

# Selection of Appropriate Technology for Knowledge Acquisition and Application Processes Using Fuzzy AHP (Case Study: Insurance Companies)

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## Abstract:

Knowledge management has created the new era of dramatic changes in managerial discourse. Given that knowledge management does not suffice to know the code and documented alone, many organizations around the world rely on their implicit knowledge and enhance their competitive position in seeking to improve their effectiveness and efficiency. In knowledge management, acquiring and application processes of knowledge are in order to achieve individual and organizational goals. Knowledge management is based on three pillars: people, processes and technology. Between these three factors, technology has created great changes in knowledge management system in the last two decades. Due to the increasing use of information technology in organizations, knowledge management and its use is increasing. Technologies, such as local area networks (LAN), Intranet, Internet, email, databases, and organizations, all have played an important role in knowledge management. On the other hand, capabilities such as more accessible, offering advanced applications and the decreasing cost of computer equipment increased the role of information technology support for knowledge management and it leads to significant improvements in behavior intelligence and knowledge-based organizations and individuals. Further analysis on the emerging technologies such as Internet-based systems, facilitate the distribution of knowledge and knowledge management, But this attitude is that these technologies are indeed anti-knowledge and knowledge management and information may not only lead to the accumulation of knowledge, So knowledge management facing challenges vague and non-systematic. Given that a few studies Has been in the field of knowledge management in insurance companies, In this research we focus on select the most appropriate technology for Knowledge acquisition and application processes in insurance companies and with Offering a perspective on knowledge and manage it, investigate the role of information technology in knowledge management and evaluate and select appropriate technology using fuzzy AHP.

**Keywords:** knowledge management, information technology, technology choice, Fuzzy Analytical Hierarchy Process.

## 1. Introduction:

Today, knowledge is recognized as an organizational important source that is very helpful in earning competitive advantage in organization. The management of knowledge assets in today's organizations has become a challenge. The role of information technology in knowledge management for organizations that want to benefit the opportunity of the new technologies emergence to improve their knowledge managing is very considerable and imposing [Alavi et al., 2001; ebgo et al., 2002]. In recent years, significant advances in information technology field have been conducted that provide new possibilities for knowledge management. Information technology is referred to suite of tools, methods and production techniques, processing, storage and dissemination of information [Abadi et al., 2010; Mansel 1999]. states one of the capabilities of information technology is to support technical and scientific knowledge sharing and the change of social and economic norms [4]. Indeed, what has caused facilitation of knowledge management process and its changing into a competitive advantage is the role of supporting of the technology (the increasing availability and accelerating knowledge transfer) [Afraze, 2012]. The capability of information technology to search, index, integration, archiving and data transfer can create a change in gathering, organizing, ratings and disseminating information. There are two divergent perspectives in the understanding of knowledge management that each of them is following by a different perspective on understanding the concepts and implementation of knowledge management. The first perspective is the perspective which is focused on information technology and the second one is concentrated on employees [Akhgar et al., 2011].

Technologies such as relational databases management systems, document management systems, internet, intranet, search engines, workflow tools, performance support systems, decision support systems, data analysis, data warehousing, e-mail, video-conferencing, bulletin board, newsgroups and discussion boards can

play a major role in facilitating the knowledge management .Furthermore, the information technology by playing the enabling role is recognized as one of the important infrastructures in implementing the knowledge management process.In other words, the greatest factor of the success of knowledge management in the present age is the capacities that information technology provides for it.The use of technology in knowledge management is not new and the analyzable results are provided by the original pioneers of this issue [Arasteh, 2010].

Considering the importance of knowledge management in today organizations, it is recognized as a necessity for these organizations .Few research studies have conducted regarding the evaluation of appropriate technology for knowledge management in organizations and companies, in previous studies the knowledge conversion is discussed in Nonaka and Takeuchi model, but no classification has been done accordance with the processes of knowledge management in that [Lin et al., 2008]and the present research can complete previous studies by categorizing and classifying the appropriate technology for knowledge management in insurance companies .In other words, the aim of this study is to define and identify acquisition process and the application of knowledge management and information technology separately an din detailed and after doing that, in accordance with the acquisition section and the application of knowledge management process and also each of the four stages of conversion process of Nonaka and Takeuchi knowledge(Socialization, building exterior, building interior, and composition),information technology and convenient tool that is used in insurance companies, is identified and in the end a model is designed for it.

## 2. Research Literature:

### 2.1 Knowledge Management:

Nonaka and Taguchi used the term knowledge management for the first time and suggest that the knowledge management of the process of discovery, acquisition, development and creation, sharing, storage, evaluation and application of knowledge in organization is through creating a proper link between human resources and technology and creating an appropriate structure to achieve the goals of the organization [Holtshouse, 1998].The studies conducted in organizations in which knowledge management forms the basis of organizational principles showed that most utilization of the organizations are determined by knowledge acquisition and sharing, training and organizational learning, improving relationships with customers and creating a competitive advantage [Ajdari, 2011]. According to study was conducted by Alavi and Lidner (1999) achieving the concept of knowledge management, the three dimensions of information, technology and culture are displayed .The knowledge management aspects are depicted in Figure 1 [Fowler, 2000].

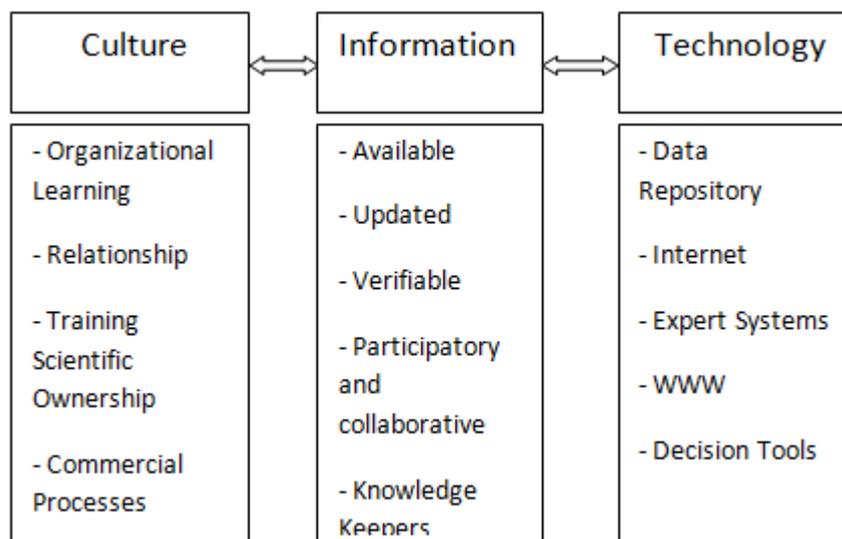


Figure 1. Dimensions of Knowledge Management

Reviewing the knowledge management literature ,we can observe the agreement on the following basic steps [Alavi et al., 2001; Shin et al., 2001]:

**1- Acquisition and Creating Knowledge:** Acquisition and creating organizational knowledge involves developing new content or replacing existing content by implicit and explicit knowledge of organization

.Knowledge is created and shared through collective and social processes as well as individual cognitive processes and in addition is strengthened and established in organizational framework.

**2- Application of Knowledge:** An important part of the knowledge theory is that not knowledge itself, but rather the application of existing knowledge in the organization is the competitive advantage factor .The knowledge technology can facilitate application of knowledge through the institutionalization of knowledge in organizational work practices and also cultural practices can be established in such a way in the information technology that these systems themselves be considered as examples of organizational norms.

**2.2 Information Technology in Knowledge Management:**

In recent years a tremendous growth has occurred in the fields of technologies and knowledge management tools .Choosing the technology of knowledge management, especially for small and medium companies, has become a major challenge .Choosing the technology is important because it causes to obtain the systems and components which help the organization in creating competitive advantage, more efficient processes and creating newer product solutions .The new technologies can present better opportunities to organizations and in this respect the importance of choosing the right technology in the organizations is recognized [Taleghani, 2013].In table 2, the stage of knowledge management process ,the used system in each stage, mechanisms and technologies of each stage are presented [Irma et al., 2010].

**2.3 Technologies of knowledge management in insurance companies:**

In relation to knowledge management in Iran insurance industry, the basic strategy is the optimal use of available technologies in organization in order to apply and better use of knowledge in the company[Taleghani, 2013].For example the existence of an insurance integrated system for doing the process of issuing and paying fines to insurers could be pointed out .This causes more increases of confidence in issuing and paying fine to insurers and decreases of the possibility of manipulating in the whole process of issuing and paying policy and the possibility of abusing the process of policy issuing and paying which finally will boost the accuracy of insurance operation .Although the factors such as affordable rate, good service, reasonable network, informing, and advertising for attracting customers have the major roles ,but the use of information technology can be stated as one of the key secrets of success in insurance companies business .The role of information technology in the insurance industry in terms of the role and impact of information technology in the process of insurance operations and its impact on insurance penetration in the country and the role of statistics and accurate and timely data in the quality of insurance companies governing are very important[Hassanzadeh, 2012].

**Table 1 - Stages of knowledge management, systems, mechanisms and technologies**

Technologies	Mechanisms	The Knowledge Management Sub-Processes	Knowledge Management Systems	Knowledge Management Processes
<ul style="list-style-type: none"> <li>• Database</li> <li>• data Analysis</li> <li>• Data Storages</li> <li>• E-mail</li> <li>• Web Portals</li> </ul>	<ul style="list-style-type: none"> <li>• Meetings</li> <li>•Telephone conversation</li> <li>•Documents</li> <li>• Creating collaborative documents</li> </ul>	<ul style="list-style-type: none"> <li>• Combination</li> </ul>	<b>Knowledge Discovery System</b>	<b>Knowledge Discovery</b>
<ul style="list-style-type: none"> <li>• Video Conference</li> </ul>	<ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• Conferences</li> </ul>	<ul style="list-style-type: none"> <li>• Socialization</li> </ul>		
<ul style="list-style-type: none"> <li>• Case Argument</li> <li>• Decision Support Systems</li> <li>• Capture and Transfer for knowledge Experts</li> </ul>	<ul style="list-style-type: none"> <li>• Traditional Organizational Relationships</li> <li>• Support Center</li> <li>• Outreach team</li> </ul>	<ul style="list-style-type: none"> <li>•Routines</li> </ul>	Knowledge Application System	<b>Knowledge Application</b>
<ul style="list-style-type: none"> <li>• Expert System</li> <li>• Organization Resource Planning Systems</li> <li>• Information Management System</li> </ul>	<ul style="list-style-type: none"> <li>• Organizational Policies</li> <li>• Standards</li> </ul>	<ul style="list-style-type: none"> <li>• Guidance</li> </ul>		

### 3. Research Methodology:

The purpose of this study is to select and actually prioritize the technologies of each stage of knowledge management processes in the insurance companies. Considering that in the most reviewed research literature the processes of (acquisition and application of knowledge) had the highest frequency, these two processes are placed in this conceptual model for different stages of knowledge management. Furthermore, technologies comparison criteria (technology selection criteria) are used in the next level that these criteria also by considering reviewed research literature have been placed on this model. Considering that the numbers of these criteria were very high, some of the most important selection criteria are used in experts' point of view for designing the conceptual model and finally some technologies are mentioned for the third level of conceptual model that have the maximum number of frequency in the research literature. After studying and reviewing the literature and consultation with experts it is decided to use the fourth level hierarchy. Since we are faced with the problem of decision making in the time of choosing, thus the conceptual model can benefit from a method of decision making. Due to the inherent ambiguity and multi criteria concepts which are existed in the definition of knowledge management, fuzzy logic and linguistic variables can be considered as good practice to select knowledge management technology that here, the fuzzy analytic hierarchy method for designing a conceptual model which is a kind of decision-making methods is used for selection technology in knowledge management. On the first level, the goal means selecting the most appropriate technologies of each step of the knowledge management processes was placed in insurance companies, the next level includes two stages of the knowledge management process which according to the research literature, 2 stages of (acquisition and application) are considered that are referred as knowledge management life cycle in many papers. For comparing and prioritizing the final options which are the same knowledge management technologies, those criteria were needed that be placed in third level. Thus the technology selection criteria were placed in the third level. Furthermore, at the final Level that is the place of options which should be compared to each other, after studying and reviewing written articles existed in the field of knowledge management technologies, the technologies that were mentioned in many books and articles were included in the final level. After formation of the hierarchical structure, we can do paired comparisons between the components through of both the matrix and the questionnaire. Finally, the final weight of each component and desired options prioritizing and adoption rates can be calculated by the software of Expert Choice 11 and Excel. In the hierarchical model which is shown in the below figure, for the selection of technology in the process of knowledge acquisition, the goal is the same technology selection in the first level, the technology selection criteria in the second-level, and the options means the same knowledge acquisition process technologies are brought in the last level.

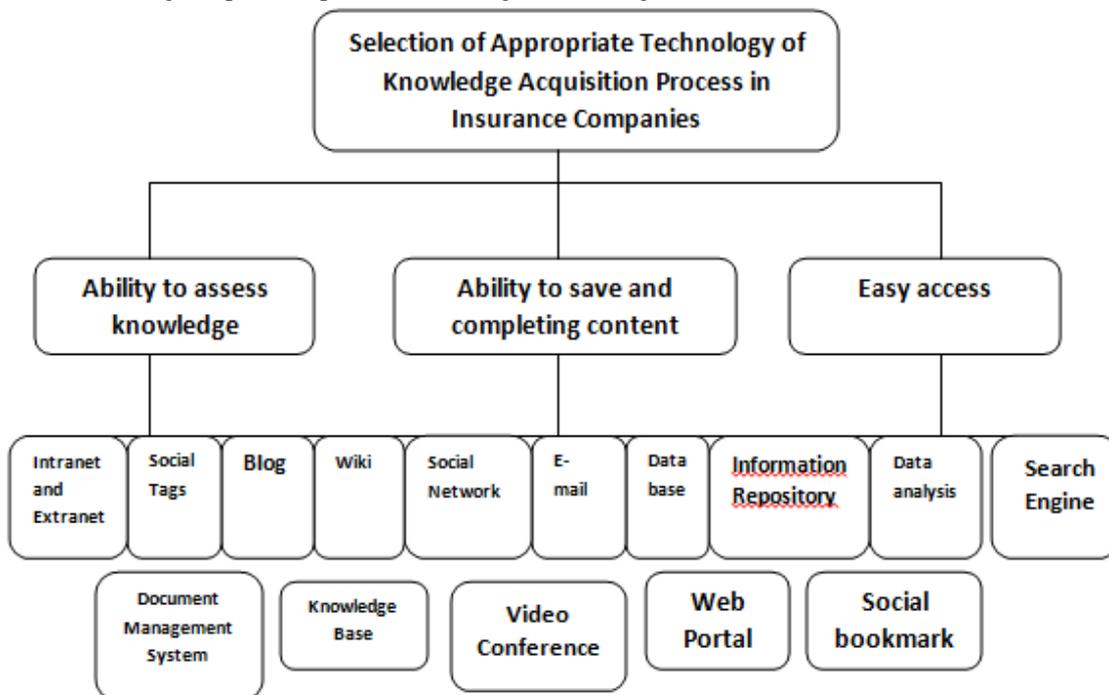


Figure 2. The initial model for the knowledge acquisition process

In the hierarchical model which is shown in the following figure, for the selection of technology in the process of knowledge application, the goal is the same technology selection in the first level, the technology selection

criteria in the second-level ,and the options means the same knowledge application process technologies are brought in the last level.

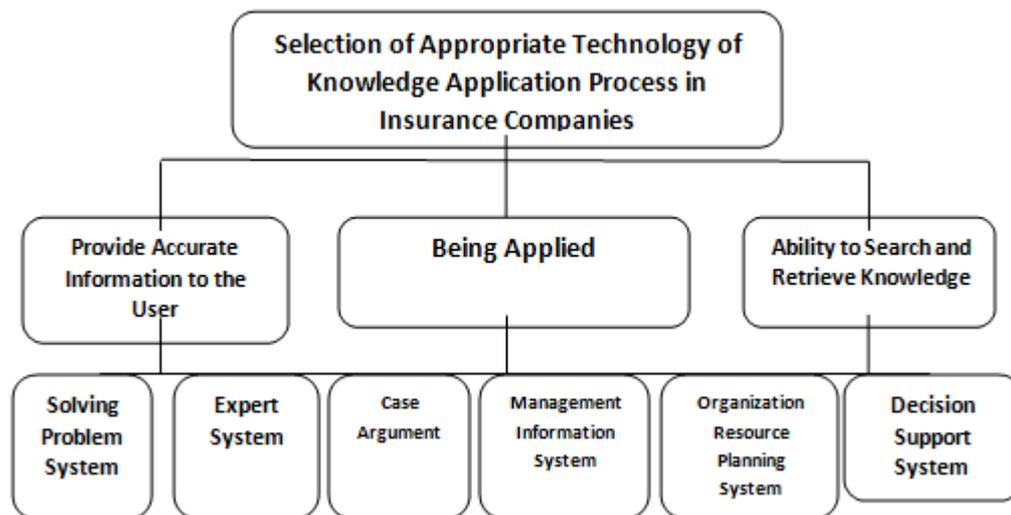


Figure 3.The initial model for the knowledge Application process

### 3.1 Data Collection:

The populations of this study are academic experts and IT experts of insurance companies that are used in poll of selecting the appropriate technology of knowledge management.The university experts Include professors who their field of study and researchwasknowledge management and also are familiar with information technology and the sampling method of them had been purposeful first and then snowball.The sample size was 11 academic experts .Insurance companies' experts also include individuals who are working in the information technology section of insurance companies.In this study, sampling method of the insurance companies IT experts had been purposeful. Furthermore, the sample size was 56 people who are selected from 10 insurance companies.

### 4. Data Analysis:

Criteria weights of technology selection and alternatives mean the same technologies of knowledge acquisition and application process are achieved through fuzzy analytic hierarchy technique using the questionnaire of paired comparisons that were answered by academics experts and IT experts of insurance companies.The obtained weights are presented in Tables 2 to 9.

Table 2. Fuzzy and Non-fuzzy Weights of Criteria for Selecting Appropriate Technology of Knowledge Acquisition Process

Selecting Appropriate Technology of Knowledge Acquisition Process	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Easy Access	(1.816, 2.159, 2.517)	(0.431, 0.601, 0.828)	0.599248399
Ability to Save and Complete Content	(0.794, 0.944, 1.144)	(0.188, 0.263, 0.376)	0.265626345
Ability to Assess Knowledge	(0.137, 0.491, 0.551)	(0.104, 0.137, 0.181)	0.13725687

Table 3. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria for Search and Retrieval the Knowledge

Easy Access	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Search Engine	(0.335, 0.623, 1.027)	(0.015, 0.034, 0.072)	0.03295394
Data Analysis	(0.780, 1.729, 2.289)	(0.033, 0.095, 0.161)	0.08012187
Data Storage	(1.204, 1.358, 1.604)	(0.052, 0.074, 0.113)	0.075870151
Database	(1.873, 2.589, 3.147)	(0.080, 0.142, 0.221)	0.136386127
E-mail	(1.110, 1.290, 1.628)	(0.048, 0.071, 0.114)	0.072946346
Social Network	(0.817, 1.033, 1.378)	(0.035, 0.057, 0.097)	0.057894602
Wiki	(0.541, 0.641, 0.837)	(0.023, 0.035, 0.059)	0.03645158
Blog	(0.416, 0.616, 0.793)	(0.018, 0.034, 0.056)	0.032373883
Social Tag	(0.348, 0.394, 0.481)	(0.015, 0.022, 0.034)	0.022264085
Intranet and Extranet	(0.526, 0.622, 0.778)	(0.023, 0.034, 0.055)	0.034898134
Social Bookmark	(0.336, 0.394, 0.579)	(0.014, 0.021, 0.041)	0.023416726
Web Portal	(0.992, 1.261, 1.604)	(0.043, 0.069, 0.113)	0.069409595
Video Conference	(0.489, 0.664, 1.008)	(0.021, 0.036, 0.071)	0.037938798
Knowledge Base	(1.946, 2.158, 2.579)	(0.083, 0.118, 0.181)	0.12168165
Document Management System	(2.523, 2.876, 3.548)	(0.108, 0.158, 0.249)	0.162336393

Table 4. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria of Being Applied

Ability to Save and Complete Content	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Search Engine	(0.344, 0.407, 0.496)	(0.016, 0.021, 0.029)	0.021605462
Data Analysis	(1.296, 1.391, 1.487)	(0.060, 0.072, 0.088)	0.072904486
Data Storage	(1.858, 2.361, 2.716)	(0.086, 0.123, 0.161)	0.119777606
Database	(2.317, 2.458, 2.650)	(0.107, 0.129, 0.157)	0.12959452
E-mail	(0.478, 0.634, 0.768)	(0.022, 0.033, 0.046)	0.032302179
Social Network	(0.610, 0.679, 0.762)	(0.028, 0.035, 0.045)	0.035753515
Wiki	(0.667, 0.861, 1.036)	(0.031, 0.045, 0.061)	0.044141709
Blog	(0.855, 1.002, 1.168)	(0.039, 0.052, 0.069)	0.052488165
Social Tag	(0.308, 0.375, 0.458)	(0.014, 0.020, 0.027)	0.019712581
Intranet and Extranet	(0.586, 0.621, 0.679)	(0.027, 0.032, 0.040)	0.032964325
Social Bookmark	(0.303, 0.380, 0.449)	(0.014, 0.020, 0.027)	0.019573087
Web Portal	(1.531, 1.618, 1.740)	(0.071, 0.084, 0.103)	0.085365472
Video Conference	(0.660, 0.733, 1)	(0.030, 0.038, 0.059)	0.041222545
Knowledge Base	(2.552, 2.945, 3.282)	(0.118, 0.154, 0.195)	0.152607494
Document Management System	(2.486, 2.656, 2.968)	(0.116, 0.139, 0.176)	0.141353447

Table 5. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria of Offering the Right Information to the User

Ability to Assess Knowledge	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Search Engine	(0.786, 0.890, 1.035)	(0.039, 0.049, 0.063)	0.049737395
Data Analysis	(1.977, 1.991, 2.032)	(0.098, 0.110, 0.125)	0.110647731
Data Storage	(1.140, 1.408, 1.808)	(0.056, 0.078, 0.111)	0.07897226
Database	(2.195, 2.226, 2.237)	(0.109, 0.123, 0.137)	0.122785223
E-mail	(0.959, 1.066, 1.249)	(0.047, 0.059, 0.077)	0.060074391
Social Network	(0.549, 0.914, 1.306)	(0.027, 0.051, 0.080)	0.048106375
Wiki	(0.549, 0.592, 0.624)	(0.027, 0.032, 0.038)	0.032528616
Blog	(0.674, 0.780, 0.911)	(0.033, 0.043, 0.056)	0.043333753
Social Tag	(0.395, 0.427, 0.452)	(0.019, 0.024, 0.028)	0.023499086
Intranet and Extranet	(0.412, 0.470, 0.514)	(0.020, 0.026, 0.031)	0.025690858
Social Bookmark	(0.338, 0.365, 0.435)	(0.017, 0.020, 0.027)	0.020921784
Web Portal	(0.981, 1.153, 1.306)	(0.048, 0.064, 0.080)	0.063053583
Video Conference	(0.682, 0.751, 0.853)	(0.034, 0.041, 0.052)	0.042040749
Knowledge Base	(2.362, 2.553, 2.732)	(0.117, 0.141, 0.168)	0.140773381
Document Management System	(2.299, 2.465, 2.709)	(0.114, 0.137, 0.166)	0.137476988

Table 6. Fuzzy and Non-Fuzzy Weights of Selection Criteria for Appropriate Technology of Knowledge Application Process

Selection of Appropriate Technology for Knowledge Application Process	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Ability to Search and Retrieve Knowledge	(1.816, 2.159, 2.517)	(0.431, 0.601, 0.828)	0.599248399
Being Applied	(0.794, 0.944, 1.145)	(0.188, 0.263, 0.376)	0.265626345
Providing Accurate Information to the User	(0.437, 0.491, 0.551)	(0.14, 0.137, 0.181)	0.13725687

Table 7. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria of Ability to Search and Retrieve Knowledge

Ability to Search and Retrieve Knowledge	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Solving Problem System	(0.295, 0.348, 0.480)	(0.033, 0.047, 0.077)	0.049702131
Expert System	(0.793, 0.897, 1)	(0.089, 0.121, 0.161)	0.120906535
Case Argument	(0.400, 0.513, 0.588)	(0.045, 0.069, 0.095)	0.06697998
Information Management System	(1.909, 2.307, 3.114)	(0.215, 0.313, 0.503)	0.323847759
Human Resources Planning System	(1.620, 1.867, 2.120)	(0.183, 0.253, 0.342)	0.251418957
Decision Making Support System	(1.178, 1.449, 1.572)	(0.133, 0.196, 0.254)	0.188089853

Table 8. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria of Being Applied

Being Applied	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Solving Problem System	(0.354, 0.366, 0.405)	(0.041, 0.047, 0.058)	0.048538554
Expert System	(0.832, 0.936, 1.018)	(0.097, 0.120, 0.146)	0.119852717
Case Argument	(0.341, 0.372, 0.416)	(0.040, 0.048, 0.060)	0.048622029
Information Management System	(2.334, 2.619, 2.910)	(0.272, 0.337, 0.419)	0.337732133
Human Resources Planning System	(1.620, 1.920, 2.200)	(0.188, 0.247, 0.317)	0.245720361
Decision Making Support System	(1.468, 1.560, 1.631)	(0.171, 0.201, 0.235)	0.20089274

Table 9. Fuzzy and Non-Fuzzy Weights of Knowledge Application Process Technologies Based on Criteria of Providing Accurate Information to the User

Providing Accurate Information to the User	Fuzzy weight	Fuzzy vector	Non-fuzzy weight
Solving Problem System	(0.261, 0.335, 0.407)	(0.029, 0.044, 0.062)	0.043379099
Expert System	(0.756, 0.895, 0.970)	(0.085, 0.119, 0.148)	0.11443577
Case Argument	(0.472, 0.512, 0.570)	(0.053, 0.068, 0.087)	0.068078224
Information Management System	(2.143, 2.470, 3.148)	(0.240, 0.328, 0.479)	0.33601139
Human Resources Planning System	(1.734, 1.978, 2.422)	(0.194, 0.263, 0.369)	0.266501179
Decision Making Support System	(1.201, 1.331, 1.400)	(0.135, 0.177, 0.213)	0.172221948

### 5. Conclusion:

In the present era ,possessing information and knowledge management has become a strong position to survive in a dynamic and innovative organizations and even the competitive ability in markets and commerce is dependent to the acquisition, development, updating and individual and organizational knowledge management .Evidences state this fact that despite the development of literature and function of the knowledge management ,many organizations and industries have failed in successful operation or its effective utilization yet .Some reasons for this fiasco actually include the prioritizing in insurance companies focused on the area of knowledge management technology and improper selection and nonconforming technologies at each stage of the processes of knowledge management with organizational requirements .In this paper, by reviewing the literature of this field and taking advantage of the expertise of insurance companies' managers and experts, we extracted the evaluation criteria and technology options in the stages of application of knowledge acquisition in insurance companies.

The criteria weights of technology selection and alternative mean the same technologies of knowledge acquisition and application process obtained through the techniques of fuzzy analytic hierarchy using paired comparisons questionnaires that were answered by academics experts and IT experts of insurance companies .For selecting the appropriate technology of knowledge acquisition process, criteria of easy access, ability to save and complete content and ability to evaluate knowledge were prioritized respectively .Furthermore, the main options in each criterion according to prioritizing of the fuzzy analytic hierarchy process are equal to :Document management system and knowledge base and database .Also for the selection of appropriate technology of knowledge application ,the criteria of the search and retrieve knowledge ,being applied and providing the correct information to user were prioritized respectively. Furthermore, the main options in each criterion according to prioritizing of the fuzzy analytic hierarchy process are equal to: Information management systems, human resource planning system and decision making support system.

According to the obtained results, it is recommended that in the process of knowledge acquisition ,document management system and knowledge base and database being used, because the extracted information from database and using of document management systems process and gained experiences store in the knowledge base in these stages and using of them reduce errors and duplications and thus will followed by reducing the cost and increasing the efficiency .Furthermore, using of these technologies is proposed at this stage .In the

knowledge application process, using of information management system is an essential issue and the guarantee of the organization survival as a tool for managers that is the producer of the irrequired information .Also it is recommended to insurance companies which do not have the ability to cost a lot of money for their knowledge managing ,to take advantage of human resource planning system and decision support system instead of organization resource planning system for their knowledge application process.

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