Assessment of Knowledge Management Maturity in Industrial Sector of Iran; a New Approach

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Abstract: Knowledge management concentrate on organizational objectives such as efficient performance, competitive benefits, innovation, the sharing of experience learned, development and continuous improvement of the organization. The aim of this paper is assessment of knowledge management maturity in industrial sector of Iran. For do it, we have introduced a new approach to assessment of Knowledge Management Maturity in Industrial Sector of Iran. Based on a regression model, we have estimated the level of Knowledge Management Maturity in industrial sector of Iran. Results indicate that the parameter of knowledge management has not a significant impact on growth of production of industrial sector of Iran. This fact is related to level of maturity of Knowledge management in industrial sector of Iran. Knowledge Management of industrial sector of Iran isn't in Maturity level. This paper has suggested some ways to improve knowledge management in industrial sector of Iran.
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1. Introduction

Knowledge management is considered a necessary and important factor of organizational survival and maintenance of competitive power [Martensson, 2000].

Knowledge Management (KM) is becoming increasingly important as organizations realize that sustainable competitive advantage hinges on effective management of their vast and varied knowledge assets [Kulkarni and Louis (2003)].

There are some problems in KM process as complexity of knowledge and the complexity of organization's culture, policies, documents, and the employees. The problems of KM implementations vary according to the context and KM maturity level. While research into and practices of KM have recently grown rapidly, the KM field has been criticized as being confusing due to lack clarity with respect to its definitions and framework [Lin, Wu and Yen (2011)].

Knowledge Management Maturity (KMM) represents a way to overcome above problems about KM process. This way evaluates each process of KM progress. In this context maturity is the extent to which a specific process is explicitly defined, managed, measured, controlled, and effective [Lin, Wu and Yen (2011)].

To modeling a KMM model, we should address both of the objectives and issues of importance regarding knowledge management and limitations present in today's models.

The aim of this paper is assessment of knowledge management maturity in industrial sector of Iran. For do it, we have estimated a regression model for considering maturity in KM process of industrial of Iran.

2. Review of Literature

Ehms and Langen (2002) have introduced Knowledge Management Maturity Model for Knowledge Management at Siemens AG. They has developed such a methodology and already applied it successfully. This methodology has comprised three components: A development model, an analysis model and an auditing process. Applying this instrument generally leads to understanding and appreciation of a gradual and integral development of knowledge management. It has delivered the important qualitative and quantitative information to navigate this journey [Ehms and Langen (2002)].

Kulkarni and Louis (2003) have surveyed instrument is to both identify the level of knowledge management maturity for an organization and have provided guidance on how to improve that level. This study was pilot tested at Intel using employees from CQN (Corporate Quality Network). It describes how that instrument was developed, how it was pilot tested, and what was learned from that pilot test. They have defined five levels of maturity. These levels are conceptually derived from the broad framework of Carnegie Mellon's Capability Maturity Model (CMM) for software engineering. The maturity levels and the assessment instrument were developed in concert with Intel Corporation. A two-stage pilot study was completed and the assessment was administered to a sample of knowledge workers in a large business unit within the company. the results of their survey indicate that self-assessment of knowledge management maturity is possible, and that

this assessment has provided valuable feedback for more effective use of knowledge assets[Kulkarni and Louis (2003)].

Robinson and et. al (2005) have investigated how large UK construction organizations manage their knowledge assets. They have shown that the UK-based companies with international operations are ahead of their national counterparts in their KM implementation efforts. They concluded that construction organizations are likely to be successful in implementing KM if appropriate considerations are given to strategy formulation, implementation issues addressed and the link between KM and business strategy was strengthened [Robinson and et. al (2005)].

Kulkarni and Freeze (2004) have considered a comprehensive methodology for KM assessment and have considered empirically validate its content and construct validity. They have presented a knowledge management capability assessment (KMCA) methodology with measures that accurately capture a firm's knowledge management ability. The results show that the KMCA is robust, in that it is able to correctly estimate the capabilities of the knowledge areas it was designed to measure.

Wijnhoven (2003) describes knowledge management as consisting of the processes that create, distribute, use, exploit and maintain knowledge. Cong and Pandya (2003) define knowledge management as an organization's ability to use its collective knowledge by way of processes like knowledge creation, distribution and exploitation facilitated by technology so as to achieve its objectives.

Cong and Pandya (2003) have provided some form of justification for importance of managing knowledge. They state that the essence of managing knowledge is to check who is to distribute/share, what is distributed, how it is to be distributed and ultimately distributing and using it. They contend that managing knowledge culminates in value when shared knowledge is used and re-used. Consistent value results when there is an atmosphere of trust and motivation for people to share and use knowledge, when there are in existent systematic processes for people to find and create, and where necessary, there is technology to store and make it relatively easy to find and share knowledge. According to Cong and Pandya therefore, knowledge management involves systematic approaches to find, understand and utilize knowledge to achieve organizational objectives. KM creates value by reducing the expense and time trial and error processes.

Antezana and et al (2009), define knowledge management as the process of systematically capturing, structuring, retaining and reusing information to develop an understanding of how a particular system works and subsequently to convey this information meaningfully to other information systems, i.e. knowledge distribution.

Leidner, Alavi and Kayworth (2012) have used a case study approach to compare and contrast the cultures and knowledge management approaches of two organizations. Their study suggests ways in which organizational culture influences knowledge management initiatives as well as the evolution of knowledge management in organizations. Whereas in one organization, the KM effort became little more than an information repository, in the second organization, the KM effort evolved into a highly collaborative system fostering the formation of electronic communities.

3. Method of Research

We have used a production function of industrial sector of Iran. This production function is as following:

$$Q = AK^{\alpha}L^{\beta} \quad (1)$$

Q is production of industrial sector, K is capital of industrial sector, L is labor force of industrial sector and A is Management factor with emphasis on Information and communications technology (ICT). This factor indicates Knowledge Management in industrial sector of Iran. We have introduced knowledge management factor as following:

$$A = e^{(\theta+\rho\tau)} \quad (2)$$

θ is factor of management, τ is knowledge management variable (ICT index) and ρ is coefficient of Knowledge management that this parameter indicates the level of Maturity in knowledge management of industrial sector of Iran.

Then, by taking the differential of the logarithm of variables, we have following form of the regression model:

$$DLN(Q_{it}) = c + \rho\tau_{it} + \alpha\, dln(K_{it}) + \beta\, dln(L_{it}) + \varepsilon_{it} \quad (3)$$

$DLN(Q_{it})$ is growth of production of industrial sector, c is intercept, τ_{it} is knowledge management factor (ICT index), ρ indicates Knowledge Management Maturity of industrial sector, $dln(K_{it})$ is the growth of capital and $dln(L_{it})$ is the growth of labor force and ε_{it} is error term. α and β are parameters of the model.

3.1. Hypothesis:

Hypothesis of this research is as following:

1. Knowledge Management of industrial sector of Iran isn't in Maturity level. In other words, ρ has not significant impact on growth of production of industrial sector of Iran.
2. Growth of capital has a significant impact on growth of production of industrial sector of Iran.

3. Growth of labor force has a significant impact on growth of production of industrial sector of Iran.

3.2. Data Collection

We have used the database of World Development Indicator (2011), Central Bank of Iran and Statistical Centre of Iran.

3.3. Estimation Method

Before estimation of a regression model, we should test unit root for variables of the model. Of particular interest to us is the Augmented Dickey-Fuller (ADF) test that has been developed to test univariate time series for the presence of unit roots or non-stationary. The extended maintained regression used in the ADF test can be expressed in its most general form as:

$$\Delta Y_t = \mu + \gamma Y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta Y_{t-j} + \beta t + \omega_t \quad (4)$$

Where μ is the drift term, t denotes the time trend, and p is the largest lag length used. In order to analyze the deterministic trends, we used modified versions of the likelihood ratio tests suggested by Dickey and Fuller (1981).

Cointegration Approach:

If the variables of the model have integrated in one level, we should use the cointegration approach for estimation long-run relationship.

Intuitively, the Johansen test is a multivariate version of the univariate DF test. Consider a *reduced form* VAR of order p:

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + u_t \quad (5)$$

where y_t is a *k*-vector of I(1) variables, x_t is a n-vector of deterministic trends, and u_t is a vector of shocks. We can rewrite this VAR as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + u_t \quad (6)$$

where $\Pi = \sum_{i=1}^{p} A_i - 1, \Gamma_i = -\sum_{j=t+1}^{p} A_j$

The error correction model (ECM), due to Engel and Granger (1987). The Π matrix represents the adjustment to disequilibrium following an exogenous *shock*. If Π has reduced rank $r < k$ where r and k denote the rank of Π and the number of variables constituting the long-run relationship, respectively, then there exist two $k \times r$ matrices α and β, each with rank r, such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is stationary. r is called the *cointegration rank* and each column of β is a cointegrating vector (representing a long-run relationship). The elements of the α matrix represent the *adjustment* or *loading* coefficients, and indicate the speeds of adjustment of the endogenous variables in response to disequilibrating shocks, while the elements of the Γ matrices capture the short-run dynamic adjustments. Johansen's method estimates the Π matrix from an unrestricted VAR and tests whether we can reject the restrictions implied by the reduced rank of Π. This procedure relies on relationships between the rank of a matrix and its characteristic roots (or eigenvalues). The rank of Π equals the number of its characteristic roots that differ from zero, which in turn corresponds to the number of cointegrating vectors. The asymptotic distribution of the Likelihood Ratio (Trace) test statistic for cointegration does not have the usual χ^2 distribution and depends on the assumptions made regarding the deterministic trends [Engel and Granger (1987)].

4. Empirical Results

First of all, we have tested unit root test for variables. Results indicate that all of the variables are stationary. Table 1 indicates the ADF test.

After we sure from stationary of variables, we can estimate the model of research. We have estimated the model by Ordinary Least Square (OLS) method as following Table.

Table 2 indicates the estimation results of the model. Based on above results, we have concluded following results:

- ✓ Growth of labor has a significant positive impact on growth of production of industrial sector of Iran.
- ✓ Growth of capital has a significant positive impact on growth of production of industrial sector of Iran.
- ✓ The parameter of knowledge management has not a significant impact on growth of production of industrial sector of Iran. This fact is related to level of maturity of Knowledge management in industrial sector of Iran. Knowledge Management of industrial sector of Iran isn't in Maturity level. Therefore industrial of Iran should increase investment on knowledge management as ICT investment for improving knowledge of workers of this section.

Reasons of lack of knowledge management maturity are as following:

- Don't attention to Knowledge investment in Industrial Sector of Iran. For example, industries have not enough investment on ICT.
- Policy makers have not program for improving human capital and social capital in organizational levels.

- Complexity of organization's culture, policies, documents, and the employees is one of the reasons no maturity.
- Lack of motivation in workers because of inefficiency of organizational structure.
- Inefficiency of institution in Iran as no intellectual property right.
- Crowding out effect by government investment decrease activity of private sector in industrial sector. Governmental industries have not efficient management.

5. Conclusion

Knowledge management is considered a necessary and important factor of organizational survival and maintenance of competitive power [Martensson, 2000].

In this paper, we have introduced a new approach to assessment of Knowledge Management Maturity in Industrial Sector of Iran. Based on a regression model, we have estimated the level of Knowledge Management Maturity in industrial sector of Iran. Results indicate that the parameter of knowledge management has not a significant impact on growth of production of industrial sector of Iran. This fact is related to level of maturity of Knowledge management in industrial sector of Iran. Knowledge Management of industrial sector of Iran isn't in Maturity level. Therefore industrial of Iran should increase investment on knowledge management as ICT investment for improving knowledge of workers of this section.

For improving the knowledge management in industrial sector of Iran, we have presented some suggestions as following:

- Attention to Knowledge investment in Industrial Sector of Iran as ICT investment.
- Reforms in organization's structure in view point human capital.
- Creation motivation in workers by implementation basic methods of knowledge management.
- Creation or reform economic institution by policy makers of industrial sector of Iran.
- Privatization of industrial sector of Iran.

Table1. ADF Test for Considering Stationary

Variable	Critical Value at 10% level	Critical Value at 5% level	Critical Value at 1% level	ADF results	Final Results
$DLN(Q_{it})$	-2.59	-2.92	-3.57	-5.51	**Stationary**
τ_{it}	-2.19	-2.72	-3.39	-3.46	**Stationary**
$dln(K_{it})$	-3.19	-3.52	-4.19	-4.41	**Stationary**
$dln(L_{it})$	-2.60	-2.90	-3.60	-3.84	**Stationary**

- Results of Eviews

- Table 2. Estimation Results

Dependent Variable: Growth of Industrial Sector
Method: Least Squares
Date: 11/27/12 Time: 11:02
Sample (adjusted): 1968 2007
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	0.132866	0.042115	3.250392	0.0003
Growth of Labor	1.210683	0.270276	4.483439	0.0000
Growth of Capital	0.234066	0.059085	3.961499	0.0003
Knowledge Management	3.17E-06	1.57E-05	0.202089	0.8410

R-squared	0.814861	Mean dependent var	0.076647
Adjusted R-squared	0.787766	S.D. dependent var	0.089993
S.E. of regression	0.027532	Akaike info criterion	-2.181612
Sum squared resid	0.216404	Schwarz criterion	-2.012724
Log likelihood	47.63223	Hannan-Quinn criter.	-2.120547
F-statistic	34.514696	Durbin-Watson stat	2.058611
Prob(F-statistic)	0.003200		

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