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Identification and Ranking of Factors affecting the implementation of Knowledge Management based on TOPSIS Technique

(Case Study: The Islamic Azad University Branches in the East of Guilan Province)

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Abstract

Background and Aim:
Knowledge management is one of the most interesting and challenging issues of the management in the new millennium. Educational and research centers are the most suitable places for the implementation of knowledge management programs. This study aims at identification and ranking the factors affecting the implementation of knowledge management based on TOPSIS technique in Universities of the east Guilan.

Materials and Method:
This research is a descriptive survey study. The population consists of the east Guilan universities faculty (190 persons) in 2011-2012, According to Cochran formula, 100 are chosen. To collect data, a rese.archer-made questionnaire on the basis of Bukowitz and William's model was used. Face validity was confirmed by experienced professors and the reliability was estimated to be 0.79 using Cronbach's Alpha. The data was analyzed using descriptive and inferential statistics by SPSS software.

Results:
Results showed that all the factors of Bukowitz and William's model (finding, use, learning, sharing, evaluation, development / maintenance, and the removal of the knowledge) in the implementation of KM in University of Guilan are effective. In ranking the factors based on TOPSIS technique, it was seen that "removal of knowledge" is the most important factor and "the Knowledge creation" has the least impact on the implementation of knowledge management.

Conclusion:
Implementing of these programs in Education environments where knowledge sharing is important, leads to present better services, to facilitate learning, teaching, and research. Therefore, understanding effective factors and ranking them is very important. According to the obtained results, Bukowitz and William's model is a comprehensive model for the successful implementation of knowledge management.

Keywords: Knowledge Management, Bukowitz and William's Model, TOPSIS.

Introduction

Today, smart and knowledgeable employees are capitals of organizations and guide their organization through steady competitive advantage with their innovation and creativity, new organizational processes creation and new products development. Innovative attempts in organization are the results of investment in teaching process and knowledge management (KM) improvement. Wisdom or knowledge era is a new title which is referred to the present time. Development of ITC has placed human society and particularly industrial-commercial organizations in a situation where they must look for new tools proportional to the circumstances. Once organizations used to look for information and knowledge but today, they are in the middle of a world of different data and knowledge and in many cases, their classification, summarizing, and utilization need hardware and software tools. That might be the reason why "KM" has received a special attention in management texts and experts have paid special attention to this field of study.

Statement of the problem

When discussing KM, knowledge definition is a must. Without a clear definition, managers do not know what they are looking for or whether they have such knowledge for exercising management or not. The answer is not that easy and it is even more difficult when it becomes related to organizational knowledge. Different subjects must be investigated in different levels in order to present a good definition of knowledge. One of the most important dimensions of KM is proper definition of knowledge, information and data.

Data
Data constitute the first level of KM and in fact they are numbers, figures, diagrams or special qualities which are obtained from observation, experience, or calculation and do not have meaning on their own. Data can be regarded as raw material needed for decision-making.

Information
The second level of KM is information. Information includes data in a particular field. When data are classified, refined and organized, we reach information. Information is a combination of data, descriptions and related interpretations and other subjects related to goals, events and special processes.

Knowledge
Knowledge is organized, integrated or classified information which is comprehensive and increase comprehension and awareness. Many different viewpoints have been formed in the field of KM due to complexity of knowledge concept. However, what is understood from different definitions is that knowledge is referred to information which is obtained by means of processes like in-depth investigation and debating and learning in individuals mind or groups. Therefore, information is the raw material of knowledge creation which may be embedded in books, reports, computer files and so on. Knowledge is a concept beyond data and information and is referred to a combination of organized information, its applicable solution, results of its application in different decision-making conditions. Implementation of KM is not only important for companies and large profit-making organizations, but also it is necessary for not-for-profit organizations like universities and hygienic centers. Hygiene and therapy sector needs using efficient methods in offering service to improve hygiene service quality due to its relationship with society health. This is largely dependent on assigning suitable time to KM. factors affecting KM must be known before implementing KM. human, process, technology and culture are among factors that affect KM plans. Therefore, a good recognition and understanding of these factors and their influence degree will help managers with implementing KM plans. After investigation and determination of factors affecting KM plans, factors

of Bukowitz and Williamz model were selected. This model has included all above factors which are effective in implementing KM plans. This model has developed KM implementation stages in a better way in comparison with other models and it is suitable for not-for-profit organizations. This model contains 7 factors including: find, use, learn, share, evaluate, and develop/maintenance, and removal of knowledge. The present research tries to identify KM and then rank factors that affect KM using TOPSIS technique. In the following part, some studies which have been conducted in this field have been reviewed.

D. lang & L. Fahee (2000) conducted a research titled: "identification of cultural obstacles in KM" and concluded that inappropriate culture is the most important obstacle ahead of creation and development of knowledge capital.

M. Damien & B. loughridge (2002) conducted a research titled: "organizational information, organizational culture and KM, Britain prospect" and concluded that organizational culture is an important and influencing factor in implementing KM plans.

M. Khalifa & V. liu (2003) conducted a research titled "factors determining successful plans in KM" and concluded that IT is an accelerating factor and catalyzer in implementing KM strategy but it can be effective and positive only when structural capacities of KM like leadership, organizational culture and strategy in organization.

P.tserng & C. lin (2004) conducted a research titled: "development of KM system based on the conducted activities for contractors use" and concluded that KM can be a good tool for all experts and engineers who are active in construction projects by means of the newest activities of IT and internet and partial development of methods for knowledge transfer.

P. Sher & V. lee (2004) conducted a research titles" IT as a facilitator for increasing dynamic abilities through KM" and concluded that internal and external knowledge are manageable through IT and dynamic capabilities of these affaires can be increased by this method.

Real et al (2006) conducted a research titled " IT as a determinant of organizational learning and technology merit" and concluded that IT and organizational learning must be complementary to each other and IT can have a positive impact on organizational education as a knowledge production process and organizational learning.

J B. Yang (2007) conducted a research titled: "impact of IT on KM systems" and concluded that the most important problem in creating management in constructional companies is formulation and development of clear strategy. Therefore, they managed to turn latent knowledge into tacit knowledge through knowledge map and explorer software.

Sh.M. Tseng (2008) conducted a research titled: "influence of IT on KM systems" and concluded that IT plays an important role in KM systems success or failure and growth and advance of KM has a great dependence on IT and progress in KM can result in progress in KM.

W. B. Lin (2008) conducted a research titled: "factors affecting knowledge sharing" and concluded that formality and complexity and concentration are effective structural factors and trust and commitment are effective intra-organizational factors and bureaucratic and innovative characteristics are among organizational culture characteristics that affect KM success.

Research hypotheses

Main hypothesis

Each of KM components is effective in its implementation.
There is significant difference between KM components considering demographic properties.
There is significant relationship between the ranks of KM components.

Subsidiary hypotheses

First subsidiary hypothesis
Finding factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Second subsidiary hypothesis
Use factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Third subsidiary hypothesis
Learning factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Fourth subsidiary hypothesis
Sharing factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Fifth subsidiary hypothesis
Evaluating factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Sixth subsidiary hypothesis
Development factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Seventh subsidiary hypothesis
Removal factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.
Eighth subsidiary hypothesis
The difference between degrees of impact of factors affecting KM implementation in the east Guilan Province Azad universities is significant.

Research methodology

In the present research, two questionnaires were distributed in order to get factors affecting KM implementation. The first questionnaire is based on 7 factors and includes 45 items (questions). The second hypothesis was distributed in order to determine factors rank. Data was analyzed by means of tests like T-test (means difference, Pearson correlation coefficient and variance analysis. It must be mentioned that SPSS (version 19) was used to analyze data.

The present research is of applied type and it is a descriptive and survey research. The present research statistical population includes all professors of management major in Guilan Province Islamic Azad universities which is 150 people. Statistical sample was calculated to be 100 people according to Cocheran formula.

Data analysis

Kolmogrov-Smearnov test

This test results showed that there is variance congruence among KM implementation components. Therefore, parametric tests could be used.

Sig	Standard deviation	Mean	Frequency	
0/078	0/33	3/64	100	All dimensions

Table 1. Results of Kolmogrov-Smearnof test

First hypothesis analysis

Finding factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
Finding	100	3/87	0/35	38/25	99	0/000

Table 2. Table t for "finding" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "finding" factor from Bukowitz and Williamz Model factors is effective in implementing KM in the east Guilan province Azad University.

Second hypothesis analysis

Use factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	frequency	mean	Standard deviation	T statistic	Degree of freedom	sig
use	100	4/09	0/55	28/77	99	0/000

Table 3. T test for "use" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "use" factor from Bukowitz and Williamz Model factors is effective in implementing KM in Guilan province Azad University.

Third hypothesis analysis

Learning factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
Learning	100	3/80	0/54	24/11	99	0/000

Table 4. T test for "learning" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "learning" factor from Bukowitz and Williamz Model factors is effective in implementing KM in the east Guilan province Azad University.

Fourth hypothesis analysis

Sharing factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
Sharing	100	3/42	0/46	19/88	99	0/000

Table 5. T test for "sharing" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "sharing" factor from Bukowitz and Williamz Model factors is effective in implementing KM in the east Guilan province Azad University.

Fifth hypothesis analysis

Evaluating factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
evaluating	100	3/74	0/58	21/41	99	.0/000

Table 6. T test for "evaluation" factor

Sixth hypothesis analysis

Development factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
development	100	3/87	0/51	26/84	99	0/000

Table 7. T test for "development" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "evaluating " factor from Bukowitz and Williamz Model factors is effective in implementing KM in the east Guilan province Azad University.

Seventh hypothesis analysis

Removal factor from Bukowitz and Williamz factors is effective in KM implementation in the east Guilan province.

Variable	Frequency	Mean	Standard deviation	T statistic	Degree of freedom	Sig
removal	100	3/87	0/51	26/84	99	0/000

Table 8. T test for "removal" factor

According to SPSS output and because sig is less than 0.05, it can be concluded that "removal " factor from Bukowitz and Williamz Model factors is effective in implementing KM in the east Guilan province Azad University.

Main hypothesis analysis

The difference between impact degrees of factors affecting the implementation of KM in the east Guilan province Azad University.

Variable	frequency	mean	Standard deviation	T statistic	Degree of freedom	sig
All factors	100	3/64	0/33	33/95	99	.0/000

Table 9. T test for all factors

According to SPSS output and because sig is less than 0.05, it can be concluded that difference between Bukowitz and Williamz Model factors is effective in implementing KM in Guilan province Azad University.

Ranking of factors effective in KM implementation

Because investigations showed that the impacts of factors affecting KM implementation are not the same, then the impact degree of each of the factors must be measured and ranked.

In the present research, TOPSIS technique was used to rank the factors affecting KM implementation.

According to TOPSIS method steps and using Excel software, we will have:

Step zero: construction of decision matrix

A decision matrix is evaluated in this method which includes 100 options and 45 indices (this matrix is the very matrix of 100 people responses to 45 questions).

First step: normalization of decision matrix

In this step, we de-scale the scales present in decision matrix. We divide each of the values by vector size of that index.

In fact, we obtain all columns numbers squares sum and calculate the square root of the result and divide each number of this column by that.

Second step: assigning weights to normalized matrix

Decision matrix is in fact a parametric matrix and must be quantified. Therefore, the decision-maker determines a weight for each weight index. In this research, Entropy method was used for each weight index.

Sum of weights (W) is multiplied by normalized matrix(R).

Third step: determination of ideal solution and negative ideal solution

We define two virtual choices A^- and A^* as follows:

Positive ideal choice:

$$A^* = \left\{ \left(\max_i v_{ij} \middle| j \in J \right) و \left(\min_i v_{ij} \middle| j \in J' \right) \middle| i = 1و2و.....و m \right\} = \left\{ v_1^* و v_2^* و \cdots و v_j^* و \cdots و v_n^* \right\}$$

Negative ideal choice:

$$A^- = \left\{ \left(\min_i v_{ij} \middle| j \in J \right) و \left(\max_i v_{ij} \middle| j \in J' \right) \middle| i = 1و2و.....و m \right\} = \left\{ v_1^- و v_2^- و \cdots و v_j^- و \cdots و v_n^- \right\}$$

The two virtual choices are in fact the best and the worst solutions. We actually find the greatest and smallest numbers of each line of the matrix in the last step.

The fourth step: calculation of distances

We measure the distance of choices by means of Euclidean method. We measure the distance of each line members from the largest element, then we raise it to power 2 and add them together and then we take square root from the result. The resulted number is considered as positive ideal. We repeat this process for the smallest element. The resulted number is considered as negative ideal.

The positive and negative ideals were obtained as follows:

Factors	Components	Distance from positive ideal solution +d	Distance from negative ideal solution -d
Finding knowledge	Emphasis on identification and introduction of key knowledge owners	0/016053196	0/009236
	Restriction (structural, cultural and so on) for finding knowledge	0/011408921	0/018853
	Emphasis on spreading knowledge research	0/024262616	0/000508
	Supply of needed knowledge from outside of organization	0/019894524	0/005368
	Access to computer facilities needed for finding knowledge	0/023314263	0/001408

	Presence of facilities for access to knowledge from other places	0/023970032	0/000826
	Supply of knowledge from inside organization	0/023412743	0/001372
Using knowledge	Ability to use one's knowledge (librarians) in new situations and issues	0/023776106	0/000823
	Use of experienced librarians knowledge in order to solve problems	0/022384212	0/002206
	Attention to new ideas and thoughts by librarians	0/023473527	0/001119
	Use of librarians knowledge for specialized decision-makings	0/022200523	0/002415
	Proportionality of offered service in different parts by applying librarianship knowledge	0/019615464	0/005147
	Holding educational workshops for applying knowledge	0/018538903	0/006698
Learning knowledge	Offering suitable educational plans for related expertise	0/018649419	0/006599
	Design and implementation of educational courses related to library goals	0/018875504	0/006298
	Gathering the experiences and knowledge of librarians	0/022513183	0/002038
	Teaching librarians on the style of organizing information and knowledge	0/021907223	0/00000823
	Attention to effective relationship with librarianship scientific and educational groups	0/000416447	0./0000202
Knowledge sharing	Organizational structure support for knowledge distribution and spread	0/000237863	0/0000944
	Holding face-to-face summits and meetings with colleagues	0/000309068	0/00007
	Presence of necessary material incentives for knowledge transfer and trade	0/0000972	0/000352
	Investigation and prediction of specific needs of different parts for knowledge sharing	0/000377065	0/0000304
	Presence of facilities for knowledge sharing with other libraries	0/000317828	0/0000596
	Library management support for knowledge sharing and transfer	0/000459622	0/0000122
	Librarians' tendency to trade and share knowledge	0/000376539	0/000029
	Presence of computer networks among librarians	0/000427343	0/0000172
	Presence of non-material incentives needed for trading and sharing knowledge	0/0000654	0/000375
Knowledge evaluation	Analysis of the style of doing works in different time periods	0/000231896	0/0000945

	Process of clear and distinct evaluation	0/000470568	0/0000103
	Evaluation of organizational current knowledge	0/000489457	0/00000711
	Evaluation of future organizational knowledge needs	0/00047072	0/0000102
	Evaluation of the shape and type of knowledge needed for library parts	0/000401792	0/0000224
Development /maintenance of knowledge	Coding the knowledge used in organizational processes	0/000408549	0/0000222
	Preparation of facilities for documentation of various experiences	0/000466952	0/0000118
	Development and maintenance of e-documents in the form of databases	0/000387794	0/0000277
	Investment in technology of storing	0/000406317	0/0000213
	Use of e-tools for creation of new knowledge	0/000447337	0/0000124
	Use of up-to-date specialized journals for enrichment of knowledge	0/000478268	0/00000818
	Presence of places for informal and friendly knowledge trading and production	0/00044149	0/0000159
	Importance of knowledge production in various parts	0/000366706	0/0000313
	Ability of librarians to enrich and produce new knowledge	0/000456911	0/0000122
Knowledge removal	Following the process of knowledge updating	0/000291426	0/0000646
	Presence of places for storing information and removed knowledge	0/000257634	0/0000865
	Removal of useless knowledge	0/000258924	0/0000852
	Presence of clear criteria for removing useless knowledge	0/000106793	0/016875

Table 10. Ideals of components of factors affecting KM

Fifth step: calculation of relative distance from ideal solution

The following relation will help finding relative distance from positive ideal

$$cl^* = \frac{d^-}{d^- + d^+}$$

And indices importance were clarified after calculation:

Factors	Components	CI
Finding knowledge	Emphasis on identification and introduction of key knowledge owners	0/365215
	Restriction (structural, cultural and so on) for finding knowledge	0/622994
	Emphasis on spreading knowledge research	0/020508
	Supply of needed knowledge from outside of organization	0/212489
	Access to computer facilities needed for finding knowledge	0/056953
	Presence of facilities for access to knowledge from other places	0/033312
	Supply of knowledge from inside organization	0/055357
Using knowledge	Ability to use one's knowledge (librarians) in new situations and issues	0/033457
	Use of experienced librarians knowledge in order to solve problems	0/08971
	Attention to new ideas and thoughts by librarians	0/045502
	Use of librarians knowledge for specialized decision-makings	0/098109
	Proportionality of offered service in different parts by applying librarianship knowledge	0/207855
	Holding educational workshops for applying knowledge	0/265405
Learning knowledge	Offering suitable educational plans for related expertise	0/261363
	Design and implementation of educational courses related to library goals	0/250184
	Gathering the experiences and knowledge of librarians	0/08301
	Teaching librarians on the style of organizing information and knowledge	0/000376
	Attention to effective relationship with librarianship scientific and educational groups	0/046262
Sharing knowledge	Teaching librarians on the style of organizing information and knowledge	0/284112
	Attention to effective relationship with librarianship scientific and educational groups	0/184663
	Teaching librarians on the style of organizing information and knowledge	0/783453
	Attention to effective relationship with librarianship scientific and educational groups	0/074608
	Teaching librarians on the style of organizing information and knowledge	0/157911
	Attention to effective relationship with librarianship scientific and educational groups	0/025857
	Librarians' tendency to trade and share knowledge	0/07151
	Presence of computer networks among librarians	0/038691
	Presence of non-material incentives needed for trading and sharing knowledge	0/851362
Evaluation of knowledge	Analysis of the style of doing works in different time periods	0/289526
	Process of clear and distinct evaluation	0/02142
	Evaluation of organizational current knowledge	0/014318
	Evaluation of future organizational knowledge needs	0/021209
	Evaluation of the shape and type of knowledge needed for library parts	0/052806
	Coding the knowledge used in organizational processes	0/051538

Development /maintenance of knowledge	Preparation of facilities for documentation of various experiences	0/024647
	Development and maintenance of e-documents in the form of databases	0/066668
	Investment in technology of storing	0/049811
	Use of e-tools for creation of new knowledge	0/026972
	Use of up-to-date specialized journals for enrichment of knowledge	0/016816
	Presence of places for informal and friendly knowledge trading and production	0/034762
	Importance of knowledge production in various parts	0/078642
	Ability of librarians to enrich and produce new knowledge	0/026007
Removal of knowledge	Following the process of knowledge updating	0/181447
	Presence of places for storing information and removed knowledge	0/251356
	Removal of useless knowledge	0/247585
	Presence of clear criteria for removing useless knowledge	0/993711

Table 11. Ranking of the components of factors affecting KM

The sixth step: ranking of choices

According to table 11, each of the indices which have greater cl is more important than others. Therefore, according to the outputs, order of importance of the factors will be as follows:

1) Knowledge removal 0.4185
2) Knowledge learning 0.2746
3) Finding knowledge 0.1953
4) Knowledge sharing 0.1282
5) Use of knowledge 0.1233
6) Knowledge evaluation 0.0798
7) Knowledge development 0.0417

Conclusion and discussion

Results of the present research showed that the factors finding, using, learning, sharing, evaluation, development and removal influence on KM implementation. However, ranking showed that "removal" has the highest and "development" has the lowest importance in implementing KM. therefore, recognition of their ranking is very important. Educational organizations can benefit a lot from application of KM programs. Implementation of these programs will facilitate learning and education in environments in which knowledge sharing is of high importance. E-learning and distance education can be from the results of attention to KM in higher education.

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