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The Role of Leadership in Knowledge Engineering Systems and Neural Networks to Establish E-Government

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In the last decade, under fierce competition and globalisation, the governments of different countries have taken to focusing a lot on the organisations that have a better Knowledge Systems Base (KSB) and neural networks (NNs) in industrial applications. In other words, those that have an identified level and superiority in a scope of how to obtain knowledge and its handling and application. In this context: management movements of the 1980s and 1990s and the new millennium include four new topics: Quality control systems (QCS), Total quality management, Business process re-engineering and Knowledge Engineering systems (KES). As a result, this study raises a key question which is, what are theories and styles of leadership that are most appropriate for the application of the concept of KES? Are these available in the Iraqi city councils? It is believed that there are some kinds of leadership that are more suited than others to KESs. In other words, there are features which should be available in the leadership for managing knowledge more effectively.

1. Introduction and literature review

The application of KES in the government sector and its institutions, to improve methods of service delivery and improve the relationship between the citizen or customer, and between governmental institutions has begun. Therefore, it requires the application of KES and preparation to create an organisational environment to get the best possible use of knowledge (Al-dujaili, 2011). So that it can be an encouraging environment for effective KES, whereby it can help to store, transfer and apply knowledge Al-dujaili, 2012). Consequently, the NNs and knowledge-based systems which are the advanced instruction fundamentals which drive the interpretation, approach and understanding of the constrictions and constraints imposed by the upper levels of the flexible manufacturing system control hierarchy.
Accordingly, there is no doubt that the most appropriate organisational structures for KES are those structures that are be flexible and adapted within this environment. Consequently, this study can classify the organisational structures based on review of previous literature into the following; 1) Matrix structures simultaneously utilize functional and divisional chains of command in the same part of the organisation. This type of structure is commonly used in companies that perform work as projects. It is also widely used to develop new products. This is because the structure is more conducive to ensuring continued success of a product by engaging multiple departments to directly contribute, and to solve problems. 2) Functional structure, in this type of structure authority is determined by the relationships between group functions and activities. Functional structures group similar or work-related expertise or processes together under recognizable headings like finance, manufacturing, marketing, accounts receivable, research, surgery, and photo finishing. Revenue is achieved through specialisation. However, this structure has risks in the form of losing sight of its overall interests as different departments pursue their own goals (Johnson, 2006).
This requires their process to be an ongoing interaction and treatments between units. Where the work is in the form of a spider's web, because the links or correlations between the units are integrated, but the coherence of the process is not strong. Moreover, these organisations operate at a minimum level of formal authority or hierarchy and the role of the center here is information collecting, and its storage in an effective manner then after that distribute to the units. The center does not generate the information itself or for itself. 3) Inverted structure, in this structure all members of the organisation from managers, heads of

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departments and staff that serve the organisation by contact with customers, in terms of functional classification are at the bottom of the organisation. Studies have confirmed that KS help the organisation in achieving better communication, in terms of speed, quality, transparency and the participation by workers. In accordance with this, the leadership must establish the appropriate regulatory structure for the KS, through the formation of an advisory board consisting of most managers in addition to a representative of top management.

2. Research methodology

The application of KES in organisations in general, and local government units in particular, requires adherence to a set of requirements, where leadership is considered the most important element in the organisation. The commander must be a teacher and role model for others, and has the ability to explain his vision to them, in spite of the importance of leadership in KES. However, most of the local Iraqi leaders raise many questions about their appropriateness to the application of KES in cities. Particularly when this could interfere with a characteristic that requires the leadership style which emulates and matches the application of KES. Hence, the main question here: What are the main manners of best to leadership and the most suited to KES? What is the extent of the availability of characteristics in the city council's leaders of Iraq? In view of that, this is study will focus on the importance and role of the commander in KES, as a pacemaker for others in continuous learning, especially in the absence of studies that focus on this role. This importance increases even more in the Arab environment. Due to the challenges that facing the KS in Arab cities, in general, and in Iraqi cities, particularly, the important requirements on the level of organise leadership and technologies. In accordance with this, this research aims to determine the following: 1) The meaning of KES, its importance and its relationship to other concepts that are associated with it, and the requirements of the application of KES. 2). The most important theories and patterns of leadership suited to KES. 3) The available extent of leadership manners for KES in the Iraq cities councils' managers.

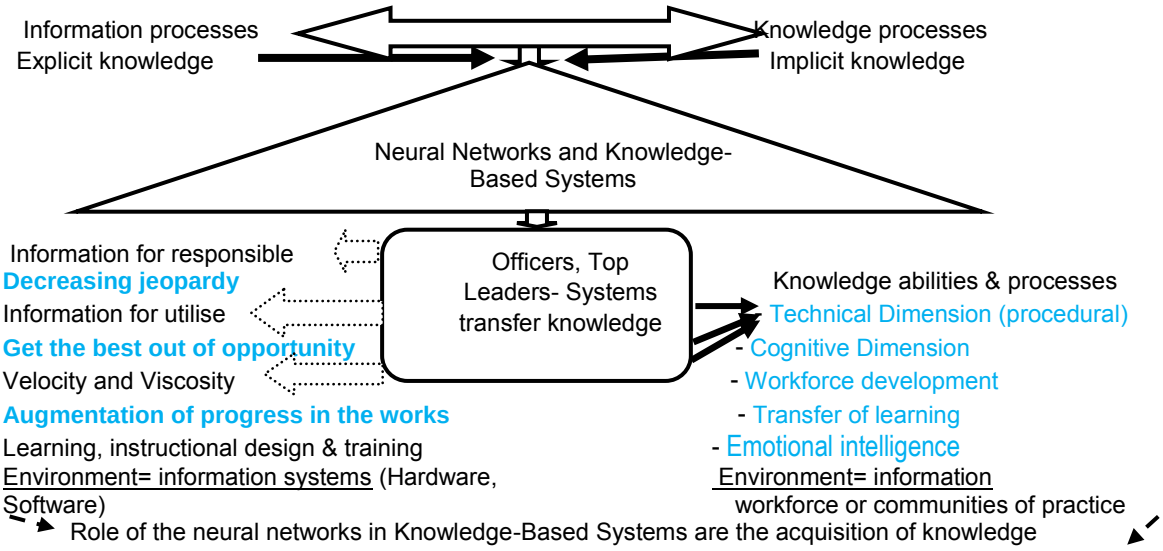

Figure 1: The research model

To achieve of the study aims, there are two general approaches to research that may result in the acquisition of new knowledge. These approaches are known as inductive research and deductive research. Inductive research is a theory-building process, starting with observations of specific instances and seeking to establish generalisations about the phenomenon under investigation. Deductive research is a theory-testing process that commences with an established theory or generalisation, and seeks to discover whether the theory applies to specific instances. This research uses into both inductive and deductive types: it produces new and unprecedented models and formulas, testing them for validity, and generalises the new knowledge, with the findings to be used worldwide. For that reason, this study adopted a descriptive analytical approach based on the literature that is written in the field of KES and the role of leadership. Also it has used the behavioral approach to identify patterns of leadership, and the extent of its relationship with KES. In addition there is a case study which will focus upon leaders of Iraqi cities councils Figure 1 explains the research vision and its' relationship with the study variables. Enlargements of abridgements are also given in Table 1.

3. Data collection and analysis

The major focus of questions in the interviews will be on: 1) what is the meaning of KES from your viewpoint? .2) what is the meaning of the leadership concept from your viewpoint. 3) What is the meaning of the organisational structures concept from your viewpoint, and what are its types. 4) Describing your experiences of leadership. 5) What do you see to be the differences between management and leadership in new Iraqi system? 6) What are the dimensions and the role of leadership in KES in the city councils of Iraq? 7) Artificial neural networks help deal with knowledge and learning from experience or to operate with cases not represented in the knowledge base? To ensure reliability and validity of the data gathered, the following steps will be taken. A) Measurement of credibility of the data that are established through participants' revision of their interviews as a check on their replies. B) Repeat interviews with further sessions to ensure the answers.

Table 1: Variables with abridgements

Antecedents	Processes variable	Outcome dimensions
Information processes (IP) Explicit knowledge (EK) Information for responsible (IR) Information for utilisation (IU) Velocity and Viscosity (V&V) Learning, instructional design & training (LIDT) Knowledge processes (KP) Implicit knowledge (IK) Knowledge abilities & processes (KAP) Technical dimension (procedural) (TD) Cognitive dimension (CD) Workforce development (WD) Transfer of learning (TL) Emotional intelligence (EI)	Neural Networks and Knowledge-Based Systems (NN-KBS) Officers, Top Leaders – Systems Transfer knowledge (OTLSTK)	Environment= information systems (Hardware, Software) (EIS, HS) Environment= information workforce or communities of practice (EI, CP) Neural networks in knowledge - based systems, acquisition of knowledge engineering (NN-KBS,AKE)

The research tests are validated for their reliability, and the Cranach's alpha test results for all of the variables were 0.964% to the sample 76, according to Eq. 1 (Devellis, 1991):

$$\alpha = \frac{k}{k-1}\left(1-\frac{\sum_{i=1}^{k}\sigma^2_{Y_i}}{\sigma^2 x}\right) \quad (1)$$

Accordingly, Cronbach's Alpha test has explained that the answers are validated for reliability. These are the values that enable us to proceed further in this research area, as the reliability of the answers is found to be very high. Additionally, the results are validated for their reliability, where their standard deviation is found to be as in Table 2 (N=76) according to Eq.2 (Dodge, 2006). This value enabled further progress in this research area, as the reliability of the outcomes found is very high.

$$\delta N = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{X})^2} \quad (2)$$

In the process variables category, the mean of NN-KBS value (3.9876) is higher than the mean of officers; top leaders-systems transfer knowledge (TLSTK) value (3.8879). In the result magnitudes category, accusation knowledge via neural networks and knowledge-based systems, acquisition of knowledge engineering (NN-KBS, AKE) has maximum mean value of 3.9987 and environment = information systems (hardware software) (EIS, HS) have the lowest mean value of 3.6543. The total result variable has mean value of 3.6397. The complete data is distributed into three structure divisions as per their descriptions and tabulated in Table 3.

Table 2: Mean, standard deviation and range knowledge processes

Variable	N	Mean	Sd	SEM	Minimum	Maximum
Antecedents						
IP	76	3.3211	.45019	.07654	1.0	5.0
KE	76	3.7955	.44433	.05432	1.0	5.0
IR	76	3.4332	.52165	.0876	1.0	5.0
IU	76	3.3456	.47453	.0796	1.0	5.0
VV	76	3.8286	.46954	.0764	1.0	5.0
LIDT	76	3.6543	.57646	.05739	1.0	5.0
KP	76	3.6176	.55588	.08876	1.0	5.0
IK	76	3.2673	.58667	.07765	1.0	5.0
KAP	76	3.9591	.56455	.05543	1.0	5.0
TD	76	3.4289	.59111	.07765	1.0	5.0
CD	76	3.7666	.47541	.06549	1.0	5.0
WD	76	3.6654	.50855	.07896	1.0	5.0
TL	76	3.8099	.45578	.08765	1.0	5.0
EI	76	3.5277	.54184	.09876	1.0	5.0
Processes variable						
NN-KBS	76	3.9876	.64537	.09543	1.0	5.0
OTLSTK	76	3.8879	.58764	.08765	1.0	5.0
Outcome dimensions						
EIS,HS	76	3.774	.52345	.09321	1.0	5.0
EI,CP	76	3.6543	.47654	.04357	1.0	5.0
NN-KBS,AK	76	3.9987	.89876	.06589	1.0	5.0
Total outcome	76	3.6397	.77543	.04532	1.0	5.0

Table 3: Structural wide mean and SD values

Variable	structure1; Matrix		Structure2; Functional		structure3; Inverted	
	Mean	Sd (N=76)	Mean	Sd (N=76)	Mean	Sd (N=76)
Antecedents						
IP	3.2215	.30011	3.3452	.37765	3.9877	.3880
KE	3.4321	.43653	3.4567	.44672	3.4779	.4998
IR	3.5214	.51286	3.5432	.53677	3.6703	.5809
IU	3.4321	.39875	3.4711	.40332	3.5766	.4657
VV	3.7654	.47654	3.8344	.56994	3.8876	.5998
LIDT	3.4562	.43209	3.4655	.49987	3.8997	.5109
KP	3.8654	.49876	3.8865	.50769	3.4332	.5433
IK	3.6654	.46548	3.6775	.48877	3.6998	.5222
KAP	3.7456	.47321	3.7999	.48863	3.8335	.5877
TD	3.6543	.46543	3.5677	.47500	3.5889	.4899
CD	3.6543	.46543	3.6833	.47761	3.7198	.4989
WD	3.5231	.41245	3.5355	.43222	3.5998	.4876
TL	3.4865	.40965	3.4887	.44466	3.4976	.4788
EI	3.4877	.41099	3.4899	.43336	3.4998	.4987
Processes variable						
NN-KBS	3.4987	.43467	3.5076	.45645	3.5433	.4766
OTLSTK	3.4113	.39877	3.4533	.40279	3.8999	.4765
Outcome Dimensions						
EIS,HS	3.4554	.39987	3.4677	.43226	3.4876	.4564
EIS,HS	3.3709	.39766	3.4115	.42291	3.4344	.4543
NN-KBS,AK	3.4876	.42379	3.4997	.43376	3.5122	.4964

Through comparing previous circumstances of appropriate structure for the leaderships to purpose apply KS, the mean values of NN-KBS (3.4987, 3.5076, and 3.5433) are at a maximum for all three divisions of structures. In all the three divisions of structures, mean value of V & V value is higher than the KP and mean value of NN-KBS is higher than the officers, TLSTK. In the outcome category, mean value of NN-KBS, AKE is maximum and EIS, HS is lowest in all three structures divisions. Likewise, this structure allows for two important concepts in understanding how knowledge transfers to others; these are V & V (the speed at which knowledge travels and the richness or thickness of it). Accordingly, the samples within

this test have divided into five groups based on the functionality of work. The data is tabulated for N=230 in Table 4.

Table 4: Inverted structural-wide mean and SD values

Heading1	R & D=40		Maintenance=50		Design =60		Production line=40		Eng. Consultants=40	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Antecedents										
IP	3.3321	.30531	3.3723	.32011	3.2814	.3002	3.3022	.3100	3.3321	.3233
KE	3.3251	.30241	3.3553	.32500	3.2544	.3100	3.3442	.3111	3.3117	.3355
IR	3.3322	.33214	3.3422	.31311	3.2452	.3001	3.3443	.3213	3.3356	.3446
IU	3.2931	.30001	3.3441	.31114	3.2996	.3001	3.3353	.3122	3.3338	.3466
VV	3.3722	.32344	3.5467	.33321	3.3456	.3235	3.3446	.3211	3.3224	.3362
LIDT	3.8653	.42322	3.9744	.48887	3.8812	.4506	3.3465	.3965	3.3779	.3886
KP	3.3352	.31822	3.3561	.32662	3.3134	.3134	3.3115	.3001	3.3654	.3354
IK	3.3352	.31544	3.5519	.36770	3.5891	.3222	3.3567	.3563	3.5965	.3573
KAP	3.3455	.33321	3.4700	.34661	3.3231	.3271	3.3476	.3342	3.3523	.3467
TD	3.3333	.32322	3.5672	.37501	3.3800	.3322	3.3398	.3213	3.3609	.3667
CD	3.3241	.30143	3.4844	.36761	3.3109	.3280	3.3460	.3221	3.3687	.3776
WD	3.3339	.30043	3.4551	.37220	3.2991	.3006	3.3341	.3302	3.3711	.3665
TL	3.2771	.30005	3.4321	.35966	3.3201	.3111	3.3133	.3001	3.3633	.3553
EI	3.3021	.30011	3.3661	.35332	3.3411	.3087	3.3233	.3112	3.3698	.3654
Processes variable										
NN-KBS	3.3489	.34462	3.8441	.35622	3.3344	.3155	3.3110	.3002	3.4281	.3559
OTLSTK	3.3334	.33643	3.4551	.35578	3.3007	.3113	3.3211	.3000	3.4335	.3567
Outcome dimensions										
EIS, HS	3.3224	.30017	3.4257	.38221	3.3252	.3334	3.3122	.3001	3.4497	.3543
EI, CP	3.3332	.32266	3.4125	.32331	3.3246	.3143	3.3217	.3211	3.4365	.3554
NN-KBS, AK	3.3669	.33321	3.4337	.40171	3.3332	.3280	3.3354	.3321	3.4576	.3765

In the antecedents' category, the mean values of learning, instructional design & training (LIDT) are (3.8653, 3.9744, 3.8812, 3.3465, and 3.3779) and at a maximum for all of the five structural groups; maintenance division has the highest value of 3.97. However, of all the structural groups, mean value of V&V are higher than the implicit knowledge. These concepts relate to how knowledge transfers to V&V. In other words, which knowledge travels and richness or thickness of it? Overall, the study has tested the process variable group; the mean value of NN-KBS is higher than the OTLSTK in all the five structural groups. There is an increasing trend from maintenance to consultants to production line to R&D to design in the mean values of NN-KBS. A similar trend is observed in OTLSTK also, in the same order. In the outcome category, the mean value of NN-KBS, NN-KBS, AKE is at a maximum; maintenance sector has the highest value of 3.4337, and environment information work force or communities of practice (EI, CP) is the lowest value in all of the structure groups. The study has gone some way towards enhancing our understanding of the relationship between the dependent variable, KESs and independent variable as leadership and NN by using ANOVA analysis test. This analysis results are displayed in Table 5.

Table 5 Analysis of variance

Model	Sum of squares	DF	Mean square	*F*	Significancee
Regression	18.41	2	7.75	211.134	0
Residual	3.39	228	0.52	-	-
Total	21.8			-	-

By comparing the absolute values $(|t|)$ for calculated values to all coefficients $(\hat{\beta})$ and by comparing tabular values by freedom degree (25) and the level of moral (0.01), $(|t|)$ has been confirmed to be the calculated absolute value, greater than the tabular value for all variables at the level indicated by the null hypothesis that will be rejected (H_O), and the alternative hypothesis (H_1) will be accepted.

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}} \quad (3)$$

$$F = \frac{\left(\frac{RSS_1 - RSS_2}{p_2 - p_1}\right)}{\left(\frac{PSS_2}{n-p_2}\right)} \quad (4)$$

This means that all of the independent variables (X_i)

have a statistically significant effect with high degree at the moral level (0.01) on the dependent variables (Y_i). Data analysis will be carried out for N=230 by using regression analysis and the results have explained in Table 6.

Table 6: Regression model

Model	R	R-Square	R- Adjusted Square	Standard error of the estimate
1	0.888	0.8321	0.80123	0.1987

This section focuses on the determination of the type of relationship (correlation) and its strength between process variables, NN-KBS, OTLSTK; Outcome variables: EIS, HS, EI, CP and NN-KBS, AKE are tabulated in Table 7 for *N* = 230. According to Eq. 5 and are as follows;

$$rxy = \frac{N\sum XY - \sum X \sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2]\,[N\sum Y^2 - (\sum Y)^2]}} \quad (5)$$

According to Hair et al. (1990) outcome of the correlation coefficient value of more than 0.18 between the variables is considered as significant. Consequently, all of the variables presented above have high correlation coefficient values. This indicates that the common outcome dimensions are relevant to both the processes of OTLSTK and NN-KBS. The highest coefficient value is 0.8859 between them.

Table 7 Correlation coefficient values

	NN-KBS	OTLSTK	EIS, HS	EI, CP	NN-KBS, AKE
NN-KBS	1*				
OTLSTK	**0.8659***	1*			
EIS, HS	0.6578*	0.5123**	1*		
EI, CP	0.5476**	0.5785**	0.4876**	1*	
NN-KBS, AKE	0.8234*	0.7032*	0.6215**	0.7134*	1*

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

4. Conclusions

This study reveals that a significant relationship exists between leadership and KESs through implementation of inverted structure. Accordingly, the research has found that the suitable structure is called the inverted structure. This is because, it helps selected contributions to KESs. Also, through this structure some likely future trends are identified in the work problems to find out suitable solutions. Because this structure focuses on the communication and contributions of knowledge in order to make it explicit through encouraging ideas of the staff. Also, one of the more significant findings to emerge from this study about the relationship between KESs and neural networks confirmed that the knowledge acquisition engineering of a range of techniques is used to obtain a scope in knowledge. This is for the purpose of explanation and configuration of the data for constructing neural networks. This confirms that it must reduce the communication gap between the expert or knowledge worker and the knowledge engineer in the companies. This is because for finding knowledge the sources must be independent.

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