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The Role of Knowledge Systems in Corporate Decision Making Process: an Empirical Investigation

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Knowledge management (KM) is the hottest subject of the day. This is because KM is a conscious strategy for moving the right knowledge to all employees at the right time to assist sharing and enabling the information to be translated into action to improve the organizational performance (OP). This research aims at harnessing the concept of KM as an essential element in the creation of sustainable competitive advantage for organisations. A conceptual model based on the literature review and consultations with knowledge workers was developed. Additionally, a pilot study with collaborating organizations active in manufacturing in Iraq was performed to validate the conceptual model and facilitate an exploratory investigation regarding the relationships. Data was collected using personal interviews with managers and knowledge workers at the enterprises and the use of surveys circulated by random samples to the firms. The study identified a high correlation between KM and OP. Findings revealed high correlation between computer based decision support systems (DSS) and OP from the study.

1. Introduction

At present applying computer-aided knowledge management systems (KMS) and the aggressive acquisition and retention of knowledge workers are two of the major KM activities. A KMS is the infrastructure necessary for the organization to implement its KM processes. This development can be viewed as a 'knowledge platform', where the objective of the KMS is to support the construction, sharing, and utilization of knowledge in organizations. KMSs have appeared in various formats in different industries. Indeed, there is no single model for a KMS. There is no single role of information technology (IT) in KM just as there is no single technology comprising KMSs (Sarvary, 1999).
Furthermore, Nonaka, (1988) asserted that the learning (L) organisation "transforms the flow of information into a stock of knowledge and, at the same time, spreads it to other departments and stimulates the systematic self-organising of information". In view of that, Nonaka, (2007) stated that in any company that wishes to engender knowledge creation, there are four patterns that interact dynamically in a spiral motion. These are: extract the secrets / implicit knowledge from individuals' experience (socialization) and translate these secrets into explicit knowledge that could be related to team members (articulation). Others include a team to collate this knowledge and put it together in a

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notebook (combination) and ultimately, through experiment, the implicit knowledge of all staff is enriched because they understand at an intuitive level.

Gorry, et al, (1971) have confirmed that the decision emphasis is on the primary focus-decision making (DM) in problem situations rather than simply information retrieval, processing, or reporting. Support; clarifies the computer's role in aiding rather than replacing the decision maker, thus including those decision situations with sufficient "structure" to permit computer support, but in which managerial judgment is still an essential element.

According to literature survey studies categorize the DSS into the following types; first. Group decision support systems (GDSS). Parker et al. (1993) classified GDSS through the level of support provided to the members of the group, in this way: "The first level offers the technological DSSs that enable group members to communicate electronically with each other. On a second level: DSSs provide support for members of the group in the decision-making process. The third level presents a GDSS with all the possibilities of the second level. 2). Expert systems (ES): Liebowitz. (1998) upholds that one of the key programs to emergence of KM, where KM involves four functions: securing, creating, retrieving/combining, and distributing knowledge. Consequently, the firms which move towards the knowledge acquisition stage of ES can capture and secure easily knowledge. Embryonic knowledge repositories for KM activities can be tracked to knowledge demonstration methodologies and knowledge encoding techniques in the ES. 3) Executive support system (ESS): an ESS "is an interactive computer system that provides business executives with the capability to obtain easy access to internal and external information relevant to DM and other executive actions". This is because ESS; are "A) Designed and clearly geared for the top management. B) Used by senior managers without technical support from the medium level. C) Require the amount of greatest information from outside the project or business. D) Include structured data and unstructured together. E) Using various communication technologies such as texts, graphics... etc." (Laudon, et al., 1994).

2. Research Methodology

Currently, KM is a most active area of research. And despite its theoretical development large scale real-world applications of decision making systems are lacking. But the applications seriously lack the technical knowledge and expertise needed to select and apply the most appropriate knowledge in firms (Lu. et al, 2000). In other words, this research aimed to investigate the issues and factors which affect the utilization of KM as a tool for effective decision making. Therefore, Decision models and DSSs which enhance effective utilization of this approach are investigated. A DSS which demonstrates an empirical application of KM will be developed through adopting the following objectives: 1) To investigate the role of KM in effective corporate decision making. 2) To develop a model of KM and other factors leading to effective corporate decision support. 3) To test the model for significant decision factors. 4) To develop guidelines for establishing KMS for effective corporate decision support (DS).

3. Research Method

This study has used a mixed method to conduct the research. The researcher has relied on interviews conducted with manufacturing enterprises to fine tune the research model. This was in addition to use of a questionnaire to collect cross sectional data, which was distributed by random samples to these firms. This data has been analysed by statistical procedures to find the significant factors of effective corporate DS.

4. Results

This study aims to assess the reality of KM in companies as a field of study. Through the identification of factors that affect KM, which have been selected in the companies that have been identified through a literature review of KM and to identify the variables most in agreement among specialists in the KM. We have distributed 165 questionnaires and have received 54 replies. The proportion of the forms retrieved (32.7 %) is a good percentage of the response of the sample in these companies to the survey supplied. The forms were sent to a range of knowledge workers within these companies including the top leadership in the production and other depts.

4.1 Standard Deviation

In probability theory and statistics, the standard deviation of a statistical population, a data set, or a probability distribution, is the square root of its variance, and defined as follows (Yadolah, 2003):

$$s_N = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(x_i - \bar{x}\right)^2} \quad (1)$$

The questions are validated for their reliability, where the standard deviation is found in Table 1 for the sample (N = 54). Therefore, these values enable further proceeding in these research areas, as the reliability of the questions is established as very high.

Table 1: One-Sample Statistics for the three Companies

Variables	KM	DSS	OP	L	INN	KR	Inertia	Cognition	GDSS	ESS	ES
Std.Deviation	.37	.60	.68	.39	.42	.41	.58	.55	.69	.63	.67

As for, Cronbach's alpha test results' for the all variables (0.90) for the sample = 54 according to equation as follows; (Devellis, R.F. 1991). With respect to each variable these were in Table 2.

Table 2: Reliability Statistics for the companies

V1.	KM	KM	DSS	L	L	INN	KR	Inertia	Cognition	INN	L	KR	Cognition	Inertia	GDSS	ESS	ES
V2.	DSS	OP	OP	INN	DSS	DSS	DSS	DSS	DSS	OP	OP	OP	OP	OP	OP	OP	OP
ά	.62	.62	.84	.83	.65	.73	.67	.65	.75	.64	.77	.79	.68	.79	.78	.76	.83
Valid%	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2

Accordingly, Cronbach's Alpha test explains that the questions are validated for their reliability as shown in Table 2 .These are the values which enabled further research in these areas, as the reliability of the questions was found to be very high.

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K}\sigma_{Y_i}^2}{\sigma_X^2}\right) \quad (2)$$

4.2 Chi-Square Test

According to Mood et al, (1997) the Chi-Square Test is the most widely used in the distributions of inferential statistics; for example, in assumptions testing over and above construction of confidence intervals to the data. In accordance with that, the method is defined as follows: If X_1, …, X_k are independent standard normal random variables, then the sum of their squares

$$Q = \sum_{i=1}^{k} X_i^2 \quad (3)$$

Is distributed according to the chi-square distribution with k degrees of freedom. This is usually denoted as:

$$Q \sim X^2(k) \text{ or } Q \sim X_k^2 \quad (4)$$

Accordingly, the chi-square distribution has one parameter: k — a positive integer that specifies the number of degrees freedom, i.e. the number of X_i's. Consequently, the study has used this test to measure homogeneity of the sample data as explained by the results in this Table 3.

Table 3: Test Statistics

	KM	DSS	OP	L	INN	KR	Inertia	Cognition	GDSS	ESS	ES
Chi-Square	12.370[a]	20.630[b]	33.222[c]	23.333[d]	15.852[e]	15.815[f]	32.111[c]	35.556[f]	29.741[g]	19.630[h]	32.667[d]
df	27	30	14	17	22	12	14	12	18	13	17
Asymp. Sig.	.993	.899	.676	.871	.823	.99	.863	.820	.74	.838	.692

4.3 Factor Analysis

Factor analysis is a statistical method used to describe variability among observed variables in terms of a potentially lower number of unobserved variables called 'factors'. In other words, it is possible, for example, that variations in three or four observed variables mainly reflect the variations in a single unobserved variable – Hatcher (1994).Therefore, factor analysis of the companies of the study domain has found that all the employees confirmed that the first variable is inviting the identification of KM, and is creating a knowledge depository. There was obtained a percentage (98 %) from other variables, as has explained the communalities for the Factor Analysis in Table 4. Where the value of contribution ranges from 0-1, which reflects the square-multiple-correlation coefficient to a variable of KM with the factors. By and large, we note that the common factors explain a high percentage of the variables variance. It was found to be less proportionate (55 %) to the variable of knowledge resources.

Table 4: Communalities for the Factor Analysis

Factors	KM	DSS	OP	L	INN	KR	Inertia	cognition	GDSS	ESS	ES
Initial	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
extraction	.980	.976	.672	.888	.806	.556	.817	.725	.811	.743	.867

Table 5 highlights the latent roots of the matrix correlations (the components' variance), and its total is equal to the rank of the matrix, which is an equal variable to the number of variables. The first main component has the largest latent root (the component variance), and equals 5.926 and explains 53.876 of the total variance for variables of KM. Also, the second component is 26.503 of variance, signifying that the component is 80.379% from the variance structure to the 11 variables. Additionally, neglected in the program are the rest of the components, since the latent roots are less than one. Therefore, a scree plot 3 is depicted in Figure 3. The inflexion point on the curve has occurred after two factors explained in Table 5 of the total variances for variables of KM. This is because its roots are more than one. All of the other factors are neglected by the program are to the latent roots being less than one.

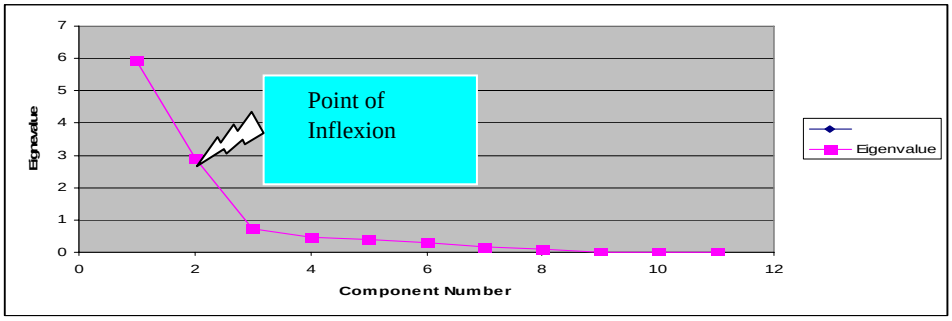

Figure 3: Scree plot to the inflexion point in the curve (Source: Table 5)

Over and above that, the components' matrix includes the loadings of ramifications of components 1 and 2 that have been explained in previous analysis, where the ramifications represent a simple correlation of coefficients among the components. Analysis of the results highlighted that the most powerful variables are correlated with the first factor variables of learning and creativity, where the percentages of both variables were 0.833 and 0.83 respectively.

Table 5: the Total Variance to the variables

Component	Initial Elgenvalues			Extraction sums squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	5.926	53.876	53.876	5.926	53.876	53.876
2	2.915	26.503	80.379	2.915	26.503	80.379
3	.714	6.494	86.873			
4	.456	4.149	91.021			
5	.410	3.726	94.747			
6	.315	2.861	97.608			
7	.178	1.617	99.226			
8	.085	.774	100.000			
9	5.478E-16	4.980E-15	100.000			
10	2.712E-16	2.466E-15	100.000			
11	4.852E-18	4.411E-17	100.000			

Then the most significant variable is ESS 0.768. The weakest variable of correlation with the first variable is ES 0.578. From the factor analysis results it appears that there is a major concern for the employees about identification of appropriate knowledge resources for their work and how these are learned within the corporation.

5. Conclusions

The research has evaluated knowledge systems as a tool for supporting the decision making process and performance. This was conducted within integrated projects in Iraq. In this exploration, the achievable results expose differences in each case due to the nature of diverse situations. Furthermore, the research presents and discusses the aims of study, literature review and the results. Consequently, from a thorough interview sessions and questionnaire conducted within these organizations, fundamental factors were identified and subsequently addressed. The results analysis shows that KM plays a fundamental role in encouraging and improving the exchange of roles to activate creativity to improve performance and remove obstacles. Where there is a major problem of the tensions in each organization that must be solved for instance among the quantity and quality of information (knowledge), push and pull in processes and top management and organizational knowledge. This requires the creation of capabilities for employees (experts) to make cross fertilization of knowledge much easier in production lines and among sectors in the firms.

References

Devellis, R.F., 1991, Scale Development, Sage Publications, 24–33.

Hatcher, L., 1994, A step-by-step approach to using the SAS system for factor analysis and structural equation modeling. Cary, NC: SAS Institute Press. USA

King, W.R., Hung, T.R.and Haney, M.H., 2008, Knowledge Management and Organization Learning. Journal of Management Science, 36, 167-172.

Laudon, K. and Laudon, J., 1994, Management and Information systems: Organisation and technology, 3rd ed. Macmillan., New York, USA

Liebowitz, J., 1998, Expert systems: An integral part of knowledge management, Journal of Cybernetics, Systems and management Sciences, 27, 2, 170 -175.

Lu, J. and Quaddus, M.A. and Williams, R., 2000, Developing a Knowledge-Based Multi-Objective Decision Support System, 1-10.

Mood, A. ,Franklin, A. and Graybill, D., 1974, Introduction to the Theory of Statistics, Third Edition, 241-246.

Nonaka, I, 1988, Creating Organizational Order Out of Chaos: Self Renewal in Japanese Firms", California Management Review, 30, 3, 57-73.

Nonaka, I., 2007, The Knowledge- Creating Company, Harvard Business Review. 162-171.

Parker C. and Case T., 1993, Management Information System Strategy and Action, Second Edition, Mitchell McGraw Hall, New York, USA, 449.

Sarvary, M., 1999, Knowledge management and competition in the consulting industry, California Management Review, 41, 2, 95-107.

Yadolah, D., 2003, The Oxford Dictionary of Statistical Terms. Oxford University. UK