful KM implementation. They must realise that organisational constraints can affect negatively the perception and/or attitudes toward KM success. If the managers hoard knowledge, they cannot possibly expect their employees to share. Sharing should be made mandatory from the top until the bottom, and across the organisational structure. On top of all, the senior managers must allocate adequate budget for their KM initiatives to be successful (Choy chong, 2006).

10) Training

The most important competitive advantage to any firm is its workforce is remaining competent through continuous training and development. Training accommodates some employees and managers the skills and information to fulfill their responsibilities. For the same reason, a number of organizations have become or are striving to become learning organizations. Thus, timely and appropriate education employee training is one of the key success factors for knowledge management implementation (Anggia et al., 2013).

11) Human recourse management

Human Resource Management (HRM) has several activities for employees on how they will get benefits from implementation of knowledge management. HRM is not only focus on hiring and retaining of employees, but also involves some activities like human resource planning, industrial relations, setting safety and health standards, etc (Anggia et al., 2013).

12) Benchmarking

Many firms have adopted benchmarking as a significant, systematic technique for measuring company's performance towards its strategic goals. Once an organization has benchmarked best practices, it is easier to apply the useful knowledge around the organization (Choy chong, 2006).

4. Fuzzy Topsis

TOPSIS technique is one of the best and the most widely used multi-criteria decision making methods. TOPSIS technique was proposed in 1981 by Huang based on the simple logic. The logic underlying this technique is that two ideal and anti-ideal options were defined in this technique and options were examined and selected based on their minimum distance from the ideal option and farthest distance from the anti-ideal option (Yoon and Hwang, 1995). Fuzzy theory was proposed in 1965 by the professor Loti Zadeh. This theory is appropriate for the ambiguous and imprecise situations. So, this technique can resolve the existent uncertainties of the verbal expressions (Semih et al., 2009). Since accessing to the correct and precise data is difficult for making decision with multi criteria, Chen and Huang proposed fuzzy set theory for the purpose of using imprecise data in the

multi-criteria evaluating method. TOPSIS technique for one multi-criteria decision making problem, n criteria and m options is included the following steps (Tavakoli et al., 2013):

Step 1) Forming a decision matrix:

With regard to n criteria, m options, and the assessment of all options of all the various criteria, a decision matrix is formed as follows:

$$\tilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \dots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \dots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \dots & \tilde{x}_{mn} \end{bmatrix}$$

If triangular fuzzy numbers are used in a problem, X_{ij} will become equal to (a_{ij}, b_{ij}, c_{ij}) . If the assessment of options was done based on the criteria by a group of k members and the fuzzy assessment of k person in a group was equal to $X_{ijk}=(a_{ijk}, b_{ijk}, c_{ijk})$, we could consider options based on the following equations with regard to the combined fuzzy ranking criteria.

$$\begin{aligned} a_{ij} &= \text{Min}(a_{ijk}) \\ b_{ij} &= \frac{\sum_{k=1}^k b_{ijk}}{k} \\ c_{ij} &= \text{Max}(c_{ijk}) \end{aligned} \quad \begin{aligned} i &= 1, 2, \dots, \dots, m \\ j &= 1, 2, \dots, \dots, n \end{aligned} \quad (1)$$

Step 2) Identifying the weight of matrix criteria

The coefficient of various criteria is as follows:

$$W_j = [w_1, w_2, \dots, w_n] \quad (2)$$

If triangular fuzzy numbers are used in a problem, each component of W_i is defined as $W_{ij} = (w_{j1}, w_{j2}, w_{j3})$. If the weights of criteria were identified by experts, we can use the following equations for the purpose of calculating the mean of group views.

$$\begin{aligned} a_{ij} &= \text{min}(W_{jk1}) \\ b_{ij} &= \frac{\sum_{k=1}^k W_{jk2}}{k} \\ c_{ij} &= \text{Max}(W_{jk3}) \end{aligned} \quad (3)$$

Step 3) non-scaling the fuzzy decision matrix:

In fuzzy TOPSIS technique, the values of fuzzy decision matrix will not be scaled with the change of linear scale for the purpose of converting the various criteria to comparable scale. Since the X_{ij} are fuzzy, the r_{ij} will certainly be fuzzy. If fuzzy numbers were in a triangular form, decision matrix elements would respectively be calculated from the following equations for the positive and negative criteria.

$$r_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right) \quad c_j^* = \max c_{ij} \quad (4)$$

$$r_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}} \right) \quad a_j^- = \min a_{ij}$$

Step 4) Identifying the weighted fuzzy decision matrix:

The weighted fuzzy decision matrix is obtained by multiplying the coefficient of each criterion and unscaled fuzzy matrix.

$$v_{ij} = r_{ij} \times w_j \tag{5}$$

In this equation, w_j indicates the significance of C_j criterion. Therefore, the weighted fuzzy decision matrix is as follows:

$$v = \begin{matrix} & X_1 & \dots & X_j & \dots & X_n \\ \begin{matrix} A_1 \\ \vdots \\ A_i \\ \dots \\ A_m \end{matrix} & \begin{bmatrix} v_{11} & \dots & v_{1j} & \dots & v_{1n} \\ \vdots & & \vdots & & \vdots \\ v_{i1} & \dots & v_{ij} & \dots & v_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ v_{m1} & \dots & v_{mj} & \dots & v_{mn} \end{bmatrix} \end{matrix}$$

If the fuzzy numbers were in a triangular form, the weighted fuzzy decision matrix elements would respectively be calculated from the following equations for the positive and negative criteria.

$$v_{ij} = r_{ij} \times w_j = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right) \times (w_{j1}, w_{j2}, w_{j3}) = \left(\frac{a_{ij}}{c_j^*} \times w_{j1}, \frac{b_{ij}}{c_j^*} \times w_{j2}, \frac{c_{ij}}{c_j^*} \times w_{j3} \right)$$

$$v_{ij} = r_{ij} \times w_j = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}} \right) \times (w_{j1}, w_{j2}, w_{j3}) = \left(\frac{a_j^-}{c_{ij}} \times w_{j1}, \frac{a_j^-}{b_{ij}} \times w_{j2}, \frac{a_j^-}{a_{ij}} \times w_{j3} \right) \tag{6}$$

Step 5) Calculating the value of fuzzy ideal option and fuzzy anti-ideal option.

$$A^+ = (v_1^*, v_2^*, \dots, \dots, v_n^*)$$

$$A^- = (v_1^-, v_2^-, \dots, \dots, v_n^-) \tag{7}$$

The values of fuzzy ideal option and fuzzy anti-ideal option are calculated with the following fixed values.

$$A^+ = (1,1,1)$$

$$A^- = (0,0,0) \tag{8}$$

Step 6) Calculating the distance from fuzzy ideal and anti-ideal options:

$$S_i^+ = \sum_{j=1}^n d(v_{ij}, v_j^*) \quad i = 1, 2, \dots, \dots, m$$

$$S_i^- = \sum_{j=1}^n d(v_{ij}, v_j^-) \quad j = 1, 2, \dots, \dots, n \tag{9}$$

In this step, the distance of each option is obtained from the fuzzy ideal and anti-ideal options.

$$d(M_1, M_2) = \sqrt{\left(\frac{1}{3}\right) [(a_1 - a_2)^2 + (b_1 - b_2)^2 + (c_1 - c_2)^2]} \tag{10}$$

Step 7) Calculating the similarity index:

The similarity index is calculated from the following equations.

$$CC_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad i = 1, 2, \dots, \dots, m \tag{11}$$

Step 8) Ranking the options:

In this step, options are ranked with the similarity index. Options with higher similarity index are of higher rank.

5. Methodology

The methodology which was used in this study was as follows:

Step 1) Surveying the literature review in the field of identifying the critical success factors of knowledge management

Step 2) Identifying the critical success factors of the knowledge management.

Step 3) The questionnaire was designed based on critical success factors and reliability and validity.

Step 4) Chose case study.

Step 5) Data collection and analyzed with the use of fuzzy TOPSIS technique.

6. Data Collection and Analysis of Results

With the survey of literature review, twelve critical success factors of knowledge management were obtained from valmohammadi’s study. The questionnaire was designed based on these factors. To ensure the reliability of our questionnaire we used reliability. For this purpose, questionnaires were distributed to a group of university professors and professionals of management field of study and then we applied their comments in the questionnaires. Also the experts and professors’ opinions and suggestions were considered for the purpose of measuring the reliability of the questionnaire. The revised questionnaire was included 36 questions for the purpose of measuring the critical success factors and sub-indexes. For the purpose of validity, we used Cronbach alpha. To this end, we chose 30 individuals from statistical population randomly and the questionnaires were distributed among them. The Cronbach alpha was obtained from them to be 0.963 indicating that questionnaires had high validity. Cronbach s alpha coefficient of 0.963 shows that this questionnaire has an acceptable reliability. Also, Cronbach s alpha coefficient was calculated for all the indexes and their results were shown in table 3.

Table 3. Cronbach s alpha coefficient

CSFs	Cronbach's alpha	CSFs	Cronbach's alpha
Management leadership and support	0.756	Processes and activities	0.851
Organizational culture	0.894	Rewarding and motivation	0.808
Information technology	0.7	Training and education	0.7
Knowledge management strategy	0.7	Removal or resource constraints	0.799
Performance measurement	0.875	Human resources management	0.728
Organizational infrastructure	0.73	Benchmarking	0.786

Table 3 shows Cronbach s alpha coefficient. With regard to the reliability of 0.963, the results of table 3 show that this research is of good validity. The statistical population of this study was included the preeminent manufacturing brands of Isfahan Province. In this study, we surveyed the companies which worked on knowledge management. There were 21 companies of preeminent manufacturing brands in Isfahan Province. Ten companies among these 21 companies did not work on field and also some of them were not willing to cooperate with us. Only 11 organizations cooperated in the completion of the questionnaires. The population of this study was included 80 managers and supervisors. the questionnaire was designed for the purpose of calculating the weight of indexes and solving the problem with TOPSIS method. The weight of these critical factors was calculated by ten

university professors and converted to fuzzy numbers. All of the questionnaires were converted to fuzzy numbers with the use of table 4.

After gathering data, we implement the fuzzy algorithm. First, all the numbers were converted to fuzzy numbers with the use of table 4. Then the fuzzy decision matrix was shown in table 5.

Table 4. Fuzzy values of linguistic variable (Yu and Hu, 2009)

Characteristic	Rank	Fuzzy number
Very Low	1	(0, 0.10, 0.25)
Low	2	(0.15, 0.30, 0.45)
Medium	3	(0.35, 0.50, 0.65)
High	4	(0.55, 0.75, 0.85)
Very High	5	(0.75, 0.9, 1)

Table 5. Decision making matrix

Criteria	Management leadership and support	Organizational culture	Information technology	KM strategy	Performance measurement	Organizational infrastructure
Mobarez	(0.193 ,0.569 , 1)	(0 , 0.368 , 1)	(0.05 , 0.42 , 0.85)	(0.05 , 0.32 , 0.85)	(0.05 , 0.245 , 0.85)	(0.05, 0.42 , 0.85)
Merat steel	(0.193 , 0.607 , 1)	(0 , 0.496 , 1)	(0 , 0.485 , 1)	(0 , 0.438 , 1)	(0.123 , 0.43 , 1)	(0 , 0.305 , 1)
Gaz souzan	(0.083 , 0.451 , 0.85)	(0 , 0.368 , 0.85)	(0 , 0.391 , 0.85)	(0 , 0.342 , 1)	(0.053 , 0.32 , 0.85)	(0.053 , 0.367 , 1)
Darakar	(0.193 , 0.618 , 1)	(0.193 , 0.564 , 1)	(0.053 , 0.513 , 1)	(0.053 , 0.459 , 1)	(0.123 , 0.484 , 1)	(0.123 , 0.442 , 1)
casting industries	(0.083 , 0.543 , 1)	(0.083 , 0.491 , 1)	(0 , 0.401 , 1)	(0.053 , 0.324 , 1)	(0 , 0.317 , 0.85)	(0 , 0.324 , 0.85)
Mobarakeh steel	(0 , 0.534 , 1)	(0 , 0.484 , 1)	(0.053 , 0.491 , 1)	(0.053 , 0.43 , 1)	(0.053 , 0.449 , 1)	(0.05, 0.41 , 0.85)
Iran smelting company	(0.303 , 0.672 , 1)	(0.303 , 0.637 , 1)	(0.193 , 0.582 , 1)	(0.193 , 0.494 , 1)	(0.193 , 0.499 , 1)	(0.19 , 0.47, 0.85)
Sepahan Cement	(0 , 0.542 ,1)	(0 , 0.345 , 1)	(0 , 0.424 , 1)	(0 , 0.291 , 0.85)	(0 , 0.257 , 0.85)	(0 , 0.224 , 1)
Pars electric	(0.303 , 0.639 , 1)	(0.029 , 0.566 , 1)	(0.123 , 0.562 , 1)	(0.123 , 0.467 , 1)	(0.123 , 0.49 , 1)	(0.123 , 0.480 , 1)
Golnsar woolen	(0.193 , 0.682 , 1)	(0.12 , 0.592 , 1)	(0.053 , 0.551 , 1)	(0.053 , 0.482 , 1)	(0.123 , 0.511 , 1)	(0.123 , 0.482 , 1)
Khodrang	(0 , 0.452 , 1)	(0 , 0.405 ,1)	(0 , 0.471 , 1)	(0 , 0.343 , 1)	(0.053 , 0.39 , 1)	(0 , 0.343 , 1)

Table 5. Decision making matrix (Continuation)

Criteria	Processes and activities	Rewarding and motivation	Training and education	Removal or resource constraints	Human resources management	Benchmarking
Mobarez	(0.052, 0.306, 0.85)	(0.05, 0.49, 0.85)	(0.02, 0.25, 0.72)	(0.113, 0.45, 0.85)	(0.083, 0.35, 0.85)	(0.05, 0.4, 0.85)
Merat steel	(0.052, 0.397, 1)	(0.053, 0.491, 1)	(0, 0.309, 0.72)	(0.113, 0.536, 1)	(0, 0.45, 1)	(0.05, 0.389, 1)
Gaz souzan	(0, 0.3, 0.85)	(0, 0.02, 0.85)	(0, 0.248, 0.723)	(0, 0.48, 0.85)	(0, 0.379, 0.85)	(0.05, 0.3, 0.85)
Darakar	(0.053, 0.434, 1)	(0.123, 0.491, 1)	(0.05, 0.41, 0.85)	(0.113, 0.645, 1)	(0.193, 0.501, 1)	(0.053, 0.44, 1)
casting industries	(0, 0.4, 1)	(0, 0.023, 0.85)	(0, 0.34, 0.723)	(0.113, 0.527, 1)	(0.083, 0.499, 1)	(0, 0.407, 1)
Mobarakeh steel	(0.053, 0.422, 1)	(0.05, 0.49, 0.85)	(0.02, 0.38, 0.72)	(0.113, 0.57, 1)	(0, 0.443, 1)	(0.12, 0.42, 1)
Iran smelting company	(0.193, 0.476, 1)	(0.193, 0.491, 1)	(0.08, 0.42, 0.72)	(0.413, 0.642, 1)	(0.303, 0.542, 1)	(0.19, 0.47, 1)
Sepahan Cement	(0, 0.275, 1)	(0, 0.491, 0.85)	(0, 0.207, 0.723)	(0, 0.39, 1)	(0, 0.291, 0.85)	(0, 0.3, 0.85)
Pars electric	(0.123, 0.48, 1)	(0.123, 0.491, 1)	(0.05, 0.43, 0.85)	(0.113, 0.618, 1)	(0.193, 0.513, 1)	(0.193, 0.46, 1)
Golnsar woolen	(0.053, 0.459, 1)	(0.123, 0.491, 1)	(0.05, 0.39, 0.72)	(0.113, 0.603, 1)	(0.083, 0.524, 1)	(0.12, 0.443, 1)
Khodrang	(0, 0.375, 1)	(0.05, 0.01, 0.85)	(0, 0.309, 0.85)	(0.113, 0.484, 1)	(0.083, 0.401, 1)	(0, 0.33, 0.85)

The next step is to form the matrix of the weight of the criteria. The data which were obtained from the questionnaires were converted to fuzzy numbers. This questionnaire was completed by university and industry experts and the matrix of weight of the criteria was achieved. This matrix has been shown in table 6.

Table 6. Matrix of weight of the criteria

CSFs	Weight
Management leadership and support	(0.55 ,0.833,1)
Organizational culture	(0.55 ,0.8 ,1)
Information technology	(0.35 ,0.733,1)
KM strategy	(0.35 ,0.667,1)
Performance measurement	(0.35 ,0.7,1)
Organizational infrastructure	(0.35 ,0.667,1)
Processes and activities	(0.35 ,0.667 ,1)
Rewarding and motivation	(0.35 ,0.8 ,1)

Training and education	(0.15 ,0.6,0.85)
Removal or resource constraints	(0.75 , 0.9 ,1)
Human resources management	(0.55 ,0.733,1)
Benchmarking	(0.35 ,0.633,1)

Based on the fuzzy algorithm steps, all the fuzzy numbers should be divided by the greatest number of the right part of each column. Since this number was one, the fuzzy decision matrix was converted to fuzzy normalized matrix. Fuzzy normalized matrix has been shown in table 5.

The weighted fuzzy decision matrix was obtained by multiplying the fuzzy normalized matrix and the matrix of the weight of the criteria. The next step is to find ideal and anti-ideal options based on the steps of fuzzy TOPSIS algorithm. Finally, the similarity index will be calculated with the use of ideal and anti-ideal results.

The similarity index was calculated for each of the companies with the use of step 7 in fuzzy TOPSIS algorithm and the companies were ranked and the results were shown in table 7.

Table 7. The rank of companies

Criteria	Similarity index	Ranking option
Mobarez	0.4531	9
Merat steel	0.4936	5
Gaz souzan	0.4415	10
Darakar	0.5229	3
casting industries	0.4773	7
Mobarakeh steel	0.4902	6
Iran smelting company	0.5561	1
Sepahan Cement	0.4227	11
Pars electric	0.5366	2
Golnsar woolen	0.5209	4
Khodrang	0.4741	8

With regard to the obtained results, Iran smelting company is known as one of the pioneers of casting and casting machine in Iran country. Iran smelting company is placed in the first place and Pars electric company is placed in the second place. Other companies are placed in the next places and Sepahan Cement Company is placed in the last place.

7. Discuss and Conclusion

The aim of this article was to evaluate the preeminent manufacturing brands of Isfahan based on the critical success factors of the knowledge management. First, the critical success factors of the knowledge management were found out from the literature review of the article of Valmohammadi. It seems that these factors are the most complete critical success factors of the knowledge management. These factors are the senior management support and guide, organizational culture, information technology, knowledge management strategies, performance measurement, organizational infrastructure management, activities and processes, reward and motivation, removing the recourse limitations, training and retraining , human recourse management, benchmarking. Thirty-six sub-

factors were identified in this research. The questionnaire was designed based on these sub-factors and its reliability and validity were examined. Data were gathered from 80 managers and supervisors of the companies and were analyzed with the use of fuzzy TOPSIS. Finally, the companies were ranked. Results show that Iran smelting company is placed in the first place and other companies like Pars electric, Darakar, Golnsar woolen company, Merat, Mobarakeh steel company, casting industries, khodrang, Gas Souzan, Sepahan Cement company were placed with less distance in the next places respectively.

With regard to the significance of the knowledge management in the competitive advantage, productivity and the performance of the organization, it is necessary to do a lot of research in this field. Also, the managers should always be aware of the knowledge and knowledge management trends of their organization. The case that would lead to the competitive advantage was the identification of critical success factors of knowledge management because the success and the failure of the organization would be identified with these factors. These points should be taken into the consideration for the management of the organization because it can prevent from a lot of problems. Ranking the organizations will help managers to remove the problems of the organizations and pay attention to the issues that were hidden from their view or maybe it was not good for them to pay attention to these points and issues. Ranking is not only a representative of the rank of the organization but also it focuses on the critical and important issues and will lead to the increase in the strong points and decrease in the weak points. Ranking makes managers to identify the critical success factors of their organizations and survey the results of performing and not performing of these factors in the competitive advantage and the performance of the organization. In this article, the preeminent brands of Isfahan province were studied with a new approach.

8. Limitations and Suggestions for Future Research

Since the people of this study were very busy, it seems that some of them did not spend a lot of time on answering to these questions. So, it is suggested that this point should be taken into consideration in the immediate studies. It seems that the critical success factors of the knowledge management but it is suggested that the critical success factors of other studies are surveyed and the results are compared together.

9. References

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