Identifying and Prioritizing Knowledge Management Effectiveness Indexes in the Health System of the Hospitals Affiliated to Shiraz Medical Sciences University

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Abstract

This research has been conducted with the aim of identifying and prioritizing the effectiveness indexes of knowledge management in the health systems of the hospitals affiliated to Shiraz Medical Sciences University. Due to the importance of knowledge in today's organizations, it is essential to emphasize knowledge management in organizations. The identification of the components affecting knowledge management can also be used as a strategy for accurate planning toward knowledge management in organizations. We used librarian method in this research in order to identify the effective components of knowledge management and identified nine influential indexes in knowledge management after we reviewed and studied the valid foreign and internal books and articles. 28 managers and assistants of the hospitals affiliated to Shiraz Medical Sciences University were selected in this research as the statistical sample. We used one of the multi-criteria decision-making techniques in order to professors the knowledge management components. We utilized Fuzzy TOPSIS Technique for this purpose, as one of the valid and reliable methods in multi-criteria decision-makings. After distributing and collecting the research questionnaire, we analyzed the data, which showed that the component "knowledge interaction" is the most important component in ranking with the coefficient of 0.021.

Introduction

Along with the development of medical technologies and improvement of the health systems, knowledge has turned into the vital and strategic resource of hospitals. By use of knowledge management, the extraction and application of knowledge resources in hospitals will improve and the service-giving level of medical services will be promoted. Hospitals knowledge management is a continuous management process that manages all types of knowledge in the hospitals, but there is a unique standard for explicit and tacit knowledge in hospitals that is challenged by management. Therefore, in order to promote the management level of hospitals, it is very important to find answers to the existing problems in creating, evacuating, sharing, using and internalizing knowledge (Lee et al., 2012). Determining an effective and reliable evaluation system in hospitals by managers is a way of promoting the hospitals knowledge managers in future and is regarded as an effective factor in performance management. Nowadays, the strategic planning of organizations includes a movement towards the new areas of business, market, technology and services, and it requires employees' new skills. The faster the employees achieve the skills and competencies needed, the better chance there will be for the organization to achieve its strategic goals. Therefore, the overall capability of an organization in attracting, classifying and learning information and in converting it into knowledge capital is an important factor in advantage maintenance (Anvari Rostami & Shahaei, 1388).Obviously, in the temporary knowledge-based economy, knowledge is known as a strategic vital resource. The acquired knowledge and information in state institutions have been obtained for long years of the life of government, for which abundant valuable resources and facilities of the country have been used up, in such a way that many experts and managers have spent their lives acquiring these knowledge and experiences. The lack of maintaining and applying these knowledge and experiences again causes the organizations to consume the resources of the country for testing what has already been tested in order to achieve their missions and goals. Obviously, such rework will drive the use of the country's budget in directions which will deviate the country from the sustainable development path (Rahnavard & Mohammadi, 1388).Knowledge management in hospitals is a continuous management process that not only manages all types of knowledge in hospitals, but it also creates a unique standard for explicit and tacit knowledge in hospitals, which is challenged by the management. Therefore, in order to enhance the management level of hospitals, it is important to find answers to the problems existent in creating, evaluating, sharing, using and internalizing knowledge. Determining an effective and reliable evaluation system in hospitals by managers is a way of promoting the hospitals knowledge managers in future and is regarded as one effective factor in performance management (Hongying & Qian, 2011).

The necessity of knowledge management is justified by the important role of knowledge in realizing the objectives of the health system. Almost all health, medical, educational, research, supervisory, productive and management activities in the health system are largely based on expertise and sophisticated skills. In order to design a knowledge management system or to enhance its level in an organization, one should first obtain full information about the nature and importance of knowledge and knowledge management in the organization, and then pay particular attention to the backgrounds of success and how to establish interaction and balance among the factors by recognizing the components and their functions in order to achieve the strategic benefits of implementing knowledge management in the organization (Kiamehr, 1385). Considering this, it is obvious that the Health and

Medical Ministry has tolerated abundant damages over past years due to its lack of utilizing the knowledge management systems and executing the knowledge management system in its organizations and hospitals. If the previous managers' knowledge, information and experiences remain in the knowledge memory of hospitals, and knowledge management is transferred to the new management team using an efficient and effective system, one may hope that these new knowledge projects will be accomplished by new managers and the mentioned damages will be minimized.The purpose of the present research is to identify and prioritize the effectiveness indexes of knowledge management. The research will first try to identify and give a full explanation of the variables and will then rank the identified variables in terms of their degree of importance in effectiveness of knowledge management.

Literature

Knowledge Management

Complexity, diversity and rapid and increasing changes which are some distinguishing features of today's environment of organizations have brought about such conditions that ignoring it will remove any organization from the competition or even life. Today, organizations have found that nothing like knowledge can place them in the desirable competitive world. Therefore, organization employees are paid attention to as the owners of knowledge and the most important capital of organizations (Ahmin, 2008). Knowledge management is the process of finding, selecting, organizing and presenting knowledge, which helps organizations to get the needed insight and understanding of their experiences. It should be noticed that knowledge management is something endless, which keeps helping organizations in changes and requires permanent support and attention.

In the information era, knowledge is the most important factor of achieving ling-term success for an individual or organization. In fact, some researchers believe that the only resource of competitive advantage is the knowledge possessed by an organization, and an organization's ability in faster learning.

Tacit and Explicit Knowledge

Palanyi divided human knowledge into two categories in 1966: explicit knowledge and tacit knowledge. This classification is one of the most popular divisions referred to frequently in knowledge management literature (Yusofi & Feizi, 1391). Explicit or encoded knowledge is the knowledge that can be transferred in the form of systematic and formal linguistic and exists in the form of models, frameworks, figures and tables. On the other hand, tacit knowledge has individual characteristics, which distinguish its systematicity and transferability. According to Polanyi, tacit knowledge lies in the comprehensive knowledge of human body and mind; while explicit knowledge can be stored in the treasures of libraries, archives and databases and evaluated on a sequential basis (Ahmadi & Salehi, 1390).In most organizations, tacit knowledge is rarely exchanged or shared. Therefore, when an individual possessing this knowledge leaves the organization, this type of knowledge is also removed and this is why the benefits of tacit knowledge are not considered long-term benefits. This knowledge is rare, irreplaceable, non-imitable, and valuable. The clear difference between tacit knowledge and explicit knowledge was first expressed by Michael, the Hungarian chemist, economist and philosopher. He asserted that personal or tacit knowledge is very important for human knowledge acquisition, because individuals acquire knowledge by (re)creating and organizing their activities actively, and the knowledge expressed by words is only a part of the floating iceberg (Valente & Breuker, 1998).

Definitions of Knowledge Management

Hoagie & Kingston: Knowledge management is the deliberate and conscious design of processes, tools and structures by the Internet with the aim of increasing renovation, sharing, improving and using knowledge in the structural, social and human elements of intelligent capital (Adli, 1384).

Malhotra: knowledge management is doing right things rather than doing things right. The emphasis is on effectiveness rather than efficiency, as efficiency without effectiveness will lead to the organization's failure. Enterprises which know the next right thing and are already prepared to ride on the next wave will be successful in the long term (Adli, 1384).

Baghaeinia (1386): knowledge management is the use of individual and collective experience and knowledge through the processes of knowledge production, knowledge sharing and knowledge use by help of technology in order to achieve the organization's goals (Alam Tabriz & Bagherzadeh, 1387).

Afrazeh (1383): knowledge management is the process of discovering, developing and creating, sharing, maintaining, evaluating and applying appropriate knowledge at the right time by a right individual in the organization, which occurs by linking the human resources, information and communication technology, and by creating an appropriate structure for access to organizational goals (Alam Tabriz & Bagherzadeh, 1387).

Effectiveness Indexes of Knowledge Management

We have used librarian studies method in this research in order to identify knowledge management effectiveness indexes. For this purpose, we reviewed the books and articles related to knowledge management and then selected the criteria included in a large number of books and articles and used by researchers as variables or components for measuring knowledge management effectiveness. We identified 11 indexes used in most issues related to knowledge management and used them as knowledge management effectiveness indexes in this research. These criteria have been shown in Table 1.

Table 1. Knowledge Management Indexes

English References	Persian References	index
Abled Naaser (2012) Kant & Singh (2008) Patil & Kant (2012) Nonaka & Takeuchi (1995)	Sohrabi et al. (1398) Shafiei Nikabadi (1391) Ahmadi & Salehi (1390)	**Organizational structure**
Abled Naaser (2012) Done (2011) Nonaka & Takeuchi (1995)	Ekhvan et al. (1389) Hassanzadeh (1389) Ahmadi & Salehi (1390)	**Organizational culture**
Abled Naaser (2012) Nonaka & Takeuchi (1995)	Khani & Nadi (1390) Ahmadi & Salehi (1390)	**Information technology**
Ahmin (2008) Fiala (2005)	Shafiei Nikabadi (1391) Alam Tabriz & Bagherzadeh (1387)	**Organizational effectiveness**
Ahmin (2008) Done (2011) Kant & Singh (2008)	Hosseini & Yadranji (1388) Ekhvan et al. (1390)	**Knowledge strategies**
Abled Naaser (2012) Fiala (2005) Nonaka & Takeuchi (1995)	Sohrabi et al, (1398) Ahmadi & Salegi (1390)	**Human resources**
Abled Naaser (2012) Nonaka & Takeuchi (1995)	Rohani & Doaei (1391) Khani & Nadi (1390) Ahmadi & Salehi (1390)	**Knowledge acquisition**
Abled Naaser (2012) Ahmin (2008) Patil & Kant (2012)	Hosseini & Yadranji (1388) Ahmadi & Salehi (1390) Ekhvan et al. (1390)	**Knowledge sharing**
Abled Naaser (2012) Done (2011) Kant & Singh (2008) Nonaka & Takeuchi (1995)	Hassanzadeh (1389) Ahmadi & Salehi (1390) Ekhvan ey al. (1390)	**Knowledge application**
Abled Naaser (2012) Fiala (2005) Kant & Singh (2008) Nonaka & Takeuchi (1995)	Shafiei Nikabadi (1391) Khani & Nadi (1390) Ahmadi & Salehi (1390) Alam Tabriz & Bagherzadeh (1387)	**Knowledge storage**
Abled Naaser (2012) Patil & Kant (2012) Nonaka & Takeuchi (1995)	Hassanzadeh (1389) Ahmadi & Salehi (1390)	**Knowledge maintenance**

Research Method

This research aims to identify and prioritize knowledge management effectiveness indexes in the health systems of the hospitals affiliated to Shiraz Medical Sciences University. For this purpose, we tried to identify the components of knowledge management using librarian method, and then used the standard questionnaire related to Fuzzy TOPSIS Technique in order to prioritize the criteria using experts' views. The statistical population and sample of this research include 28 managers and assistants of 14 hospitals affiliated to Shiraz Medical Sciences University. Because of the small population of the research, the population number is equal to the sample size. We used the viewpoints of experts and professors of the research subject and the questionnaire in order to estimate the validity of the questionnaire and its items. We used Cronbach's alpha coefficient to measure the reliability of the questionnaire, which involved measuring the variance of the scores of each subset of the questionnaire items first and measuring the total variance after that. The Cronbach's alpha of this research has been shown in Table 2.

Table 2. Reliability of the questionnaire

Cronbach's alpha coefficient	questionnaire	row
0/783	The standard questionnaire of Fuzzy TOPSIS	**1**

Fuzzy TOPSIS Technique

In an article called "Extension of the TOPSIS for Group Decision-making Fuzzy Environment", Chen (2000) used TOPSIS Technique with fuzzy approach. In order to do the TOPSIS Technique calculations under fuzzy environment, one should first a linguistic scale for data collection. Chen (2000) proposed a seven-point linguistic scale for rating each item based on a criterion. It is also possible to use decision matrix for ranking the degree of importance of the criteria with a technique like Entropy Technique. Therefore, Chen has proposed a similar scale for rating the criteria. It has also been explained in TOPSIS Questionnaire design that nine-point Likert Scale is used for the qualitative evacuation of alternatives in TOPSIS Technique with final numbers, while seven-point scale is used in the qualitative evacuation of alternatives in fuzzy TOPSIS Technique. Chen's proposed seven-point scale in evacuation of alternatives for fuzzy TOPSIS Technique is in the following way:

Table 3. Triangular fuzzy numbers
Triangular fuzzy numbers equivalent to seven-point scale for evaluation of alternatives (Habibi et al., 1393:125)

fuzzy equivalent	Linguistic variable
(0,0,1)	Very poor
(0,1,3)	Poor
(1,3,5)	Medium poor
(3,5,7)	Fair
(5,7,9)	Medium good
(7,9,10)	Good
(9,10,10)	Very good

The triangular fuzzy scale is shown below:
  Triangular fuzzy numbers equivalent to seven-point scale for evaluation of alternatives (Habibi et al., 1393:125)
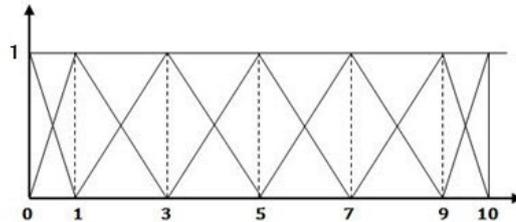
Fuzzy TOPSIS Technique algorithm
1- Forming decision matrix
Decision matrix refers to the matrix of evaluation of m alternatives in terms of n criteria. In this matrix, each alternative is given a score based on each one of the criteria. In fuzzy TOPSIS Technique, a triangular fuzzy number is given to each alternative in terms of each criterion.
2- Normalizing direct relation matrix
If each element of decision matrix is shown with x, and each element of normal matrix is represented with n, the matrix can then be normalized using the following formula:
If the criterion has positive load, we will have this formula:
If the criterion has positive load, we will have this formula:
If the criterion has negative load, we will have this formula:
3- Calculating weighted normal decision matrix
Fuzzy weighted unscaled matrix should be formed in the third step. In general, the unscaled matrix should be turned into weighted unscaled matrix in this step. This matrix is displayed with the sign $\tilde{V}$. The weight of each one of the indexes is calculated using FAHP Technique, Entropy Technique and others.

$$\tilde{n}_{ij} = \left(\frac{l_{ij}}{u_j^*}, \frac{m_{ij}}{u_j^*}, \frac{u_{ij}}{u_j^*}\right)$$

$$u_j^* = max\ u_{ij}$$

$$\tilde{n}_{ij} = \left(\frac{l_j^-}{u_{ij}}, \frac{l_j^-}{m_{ij}}, \frac{l_j^-}{l_{ij}}\right)$$

$$l_j^- = min\ l_{ij}$$

Results
Ranking Alternatives
The alternatives can be ranked based on a descending order. Any alternative with greater CC is actually considered a better alternative. The results have been shown in Table 4.

Table 4. Ranking the alternatives

rank	CC	Distance to negative ideal	Distance to positive ideal	alternatives	row
5	0.018	0.534	28.492	structure	1
4	0.019	0.54	28.484	culture	2
3	0.02	0.574	28.451	Knowledge acquisition	3
6	0.018	0.533	28.491	technology	4
1	0.021	0.601	28.42	Knowledge interaction	5
2	0.02	0.58	28.442	knowledge application	6
7	0.018	0.527	28.498	knowledge protection	7
8	0.016	0.454	28.574	effectiveness	8
9	0.015	0.447	28.577	strategy	9

Ranking the alternatives with Fuzzy TOPSIS Technique
The results of ranking the alternatives using Fuzzy TOPSIS Technique suggest that the alternative "knowledge interaction" has the highest priority of all alternatives.
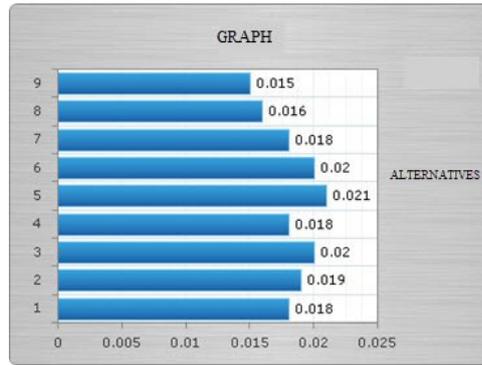
Graph 1. Ranking the alternatives

Findings

This research, called "identifying and prioritizing knowledge management effectiveness indexes in the health system of the hospitals affiliated to Shiraz Medical Sciences University" has been conducted with the main aim of identifying and prioritizing the components of knowledge management in the hospitals affiliated to Shiraz Medical Sciences University. We researched and reviewed new and authentic sources in order to identify the components effective in knowledge management, and then identified nine components with the highest frequency in the foreign and internal books and articles. Then, we distributed the standard questionnaire of Fuzzy TOPSIS Technique among the managers and assistants of the hospitals affiliated to Shiraz Medical Sciences University. The results of ranking knowledge management components have been shown in the following table.

Table 5. Results of ranking knowledge management components

rank	alternatives	row
5	structure	1
4	culture	2
3	Knowledge acquisition	3
6	technology	4
1	Knowledge interaction	5
2	knowledge application	6
7	knowledge protection	7
8	effectiveness	8
9	strategy	9

Suggestions based on the research findings

- Based on the information obtained from Fuzzy TOPSIS Technique, the component "knowledge interaction" had the first rank of importance in experts' view. Regarding the knowledge interaction with the managers of the hospitals affiliated to Shiraz Medical Sciences University, it is suggested that the use of the Internet, Intranet, and Automation will lead to knowledge interaction. Adequate and accurate reporting by the organization to the employees, building a library and study hall, holding conferences, regular getting-together, lectures and educational meetings will increase knowledge dissemination.
- The component "knowledge application" is in the second rank of importance. It is recommended to the managers of the hospitals affiliated to Shiraz Medical Sciences University regarding this domain that application of knowledge can lead to the creation of new knowledge. Using obvious methods, the organization should develop the knowledge obtained and use it to create patterns in the future of the organization. Managers should provide conditions so that the users can utilize the existing conditions.
- The component "knowledge acquisition" is in the third rank of importance. It is suggested to the managers of the hospitals affiliated to Shiraz Medical Sciences University regarding this component that the most important factor in the success of knowledge management in an organization is knowledge achievement. The organization should pay much attention to this factor and pave the way for knowledge achievement. The organization can achieve its required knowledge by creating cooperation between the intra- and inter-organizational subjects.

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