Measuring Knowledge Management Initiatives in the Organizations

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Abstract

With the increased focus on Knowledge management (KM), many Indian organizations are employing it at various levels. However, less attention has been given to developing a measure of KM. The purpose of this paper is to develop an empirically based comprehensive instrument for measuring an organization's KM initiatives. A pool of 257 items for measurement of the identified KM practices has been generated from a thorough literature study which was put through a number of iterations to finally develop a scale consisting of 45 items. This scale was used to collect data from a set of 150 employees belonging to different organizations, after which EFA has been applied to estimate principal components. This paper explains KM with the help of different constructs and proposes a multi-item measure of KM established with the help of EFA. The scale developed may be a little narrow in its scope as it started with the consideration of nine KM practices. Other aspects of the organization will have to be considered for drawing a complete picture of KM initiatives of an organization. Model generalizability may be an issue to address. It would be advisable to replicate this study with a larger sample across different industries in order to ascertain its external validity. This empirically derived scale may be used as a metric to measure KM practices in an organization.

Key Words : Knowledge Management (KM), Scale Development, Exploratory Factor Analysis (EFA)

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INTRODUCTION

Academic and industry interest has focused on KM as a means for creating competitive advantage and customer value Knowledge is an extremely important resource for an organization. Knowledge has to be properly managed and wisely utilized (Birkinshaw & Sheehan, 2002), hence Km becomes an essential requirement for organizations. KM deals with acquisition, codification and dissemination of the right knowledge to the right person at the right time. KM performance measurement becomes inevitable for organizations who wish to keep knowledge at the forefront of their business model.

The purpose of this article is to develop a comprehensive instrument based on empirical testing for measuring an organization's KM practices. A thorough literature analysis has been done for construct development, item generation and purification. The article finally concludes with a discussion of managerial implications and considerations for further research.

LITERATURE REVIEW

Knowledge Management (KM)

According to Van Krogh (1998), KM refers to identifying and leveraging the collective knowledge in an organization to help the organization compete. Marques & Simon (2006) said that KM could be seen as an organizational innovation involving changes in strategy and management practices of firms. Andreeva & Kianto (2012) defined KM practices as the set of management activities conducted in a firm with the aim of improving the effectiveness and efficiency of organizational knowledge resources.

KM practices refer to those aspects of an organization that can be controlled and varied by conscious intentional management activity (Andreeva & Kianto, 2012; Foss & Michailova, 2009). The authors, accordingly conceptualize KM practices as the set of management activities that enable the firm to deliver value from its knowledge-based assets. The research emphasizing these dimensions is outlined in Table I. The initial constructs for each of these dimensions have been derived from the KM literature, and then further defined through procedures described in the following sections. The present literature has laid stress on the following kinds of KM practices:

1. Human oriented KM practices – culture, people and leadership;
2. Organization-oriented KM practices – processes and structures;
3. Technology-oriented KM practices – infrastructure and applications; and
4. Management process oriented – strategy, goals and measurement.

For the purpose of this study, we divide KM practices into nine main categories (as described in Table I):

KM1 Culture
KM2 People – Integration of KM and HRM
KM3 Structure
KM4 Information and Communication Technology
KM5 Training
KM6 Leadership
KM7 Resources for KM
KM8 KM strategy
KM9 Network and Alliances

Figure 1 : KM Practices and Organizational Performance

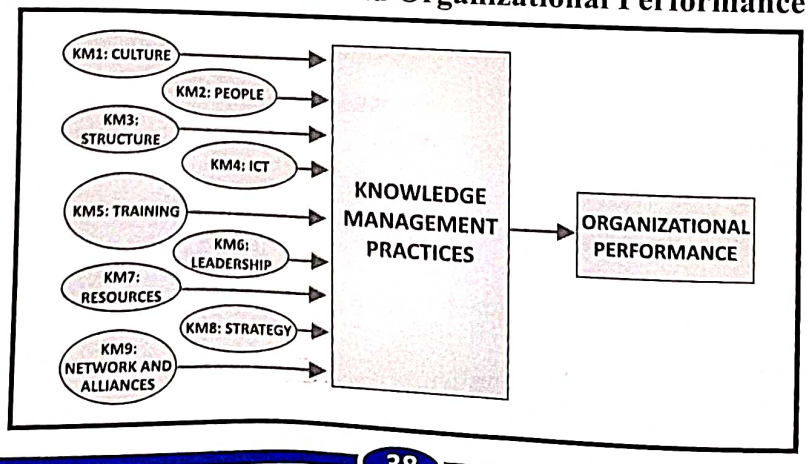

Table 1: Identified KM Practices and Sources

S. No.	Dimension	Sources
1	KM1 Culture	Skyrme& Amidon, 1997; Davenport et al., 1998; Buckman, 1999; Greco, 1999; Liebowitz, 1999, APQC, 1999; Ryan &Prybutok, 2001; McDermott, 2001; Wild et al., 2002; Hassanali, 2002; Moffett et al., 2003; Lee & Choi, 2003; Wong & Aspinwall, 2005; Al-Busaidi&Olfman, 2005; Hung et al., 2005; Akhavan et al., 2006; Chong, 2006; Bozbura, 2007; du Plessis, 2007; Basu& Ray, 2014; Marques & Simon, 2006; Zaim, 2009; Valhoahmaddi, 2010; Appelbaum et al. , 2014; Basu& Ray, 2014; Lee, Shiue &chen, 2016
2	KM2 People	Bontis, 2000; Mondy et al., 2002; Garavan et al., 2000; Mentzas 2001; Horak, 2001; Salleh & Goh, 2002; Yahya & Goh 2002; Hwang, 2003; Moûett et al., 2003; Hung et al., 2005; Chong & Chong, 2005; Wong & Aspinwall 2005; Akhavan et al. 2006; Chong 2006; Akhavan& Jafari 2006; Bozbura 2007; du Plessis, 2007; Jafari et al. 2007; Priesto -Pastor et al, 2010; Jain &Moreto, 2015
3	KM3 Structure	Davenport & Klahr, 1998; Ulrich, 1998; Davenport & Klahr,1998; Greco, 1999; Buckman, 1999; Greco, 1999; Hickins, 1999; Tynan, 1999; Choi, 2000; Wenger & Snyder, 2000; Hsieh et al., 2002; Hsieh et al., 2002; Moffett et al., 2003; Gold et al, 2001; Lee & Choi, 2003; Chong & Choi, 2005; Hung et al, 2005; Zaim et al, 2009
4	KM4 ICT	Davenport & Klahr, 1998; Davenport & Klahr, 1998; Greco, 1999; Ulrich, 1998; Buckman, 1999; Greco, 1999; Hickins, 1999; Tynan, 1999; Wenger & Snyder, 2000; Choi, 2000; Gold et al, 2001; Hsieh et al., 2002; Hsieh et al., 2002; Lee & Choi, 2003; Moffett et al., 2003; Chong & Choi, 2005; Wong & Aspinwall, 2005; Zaim et.al., 2009; Valhoahmaddi, 2010;Andreeva& Kianto, 2012
5	KM5 Training	Greengard, 1998; Cohen & Backer, 1999; Choi, 2000; Garavan et al., 2000; Horak, 2001; Mentzas, 2001; Yahya & Goh, 2002; Mondy et al., 2002; Salleh & Goh, 2002; Hwang, 2003; Moûett et al., 2003; Moffett et al., 2003; OECD research, 2003; Chong & Choi, 2005; Wong & Aspinwall, 2005; Chong, 2006; Hung et al., 2005; Marques & Simon, 2006; Hung et al., 2005; Bozbura, 2007; Valhoahamaddi, 2010; Wong 2013, Donate &Gaudamillas, 2015, Kianto, Saenz &Araburu, 2017.
6	KM6 Leadership	Skyrme& Amidon, 1997; Davenport et al., 1998; Abell &Oxbrow, 1999; American Productivity & Quality Center (APQC), 1999; Hasanali, 2002; Liebowitz, 1999; Holapple& Joshi, 2000; Holsapple & Joshi, 2000; Choi, 2000; Civi, 2000; Ryan &Prybutok, 2001; Pemberton et al., 2002; Kalling, 2003; Moûett et al., 2003; Ribiere& Sitar, 2003; Chong & Choi, 2005; Peyman et al., 2005; Hung et al, 2005; Wong & Aspinwall, 2005; Al-Busaidi&Olfman, 2005; Chong, 2006; Akhavan& Jafari, 2006; Akhavan et al., 2006; Jafari et al. ,2007; du Plessis, 2007; Chong, 2006; Anantamulla, 2007; Valhoahmadi, 2010; Donate & Pablo, 2014
7	KM7 Resources	Holsapple & Joshi, 2000; Davenport &Volpel, 2001; Wong & Aspinwall, 2004; Chong, 2006; Valhoahmaddi, 2010
8	KM8 Strategy	Skyrme & Amidon (1997), Davenport et al. (1998), Liebowitz (1999), (APQC) (1999), Zack (1999), Wong & Aspinwall (2005), Akhavan et al. (2006), Bozbura (2007), du Plessis (2007), Valhoahmaddi, 2010
9	KM9 Network and Alliances	Wu, I. L., & Chen, J. L. (2014); Yahyapour, S; Shamizanjani, M; Mosakhani, M. (2015); Sinha et al. (2015)

DEVELOPMENT OF THE CONSTRUCTS

The procedure

The scales for measurement of behavioral variables were first developed and refined by psychologists (Likert, 1967; Nunnally, 1978). The procedures used for development of a scale for the purpose of measurement of KM practices are the generally accepted principles of instrument design as laid out by these psychologists, and are serially presented in this article. This procedure is based on Churcill's (1979) general design involving:

1. pretesting,
2. revision,
3. development of a preliminary instrument,
4. ascertaining internal consistency,
5. detailed item analysis,

Generation of scale items

Keeping in mind the general principles of scale development (Gerbing and Anderson, 1988), at this stage the task was to generate an inventory of items that could be used to capture KM practices in an organization. On the basis of the present literature (Table 1), a large pool of items for measurement of the identified KM practices was generated. The process was carried out very carefully and care was taken to cover the major aspects of all KM practices in order to get a complete picture. This resulted in multiple items for each KM practice. This pool was then passed through iterations based on discussion with two experts – one from the industry and the other from academia. Overall, 257 items were generated, which were then iterated on the basis of appropriateness, uniqueness, and ability to convey the meaning to respondents.

Purification of scale items

In order to purify the scale, the items were tested for clarity and appropriateness. These items were presented to a cross section of 150 employees belonging to different organizations. These executives were asked to critically analyze each of the items in respect to the dimension it was intending to measure. A number of sessions were held with some of these employees in which participants were questioned about the appropriateness of the items, ease in understanding the meaning; ambiguity, if any and improvements, if required. The result of this process was deletion of some items, and change in the language of some of them, so that they are better understood by the reader. Finally, 45 scale items remained which have been enlisted in Table 2.

Table 2: Measuring KM Practices

KM1	**Culture**
C1	Level of collaboration between employees
C2	Level of trust between employees
C3	Level of focus on learning and innovation
C4	Level of open and improved communication
C5	Level of approachability of senior management
C6	Level of openness to new ideas / knowledge
KM2	**People**
P1	Level of task orientation of employees
P2	Level of employee participation, empowerment and satisfaction
P3	Level of succession planning
P4	Level of team work
P5	Level of effort put in recruitment of employees
P6	Level of effort put in retention of employees

KM3	**Structure**
S1	Level of autonomy given to employees
S2	Level of participation of employees in decision making
S3	Level of formalization in the organization
S4	Level of vertical integration
S5	Level of horizontal integration
KM4	**ICT**
ICT1	Adequacy of data management architecture and services
ICT2	Adequacy of technological tools (collaborative tools, knowledg e bases, searching tools, document management systems, intelligent systems etc) for knowledge sharing
ICT3	Adequacy of organizational infrastructure (meeting room, filing rack etc.)
ICT4	Capability of ICT system in terms of sharing data and information with all stakeholders
ICT5	Effectiveness and efficiency of information systems
ICT6	Frequency of technological infrastructure maintenance
KM5	**Training**
T1	Level of formal training related to KM
T2	Level of training in skills development such as creative thinking, problem solving, communication, soft networking, team building, etc.
T3	Level of encouragement to participate in internal and external new learning opportunities such as conferences, training seminars, university courses, etc.
T4	Adequacy of training for using KM system and tools
T5	Adequacy of training to take up knowledge related roles
T6	Level of opportunity provided for competence development by providing specialized training programs
KM6	**Leadership**
L1	Level of determination and commitment of top management for adoption of KM system.
L2	Adequacy of funding to support KM projects
L3	Degree of willingness from top management to share knowledge with employees
L4	Level of participation and guidance by senior managers
KM7	**Resources for KM**
R1	Amount of budget allocated for KM initiatives
R2	Adequacy of human resource to support KM initiatives
R3	Adequacy of time given to employees to perform knowledge related activities

As the main objective of this research was to develop a comprehensive instrument to measure KM practices, the sample consisted of managerial and operational level employees. In line with Nunnally (1978), the sample used was the group on whom the instrument was intended to be implemented. These respondents are the ones who construct and implement KM practices in the organization. The sample included employees from different organizations since the goal was to develop a heterogeneous group so as to avoid the risk of getting similar responses and also to get different points of view from different people across various organizations. It should be noted that all the organizations included in the sample have implemented varying kinds and levels of KM practices depending on their business macro and micro environment factors.

The survey was electronically administered to 407 employees and the time period for collection of data was July 2017 to October 2017. In all, 110 employees from 80 organizations responded to the survey, out of which 5 had to be discarded because of significant missing values. In all, 105 usable surveys were used for analysis leading to a response of 25.7%. SPSS version 22 was used to for data analysis.

RESEARCH METHODOLOGY

Exploratory factor analysis

The size of the sample with respect to the model being tested is a major consideration for data reduction. EFA has been applied to estimate principal components. It is important to mention that the main objective of this research is to propose an exploratory model in the first place. The objective of EFA is to extract the smallest number of interpretable factors that contribute to the correlation among the given set of variables. The items that group together after applying EFA are said to measure the same underlying construct (Kerlinger, 1986). EFA is a useful tool for understanding the various dimensions of a construct. It also helps in isolating those variables that do not contribute to explaining the construct at hand. EFA is extremely helpful during the pilot study stage for extracting a set of important variables as all loadings are free to vary in this process contrary to confirmatory factor analysis in which certain loadings have to be zero.

The analysis was conducted using various extraction methods and the solution which is considered to be the most interpretable solution was using unweighted least squares factoring as extraction method and varimax rotation as the rotation procedure. The 45 scale values loaded onto five factors with eigen values greater than one (1) explaining 69.039 percent of the variance. Three items were dropped by the process of EFA - ICT1 (Adequacy of data management architecture and services), S5 (Level of horizontal integration), and P5 (Level of effort put in recruitment of employees) since it was specified that factors which failed to explain less than 0.5 percent variance should be ignored. The final factor solution, factor descriptions, percentage of variance explained and coefficient alphas are presented in tables below. The high measure of sampling adequacy and the significance of the Barlett's test of sphericity for the initial factor solution indicate that the correlation matrices are suitable for multivariate analysis. The new factors that emerged were carefully studied and given a descriptive title that represented the characteristics of the construct.

Detailed item analysis

Reliability testing and thorough item analysis was undertaken in order to refine the factors. Nunnally (1978) developed a commonly adopted method to evaluate allotment of items to a construct. This approach considers the correlation of each item with each construct. The item score to scale score correlations are used to determine if an item belongs to a construct as determined by factor analysis or if it should be grouped under a different construct or completely dropped. Here, the approach that has been adopted was to evaluate each measurement item with respect to its reliability contribution to a scale. After applying this if any item reduced the reliability of a factor, it was deleted.

If the value of coefficient alpha was below 0.7 (Nunnally et al., 1990) that factor either would be deleted or a solution to improve the reliability would be derived. 0.70 has been maintained as the threshold for acceptance of a factor for the purpose of this study. As indicated in the Table 5, the reliability coefficients were well above the threshold of 0.7 ranging from 0.863-0.922. Also,

during running the reliability analysis test, another aspect is to see if the reliability of the scale increased by deleting an item. In this case, the deletion of two items was resulting in the increase of the overall reliability of a scale, while addition of these to factor 4 resulted in increased reliability, hence these items two items were considered to be a part of the fourth factor.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.929
Bartlett's test of sphericity	Approx. Chi-Square	5473.349
	Df	990
	Sig.	.000

Table 4: Rotated Component Matrix

	Component				
	1	2	3	4	5
C1		.742			
C2		.697			
C3		.653			
C4		.732			
C5		.752			
C6		.686			
P1		.664			
P2		.648			
P3		.580			
P4		.692			
P5					
P6					.695
S1					.728
S2					.578
S3					.652
S4					.649
S5					
ICT1					
ICT2					
ICT3			.629		
ICT4			.743		
ICT5			.661		
ICT6			.638		
T1			.691		
T2			.607		
			.524		

T3	.625				
T4	.687				
T5	.708				
T6	.708				
L1	.724				
L2	.636				
L3	.688				
L4	.523				
R1	.743				
R2	.654				
R3	.667				
SY1	.608				
SY2	.572			.527	
SY3	.515			.519	
SY4				.544	
NA1				.647	
NA2				.654	
NA3				.698	
NA4				.652	
NA5				.630	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table 5 : Reliability Statistics

Factor	Name of the factor	No. of items	Cronbach's Alpha
Factor 1	Commitment and support from top management	12	0.95
Factor 2	Culture of the organization	10	0.918
Factor 3	Technological tools availability and skill development	7	0.922
Factor 4	Knowledge – acquisition and processing	8	0.912
Factor 5	People – importance and functionality	5	0.863

Table 6 : New Factors

Factor Number	Factor Name	Items	Variance explained
Factor 1	Commitment and support from top management	Level of encouragement to participate in internal and external new learning opportunities such as conferences, training seminar, university courses, etc.	0.625
		Adequacy of training for using KM system and tools	0.687
		Adequacy of training to take up knowledge related roles	0.708
		Level of opportunity provided for competence development by providing specialized training programs	0.708
		Level of determination and commitment of top management for adoption of KM system.	0.724
		Adequacy of funding to support KM projects	0.636
		Degree of willingness from top management to share knowledge with employees	0.688
		Level of participation and guidance by senior managers	0.523
		Amount of budget allocated for KM initiatives	0.743
		Adequacy of human resource to support KM initiatives	0.654
		Adequacy of time given to employees to perform knowledge related activities	0.667
		Degree of alignment of KM strategy with organizational strategy	0.608
Factor 2	Culture of the organization	Level of collaboration between employees	0.742
		Level of trust between employees	0.697
		Level of focus on learning and innovation	0.653
		Level of open and improved communication	0.732
		Level of approachability of senior management	0.752
		Level of openness to new ideas / knowledge	0.686
		Level of task orientation of employees	0.664
		Level of employee participation, empowerment and satisfaction	0.648
		Level of succession planning	0.58
		Level of team work	0.692
Factor 3	Technological tools availability and skill development	Adequacy of technological tools (collaborative tools, knowledge bases, searching tools, document management systems, intelligent systems etc) for knowledge sharing	0.629
		Adequacy of organizational infrastructure (meeting room, filing rack etc.)	0.743
		Capability of ICT system in terms of sharing data and information with all stakeholders	0.661
		Effectiveness and efficiency of information systems	0.638
		Frequency of technological infrastructure maintenance	0.691
		Level of formal training related to KM	0.607
		Level of training in skills development such as creative thinking, problem solving, communication, soft networking, team building, etc.	0.524

Factor 4	Knowledge – acquisition and processing	Degree of clarity of objectives for KM	0.527
		Degree of explicit documentation of KM rules	0.519
		Degree of awareness and support of employees towards the organization's KM strategy	0.544
		Adequacy of dedicated resources to obtain external knowledge	0.647
		Extent of participation in teams where external members are also present	0.654
		Memberships of industry bodies	0.698
		Adequacy of processes for exchanging knowledge with business partners and suppliers	0.652
		Adequacy of processes for obtaining customer feedback	0.63
Factor 5		Level of effort put in retention of employees	0.695
		Level of autonomy given to employees	0.728

CONCLUSION AND DISCUSSION

The model proposed at the beginning of the paper has undergone modifications and there are five factors that have emerged from the EFA, representing 42 statements. There were few logical inconsistencies in the way the statements loaded on to the factors. The resulting scale is concise and has retained all the important aspects of the original version. If we look closely at the newly developed factors and the items that constitute them, we will notice that though the number of factors has reduced, but the items which are now representing factors are more comprehensively covering the actual spirit of the factor.

The first factor 'Commitment and support from top management' is the most comprehensive and takes an eagles view of the entire KM of an organization starting from the perspective of support from top management for participating, training, resource allocation and general approach to KM in the organization. Whereas the first factor sets the tone, it is the 'Culture' of the organization which decides how and what kind of knowledge will be shared by the employees, if at all. This factor includes items like collaboration and trust, openness to new ideas, employee participation, team work and succession planning which are all extremely important as far as knowledge sharing within an organization is concerned. After top management support and development of a knowledge sharing culture, the next thing to measure would be to make availability of all the right resources in terms of technological tools and infrastructure and then providing training for the appropriate use of these, which is measured in the third factor, namely, 'Technological tools availability and skill development'. Acquisition of knowledge from all the touch points and the use of this knowledge will be the differentiating factor between organization which have the first three but fail to put the fourth factor in place. Hence measurement of tendency for 'Knowledge acquisition and processing' is the fourth factor. The resource for whom all the four factors have been developed are the ones who have the capability to take an organization to new heights or drop it down a cliff are the employees of the organization and hence the fifth factor, 'People – importance and functionality' aims to measure the effort that goes into recruitment, retention and freedom given to them in order to be able to think and implement what according to them will add value to their process.

The proposed five factor scale is extremely logical in its approach and is a practical way to measure an organization's KM practices. One of key managerial implications of this scale is that it has retained all but three items from the previous scale, only grouped them in a more logical and meaningful way, and hence covers all the aspects of KM practices that an organization may decide to implement. The scale could be put to use descriptively or diagnostically; descriptively - establishing a baseline of KM practices within a department or division of the organization, to discriminate across business units by mapping their present positions and charting the path for reaching their future goals. The scale could also

help identify areas of strength and weaknesses that could be reinforced or improves based upon the feedback from the scale. This would be the diagnostic use of the developed instrument. This could have far reaching implications for an organization which is in need to understand their current level of KM activity in comparison to the industry, country or the world at large.

LIMITATIONS AND FUTURE SCOPE

This empirically derived scale may be used as a metric to measure KM practices in an organization. But the scale may be a little narrow in its scope as it started with the consideration of nine KM practices. With the ever-changing business environment, other aspects of the organization will have to be considered for doing a complete picture of KM initiatives of an organization. Further, a study into these lines would be beneficial. Also, model generalizability may be an issue to address. It would be advisable to replicate this study with a larger sample across different industries in order to ascertain its external validity.

The model proposed here presents a framework for measuring KM practices and is complimentary to its previous studies. The findings presented here may serve as an alternative to measure KM practices. It extends a basic framework for further investigating and to provide direction for future research.

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