

## Determining and ranking dimensions of knowledge management implementation using Hicks model and fuzzy TOPSIS Technique

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### ABSTRACT

The 20<sup>th</sup> century was the age of an industry-based as well as knowledge-based economy. In a knowledge-based economy, knowledge plays an essential role to produce wealth compared with other tangible and physical assets. The purpose of this research is to identify and rank different aspects of knowledge management based on the Hicks model using the fuzzy TOPSIS technique for one of the most prestigious universities in Iran. The proposed model considers four main criteria of knowledge including creation, distribution, storage, and application along with 17 sub-criteria. The Chi-square correlation test indicates a positive and meaningful correlation between four mentioned criteria and knowledge management implementation. Using the fuzzy TOPSIS technique, the results also indicate that “Need for new and updated information and knowledge” was selected as the most important sub-criterion and “Sharing or distribution of knowledge” was selected as the most important main criterion on Hicks model.

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## 1. Introduction

During the last decades of the new millennium, despite the introduction of some concepts such as learner organizations, and later knowledge management, some intellectuals considered them as abstract concepts and believed they were not applicable in many organizations. However, in recent years, these terms have taken some steps beyond theoretical framework, and the intellectuals and many have been convinced that there must be some attempts to provide executive solutions, and to set the groundwork for the implementation of these concepts in the organization. Organizational managers consider themselves in some new circumstances where they have no choice except to think about concepts such as knowledge management and to look for its implementation. Today, the challenge is not whether knowledge management is an abstract concept or it is applicable, rather the

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important question of organizational and corporate managers is how to apply it to take advantage the most in organizations.

The necessity and importance of knowledge management implementation is so obvious that some of the famous and leading managers attempt to use, at least, the objectives of knowledge management in their organizations. They have observed on how organizations, making use of knowledge management, have succeeded in their path for development. Therefore, it is a logical and necessary question to ask how knowledge management could be used in organization or, at least, how to manage the present knowledge more efficiently in organization. The difficulty the intellectuals and authors face in answering such questions lies, on the one hand, in the complexity and novelty of knowledge management, and, on the other hand, in the hidden experiences of other companies and organizations in application and implementation of this concept. The main reason is because knowledge is designed and produced within the organization before it is commercialized (Daneshfard & Zakery, 2010), the development of information technology and communication and its infiltration into all aspects of human life have provided new paradigms for all of us and has changed human life (Norouzian, 2006).

Organizations are now facing various challenges because of rapid changes in the modern world. In such circumstances, many organizations take advantage of opportunities on the use of modern management tools and technology such as knowledge management to empower their structures (Shahbazi, 2007). Nowadays, increasing attention is being paid to knowledge management in both academic and business areas. This can be well recognized by the increasing number of researches in the area of knowledge management (Von Krog et al., 2001). The studies performed in the European countries show that in 2000, knowledge management had been used by 80% of the world's greatest companies (KPMG, 2000). Knowing the key enablers impacting the use of knowledge management is one of the most important challenges facing organizations. The essential factors for achieving success in the area of knowledge management implementation can be considered as activities and procedures, which are focused on in order to guarantee the successful implementation of knowledge management (Wong, 2005). At the organizational level, the essential factors for the implementation of knowledge management can be classified into some internal and external factors. The main challenge at this level is to convince the organizations about the necessity of important cultural changes inside the organizations. These include the creation of an open, comprehensive, relationship based and collaborative working environment, which encourage the knowledge exchange among people as well as the creation of organizational and technological situations necessary for such an exchange (Mertins et al., 2003).

Knowledge management (KM) referred to as the new paradigm of the management area provides an answer to the country's requirements based on the management of nation's intangible assets. KM is an all-dimensional approach capable of affecting the country in differently. Considering the complexity of relevant concepts and their relationship with human and social issues, the development of a procedure, which can manage properly the knowledge at the organizational level, is an essential factor for the creation of competitive advantage, and it is one of the biggest expectations of every organizational manager. Based on this, the national educational system, as one of the most important social organizations responsible for training innovative and creative people, is the main source of the society's mental assets. In order to have control over the society's mental assets, use of the KM process is necessary in these kinds of firms. Universities are the major centers of knowledge production and distribution. The development of creativity and the production of modern knowledge are considered as the major functions of academic institutes. Therefore, this research aims to execute and implement KM models at Islamic Azad University, Science and Research Branch, Tehran, as one of the major knowledge production centers across the country in order to fulfill its scientific goals.

Islamic Azad University, Science and Research Branch is staffed by a highly expert and experienced people at the department of education and research, despite their high capabilities and specialties, they have not yet implemented their knowledge in an appropriate written form. In fact, converting human assets into organizational assets is a major challenge of this organization.

On the other hand, the budget allocated for the implementation of KM and the documentation of individual knowledge is not sufficient for an all-dimensional investment for KM implementation. Therefore, this study tries to test and to identify different aspects of the Hicks model, a KM implementation model, at Islamic Azad University, Science and Research Branch and rank the sub-criteria of each model using the fuzzy TOPSIS technique. Therefore, the following main questions may arise here in this research:

- ✓ What aspects influence KM implementation at Islamic Azad University, Science and Research Branch?
- ✓ How are these factors ranked using fuzzy TOPSIS technique?

## 2. Literature Review

### 2.1 Knowledge

Since knowledge is a multi-dimensional concept, the philosophers and intellectuals have studied this issue for years. The definition of knowledge covers a wide range of operative and philosophical concepts (Beckman, 1999). A few authors and activists in the area of KM have given a precise and convincing definition of knowledge. While giving a precise definition of knowledge is the prerequisite to successful management.

### 2.2 Knowledge Definitions

There are literally different definitions for knowledge and some of them may be in conflict. According to O'Dell and Grayson (1999) knowledge is what people know about customers, productions, processes, mistakes, and achievements. Van der Spek and Spijkervet (1997) stated that knowledge is a collection of experiences, insights, and rules. Others defined Knowledge as a collection of collective experiences of an organization. Andersen (1996) specified knowledge as all information and collective experiences of an organization. Ernst and Young (1998) explained knowledge as the thoughts, capabilities and information, which add value to the organization. Back (2001) specified knowledge as people's opinions and beliefs about how to solve problems of organization. According to Beckman (1997), knowledge is a set of reasonable data and information, which leads to the performance improvement, organizational problem solving and better decision making. Pentland (1995) explained knowledge as the product of a set of continuous actions, which are inside the physical and social structure of the organization. According to Davenport and Prusak (2003) knowledge is a harmonic mixture of systematic experiences, values, available information, and views, which provides a framework for evaluation and making use of new experiences and information. Delphi (1999) defined knowledge is a set of information inside people's mind. Demarest (1996) stated knowledge is a set of information, values, experiences and rules. Leonard-Barton (1995) specified knowledge as a set of related, applied information, which is relatively based on experience. In Nonaka and Takeuchi (1995)'s opinions, knowledge is a wide and justified belief. Wiig (1995) defined knowledge as the realities of concepts, judgments and procedures. Wijnhoven (1998) specified knowledge as a set of continuous experiences or abstract conceptualizations.

### 2.3 Knowledge Management (KM)

The definition of KM, because of its multi-level concepts, is a difficult task (Lee & Chio, 2003) and there has been no precise agreement for its definition. In most presented definitions of KM, the process of knowledge application has been used more often and less attention has been paid to the knowledge creation as the major element. The reason may be the lack of a systematic look at the KM. KM plays an efficient role in the society and it is successful in the production and creation of

knowledge. Therefore, KM is a combination of management, control, creativity, codification, dissemination and enforcement of the knowledge power processes for organizations. The primary objective of KM is to ensure that the applicant could have access to the relevant knowledge in a given time so that he/she could decide, properly and quickly (Daghfous, 2003).

KM is a process, which helps firms detect, select, organize, and publish necessary information. It is also an expertise for activities like problem solving, dynamic learning, dynamic planning, strategic planning, and knowledge management decision making to “do the right things” (effectiveness) rather than “do things right” (efficiency). The focus in KM is more on effectiveness and not efficiency. Efficiency without effectiveness would lead to failure, and in the long term an organization would be successful that knows the next right thing and is ready for the next move in advance (Malhotra, 2004).

#### 2.4 Hicks Model

This model was proposed in 2000 and includes the following four processes:

1. Create: The development of this capability requires the experience of knowledge sharing, making relationships among ideas and creating cross-relationship among other topics.
2. Save: This topic should incorporate the possibility of rapid information research, information access for other knowledge workers and efficient knowledge sharing.
3. Distribute: This topic leads to the development of a collective soul where individuals as coworkers feel united and dependant in pursuit of their shared goals.
4. Use/Apply: This is the most important step of KM and the ultimate goal of this process is to make use of created knowledge and its results and outputs.

### 3. Research Methodology

The present study can be considered as an applied research in terms of the goal, and descriptive co-relational in terms of the method of gathering data, and since it studies a particular society it may be considered a case-study. For gathering data, library method based on books, articles, records, internet, etc. and field study including distribution of questionnaire has been used.

Two separate questionnaires were designed to identify and to rank different aspects of KM. Both questionnaires contain 33 identical questions. The first questionnaire used a 5 point Likert scale for identification of the aspects of KM implementation, and the second one used the 7 point scale related to Fuzzy TOPSIS. The results of the KM implementation outputs are needed to rank these 33 mentioned criteria, which are regarded as the criteria for ranking scales of the sub-criteria. Then, by reviewing the literature, 11 different criteria were identified, and three of them were selected as the most important criteria including: "learning and empowerment", "Organization performance" and "Competitive advantage". The population of the present study includes 401 participants from Education and Research Department staff as well as Education and Research units of 19 faculties of the Islamic Azad University, Science and Research Branch. Because of the great number of the population, sampling method with the following formula was used for determining the sample volume (Azar & Momeni, 2005, 76).

$$n = \frac{NZ^2 \frac{1-\alpha}{2} pq}{(N-1)\varepsilon^2 + Z^2 \frac{1-\alpha}{2} pq} \Rightarrow \frac{401 \times (1.96)^2 \times (0.5)^2}{400 \times (0.05)^2 + (1.96)^2 (0.5)^2} \cong 197$$

where

P: Estimation of the proportion of variable (P= 0.5)

Z: The value of normal variable corresponding to confidence level of 95% ( $Z_{\alpha/2} = 1.96$ )

$\varepsilon$  : The amount of allowable error ( $\varepsilon = 0.05$ )

N: Finite population size (401people)

Therefore, the sample volume was decreased to 197. In this survey, 44% of the participants were women and 56% were men. Sixteen percent were 20-30 years old, 47% were 31-40 years old, and the remaining 37% were above 40 years old. Moreover, in this survey, 86% of the participants hold Bachelor degrees of science. In addition, 9% of the participants had less than 5 years of work experience, 81% had 6-15 years of work experience, and 10% had 16-25 years of work experience.

For determining questionnaire validity, content validity of the questionnaire was measured. In this survey, the questionnaires were distributed among the professors of distribution management and after removing all flaws and ambiguities, they were distributed among statistical society. In order to evaluate the reliability of the questionnaire by SPSS 16 statistical software, Cronbach's alpha reliability coefficient was calculated and the result was 0.89 which shows the high reliability of the questionnaire.

#### 4. Fuzzy TOPSIS Technique

Technique of ranking by similarity by positive ideal solution (TOPSIS) has been a classical multiple criteria decision-making (MCDM) method and it was first developed by Hwang and Yoon (1981). The selected alternative should have the shortest distance from the positive ideal solution and, on the other side, the farthest distance from the negative ideal solution (Hwang & Yoon, 1981). Fuzzy TOPSIS technique in Iran started from 1990s in a restricted form and some instances of its application are limited to the recent years. Decision making process steps by fuzzy TOPSIS technique are as follows:

Step 1: Calculating weights vector  $w_j$

Step 2: Normalizing the matrix obtained from experts opinions regarding the alternatives, which forms a new matrix as the follows:

$$\tilde{R} = [\tilde{r}_{ij}]_{m \times n} \quad (1)$$

$B \subseteq \{1, \dots, n\}$  refers to the interest indices (2) and  $C \subseteq \{1, \dots, n\}$  refers to the cost indices (3).

$$\tilde{r}_{ij} = \left( \frac{a_{ij}}{d_j^+}, \frac{b_{ij}}{d_j^+}, \frac{c_{ij}}{d_j^+}, \frac{d_{ij}}{d_j^+} \right), \quad j \in B \quad d_j^+ = \max_i d_{ij} \quad \text{if } j \in B \quad (2)$$

$$\tilde{r}_{ij} = \left( \frac{a_j^-}{d_{ij}^-}, \frac{a_j^-}{c_{ij}^-}, \frac{a_j^-}{b_{ij}^-}, \frac{a_j^-}{a_{ij}^-} \right), \quad j \in C \quad (3)$$

$$a_j^- = \min_i a_{ij} \quad \text{if } j \in C$$

Step 3: So normalized weighted matrix is calculated as Eq. (4):

$$\tilde{V} = [\tilde{v}_{ij}]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n \quad \tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j \quad (4)$$

Step 4: Determining the fuzzy positive ideal solution ( $FPIS$ ) $^{\tilde{v}_j^*}$  and fuzzy negative ideal solution ( $FNIS$ ) $^{\tilde{v}_j^-}$  (Eq. (5) and Eq. (6)):

$$\tilde{v}_j^+ = \begin{cases} \max & \tilde{v}_{ij}; j \in B \\ \min & \tilde{v}_{ij}; j \in C \end{cases} \quad (5)$$

$$FPIS = \{\tilde{v}_j^+ | j = 1, \dots, n\}$$

$$\tilde{v}_j^- = \begin{cases} \min & \tilde{v}_{ij}; j \in B \\ \max & \tilde{v}_{ij}; j \in C \end{cases} \quad (6)$$

$$FNIS = \{\tilde{v}_j^- | j = 1, \dots, n\}$$

Step 5: Calculating the distances using Fuzzy Euclidian distance:

$$D(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{4}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2 + (a_4 - b_4)^2]} \quad (7)$$

The distance of each alternative from positive and negative ideal is calculated by applying Eq. (8) and Eq. (9) as follows,

$$S_i^+ = \sum_{j=1}^n D(\tilde{v}_{ij}, v_j^+), \quad i = 1, 2, \dots, m, \quad (8)$$

$$S_i^- = \sum_{j=1}^n D(\tilde{v}_{ij}, v_j^-), \quad i = 1, 2, \dots, m, \quad (9)$$

Step 6: Calculating the relative closeness to the ideal solution and ranking (10):

$$Cc_i = \frac{S_i^-}{S_i^+ + S_i^-}, \quad i = 1, 2, \dots, m \quad (10)$$

## 5. Data Analysis

### 5.1 The Results of applying the Chi-Square test

To identify the relationship between the dimensions of knowledge management model and the implementation of knowledge management based on Hicks model at the Islamic Azad University, Science and Research Branch, Karl Pearson's Chi 2 test was applied. The results of applying this test are shown in Table 1.

**Table 1**  
Results obtained from using Chi2 test

Variables	Test Result	Sig	Chi 2	Test Result
Knowledge creation		0.021	9.531	Positive and meaningful correlation
Knowledge saving		0.012	8.425	Positive and meaningful correlation
Knowledge distribution		0.019	9.012	Positive and meaningful correlation
Knowledge application		0.022	7.625	Positive and meaningful correlation

As it is shown in Table 1, the Sig. degree for all variables is lower than research error degree (0.05) and we can confirm that there is a positive and meaningful correlation between knowledge creation, knowledge saving, knowledge distribution and knowledge application and knowledge management implementation.

### 5.2 Setting Priority of Hicks Model Elements Using Fuzzy TOPSIS Technique

In real-world situations, because of incomplete or non-accessible information, the data (attributes) are often not so definitive; rather they usually are fuzzy/ imprecise. Therefore, we try to extend TOPSIS for fuzzy data to set priority of the elements of KM implementation. The fuzzy degrees of linguistic variables for determining the weight of each criterion are shown in Table 2 (Chen, 2000). The Fuzzy decision making matrix and Fuzzy weights for the elements of KM implementation obtained by using the opinions of managers and specialists are calculated as follows: (see Table 3).

**Table 2**

Linguistic variables for determining the weight of each criterion

Very Low	VL	(0, 0, 1, 2)
Low	L	(1, 2, 2, 3)
Medium Low	ML	(2, 3, 4, 5)
Medium	M	(4, 5, 5, 6)
Medium High	MH	(5, 6, 7, 8)
High	H	(7, 8, 8, 9)
Very High	VH	(8, 9, 10, 10)

**Table 3**

Fuzzy decision making matrix and fuzzy weights

Variables	8	9	10	10	5	6	7	8	7	8	8	9
	Learning and Empowerment				Performance				Competitive Advantage			
P1	8	9	10	10	8	9	10	10	2	3	4	5
P2	7	8	8	9	2	3	4	5	7	8	8	9
P3	4	5	5	6	4	5	5	6	5	6	7	8
P4	2	3	4	5	7	8	8	9	7	8	8	9
P5	5	6	7	8	8	9	10	10	8	6	7	8
P6	7	8	8	9	8	9	10	10	5	6	7	8
P7	8	9	10	10	5	6	7	8	4	5	5	6
P8	2	3	4	5	4	5	5	6	7	8	8	9
P9	5	6	7	8	1	2	2	3	2	3	4	5
P10	2	3	4	5	5	6	7	8	7	8	8	9
P11	7	8	8	9	2	3	4	5	8	9	10	10
P12	7	8	8	9	5	6	7	8	5	6	7	8
P13	8	9	10	10	4	5	5	6	7	8	8	9
P14	7	8	8	9	4	5	5	6	7	8	8	9
P15	8	9	10	10	8	9	10	10	7	8	8	9
P16	2	3	4	5	2	3	4	5	8	9	10	10
P17	5	6	7	8	4	5	5	6	7	8	8	9

The fuzzy weighted normalized matrix is also shown in Table 4. It should be mentioned that due to the high amount of calculations, fuzzy weighted normalized matrix is not mentioned here. At the third step of decision making, fuzzy weighted normalized matrix was obtained (Table 4). It should be mentioned that due to the high amounts of calculations, fuzzy weighted normalized matrixes obtained from formulas 2 and 3 are not mentioned here. Table 4 was created using Eq. (4). At the next step, the total number of positive and negative ideal points will be obtained by using Eq. (8) and Eq. (9) the positive ideal points show the distance from positive ideal, and negative ideal points show the distance from negative ideal.

**Table 4**

Fuzzy weighted normalized matrix

Variables	Learning and Empowerment				Performance				Competitive Advantage			
P1	0.64	0.81	1	1	0.4	0.54	0.7	0.8	0.14	0.24	0.32	0.45
P2	0.56	0.72	0.8	0.9	0.1	0.18	0.28	0.4	0.49	0.64	0.64	0.81
P3	0.32	0.45	0.5	0.6	0.2	0.3	0.35	0.48	0.35	0.48	0.56	0.72
P4	0.16	0.27	0.4	0.5	0.35	0.48	0.56	0.72	0.49	0.64	0.64	0.81
P5	0.4	0.54	0.7	0.8	0.4	0.54	0.7	0.8	0.35	0.48	0.56	0.72
P6	0.56	0.72	0.8	0.9	0.4	0.54	0.7	0.8	0.35	0.48	0.56	0.72
P7	0.64	0.81	1	1	0.25	0.36	0.49	0.64	0.28	0.4	0.4	0.54
P8	0.16	0.27	0.4	0.5	0.2	0.3	0.35	0.48	0.49	0.64	0.64	0.81
P9	0.4	0.54	0.7	0.8	0.05	0.12	0.14	0.24	0.14	0.24	0.32	0.45
P10	0.16	0.27	0.4	0.5	0.35	0.25	0.36	0.49	0.64	0.64	0.64	0.81
P11	0.56	0.72	0.8	0.9	0.1	0.18	0.28	0.4	0.56	0.72	0.8	0.9
P12	0.56	0.72	0.8	0.9	0.25	0.36	0.49	0.64	0.35	0.48	0.56	0.72
P13	0.64	0.81	1	1	0.2	0.3	0.35	0.48	0.49	0.64	0.64	0.81
P14	0.56	0.72	0.8	0.9	0.2	0.3	0.35	0.48	0.49	0.64	0.64	0.81
P15	0.64	0.81	1	1	0.4	0.54	0.7	0.8	0.49	0.64	0.64	0.81
P16	0.16	0.27	0.4	0.5	0.1	0.18	0.28	0.4	0.56	0.72	0.8	0.9
P17	0.4	0.54	0.7	0.8	0.2	0.3	0.35	0.48	0.49	0.64	0.64	0.81

Therefore, the less the distance from positive ideal points and the more the distance from negative ideal points, the higher the priority of indices. The closeness coefficient obtained from Eq. (10), indicates the degree of indices' importance, that is the more the closeness coefficient, the higher the priority of the variables. The total number of positive and negative ideal points, closeness coefficient and the final ranking are also shown in Table 5.

**Table 5**

Total number of positive and negative ideal points and indices' final weights

Indices	D+i	D-i	Cci	Rank
The degree of error acceptance by the staff	1.343813341	1.81333661	0.574358722	5
Consideration of new ideas implementation	1.42459579	1.675133729	0.540412871	10
Improvement of self-reliance for implementation of good ideas	1.708184709	1.369972619	0.445062573	14
Employment of the people who value knowledge	1.543570199	1.555677888	0.501953327	12
Performance of group activities	1.328762281	1.801882354	0.575562724	4
Providing the possibility of knowledge and experience documentation of different people (into the lessons acquired during projects)	1.193679669	1.928388461	0.617663799	2
Disorder in performance of duties, responsibilities and suspension of plans due to managerial changes and substitutions	1.389091987	1.749536514	0.557420706	9
Documentation of results by the staff	1.727497652	1.358867361	0.440280834	16
Providing opportunities for exchanging ideas among university staff	2.00545541	1.091258203	0.352392355	17
Developing the culture of sharing the knowledge and ideas among staff	1.635904515	1.470160625	0.473319315	13
Creating atmosphere of interest among the university specialists for answering the questions	1.335695191	1.775581834	0.570692298	6
Holding discussion and debate meetings on business issues	1.358352771	1.758328361	0.564166909	8
Interest of the experienced people of the organization to guide beginners	1.251231212	1.877778455	0.600119097	3
Access to useful information and scientific and technical documents in time of need	1.331425107	1.757635936	0.568987117	7
Need for new and updated information and knowledge	0.994964974	2.159131819	0.68454837	1
The staff resistance against the application of new methods and knowledge	1.731767736	1.37681326	0.442907314	15
Using the earlier projects, experiences in the undertaking projects	1.46650772	1.631129829	0.526572203	11

With a look at Table 4, it is seen that the need to the new and updated information and knowledge, the possibility of knowledge and experience documentation of different people (into the lessons acquired during the projects) and the interest of the experienced people of the organization to guide beginners are the most important sub-criteria of Hicks model. In addition, knowledge sharing or



distribution with (0.600119) point degree and knowledge saving with (0.440281) point degree were selected as the most and the least important criteria of Hicks model respectively.

## 6. Conclusion and Recommendations

The purpose of the present research was to identify and rank different aspects of knowledge management implementation based on Hicks model at the Islamic Azad University, Science and Research Branch, Tehran. The Hicks model consisted of these four major criteria including knowledge creation, knowledge distribution, knowledge storage and knowledge application.

At first, a positive and meaningful correlation between the above-mentioned aspects and knowledge management implementation at Islamic Azad University, Science and Research Branch was approved, by the application of a Chi-Square test. Finally, by using the fuzzy TOPSIS technique, the elements of the Hicks model were ranked. Consequently, three factors including “The need for new and updated information and knowledge”, “The possibility of knowledge and experience documentation of different people (into the lessons acquired during the projects)” and “The interest of the experienced people of the organization to guide beginners” were selected as the most important factors for knowledge management implementation. In addition, knowledge distribution, knowledge application, and knowledge creation were selected as the most important criteria of the Hicks model of knowledge management. Considering the results of the present study, the following recommendations may be given:

There is a positive and direct correlation between knowledge creation and knowledge management implementation. Therefore, in order to create and produce a higher level of organizational knowledge, the following solutions may be addressed including: to let the staff present new ideas, to provide opportunities for the staff to participate in the decision making processes and organizational meetings held periodically, and to employ and use people who are seeking higher levels of knowledge and learning.

There is a direct and positive correlation between knowledge distribution and management implementation. Therefore, it can be recommended to hold some meetings in which people could share their ideas and opinions, benefit from the knowledge and experience of each other, and have great contributions in knowledge sharing and transfer.

There is a positive and direct correlation between knowledge storage and knowledge management implementation. The following recommendations may be given for storing the knowledge and preventing its destruction, including documentation of all the available projects and experiences, and preventing managerial changes and substitutions, which will have considerable negative impacts on the organization.

There is a positive and direct correlation between knowledge application and knowledge management implementation. The application of available documents obtained from earlier projects in the organization and providing all people with the possibility to have access to the organizational information and documents can help to increase knowledge application in this branch.

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