`

The Importance and Implication of Knowledge Management and Its Impact on Organizational Performance

Muhammad Usman, Rana Tahir Naveed, Asim Iqbal, Ghulam Mustafa, Aftab Anwar

Department of Economics and Business Administration, Art & Social Sciences Division, University of Education, Lahore

Abstract

The current research examined the effect of knowledge management (hereafter K-M) in the sector of oil & gas automation of Pakistan. In this paper, we analyzed the perceived importance of K-M from the viewpoint of service providers and end-users in industry. Furthermore, we also tried to relate K-M with firm performance. In total 132 responses were collected from service providers and end-users, out of which 51 responses were from the end-users and the remaining 81 were from service providers. Our results indicated that K-M is considered important by both service providers and end-users. There is no significant perceptual difference regarding the importance of K-M among end-users and service providers, however, end-users are more aware of K-M than service providers. Furthermore, the results showed that the majority of firms have adopted some form of K-M. This study also took into account the major facilitating factors for implementing K-M such as supportive and encouraging organizational culture and development of strategy and objectives relating to K-M, and major hindrances for implementing K-M such as lack of interest, less managerial support, and low employee involvement. Moreover, our results presented a a positive impact of K-M on the performance of firms in the Oil & Gas Automation sector of Pakistan.

Key Words: Knowledge Management; Oil & Gas Automation sector; Service Providers; End Users; Pakistan

The first revolution in corporate history was marked by the industrial revolution where formal industries and organizations were set up and mass production of the goods became the ultimate goal of the corporation. The era of the industrial revolution dissolved into the era of information technology. The dawn of the new era was characterized by many complexities and trends like increasing competition, saturating markets, globalization, and the emergence of services based industry along with the decline of production based industries. This dynamic era of change has forced the organizations to deeply look into the mechanism of organizational mechanics and utilize organizational resources more effectively in a formal manner. Thus, the need for and importance of intangible assets possessed by the organization is increasing with time. Such an intangible asset is the knowledge possessed by the organizations and individuals within an organization (Lee, Lee & Kang, 2005). The management of knowledge has been a hot area of debate and its value as a strategic asset is widely propagated both in literature and in practice (Gartner, 1998; Alavi & Leidner, 2001).

Although the concept is not new as according to Bergeron (2003), K-M essentially was informally done in the ancient civilizations. The concept of craftsmanship and apprenticeship in the pre-industrialized era indicates the knowledge possessed by the master and which was transferred to the generations of apprentices over time. The formalization of the firms' recourse-based concept started after the propositions of Penrose (1959). K-M became a buzzword in of corporate strategy in the last two decades and organizations around the globe started to pursue K-M formally and as a result, various key positions relating to K-M were added to organizational hierarchy and structure (Metaxiotis, Ergazakis & Psarras, 2005). K-M not only pervaded in the corporate scenario, but economists also related to term into economic context as World Bank (2000) stressed the

`

importance of K-M by stating that economics could build and maintain their competitive edge by focusing on their ability to develop and apply knowledge.

Apart from the implications of K-M at economic levels, organizations around the globe are increasingly investing in knowledge related initiatives and intangible assets. The focus on physical assets is decreasing as a consequence (Roos, Pike & Fernstrom, 2012). The dynamics of organizations are also changing and processes in the organizations are changing from a standardized mass production base model to customized project-based tasks. In this scenario, Glass (2005), iterated that in this context of recent developments, projects success is largely based on the firms' capability to exploit their explicit and tacit knowledge-level and by this way a proper framework of knowledge transfer is to be established between projects to effectively exploit the knowledge (Abdul-Rehman et al., 2008). But confusion relating to the conception and implementation of K-M persisted in the practice. The very essence of the knowledge sometimes is considered at par with the data or information (Alavi & Leinder, 1999) while in actual it's essentially a multifaceted concept which is much complicated as compared to simple information (Kulkarni, Ravindran & Freeze, 2007).

The importance of K-M is a widely debated issue in both literature and practice (Hislop et al., 2018). Organizations around the globe are implementing K-M initiatives to capitalize on the benefits provided by K-M (Asrar-ul-Haq & Anwar, 2016). Basically, automation is a project-oriented sector in which the expertise of the service provider matters a lot (Wollschlaeger et al., 2017). Moreover, the demand for services relating to the automation industry is increasing and service providers are also facing a lot of competition in the market (Kromann et al., 2020). For meeting the demands of end-users' service providers need to effectively manage their knowledge and expertise to provide services that are better than the competitors in the industry. However, the problem in this regard lies with the perceptual aspects of the management and experts working in the industry. Therefore, this study highlights the perceptions of the individuals associated with the automation industry for assessing the implications of K-M. This study in this regard is exploratory as past literature does not highlight the perceptual conceptions of the people in the automation industry of Pakistan nor it takes account of the end-users in this regard.

This study is exploratory and is being conducted in the developing economy of Pakistan. Much has been studied concerning the implications of K-M, particularly in construction sector. Moreover, this paper draws attention towards a developing economy i.e., Pakistan, where a draught of empirical evidence in the local scenarios in almost all of the domains of knowledge. Thus, this study would bridge the gaps by performing empirically about the insights and implications of K-M in the automation industry of Pakistan. The findings of the research would unveil the dynamics and deficiencies of the K-M mechanism in the automation industry of Pakistan. Thus, by the building of the findings of the study managers within the industry would be able to address the deficiencies in their K-M mechanism and structure to better capitalize on the benefits provided by the K-M framework. Moreover, this study would also pave the path of further research in this contemporary area of research and further research on K-M would be able to use the foundations laid by this research.

The rest of the paper is as follows. Section-2 explains the overview of the topic by discussing different aspects of the K-M. Section-3 elaborates research methodology and provides details on the method, sampling procedure, instrumentation, and analysis. Section-4 elaborates the findings and also a detailed discussion. Lastly, section-5 presents the conclusion of the paper and provides implications, recommendations, and directions for future research.

Literature Review

K-M and its Importance

An idea of knowledge and K-M has fascinated the managers in corporate world and academicians alike and both agree that knowledge has become a crucial asset in the modern era of corporate management and it also contributes significantly towards organizational success (Williams, 2011). The contemporary concept of K-M evolved from the knowledge-based perspective of the organization which rests on the resource-based philosophy. This philosophy states that the ability of the organization to reap its competitive advantage does not rest on the resources an organization has but on the potential of these resources as to what extent these resources serve the organization in rendering the services (Penrose, 1959). A firm's resource-based viewpoint further maintains that external factors of an entity are unable to explain long term

`

differences in the profitability of the organization (Peteraf, 1993). Thus, internal factors/ resources of the organization are deemed important under the organization's resource-based viewpoint.

Alavi and Leidner (2001) explained that the firm's knowledge-based viewpoint is rendered by the resources depend upon the ability of the organization to combine and apply these resources and this ability stems from the know-how of the organization i.e., (technical knowledge). Spender (1996) in this regard provided that this knowledge is rooted in various organizations and agents, for example, culture, political systems, routines, identity, documents, and even in the employees of the organization. Cheng at el. (2011) stated that most of the organizations overlook the knowledge aspect of their business as such knowledge is retained by the individual employees of the organization and is not transferred when such works depart from the business; knowledge retained by those employees leave with them causing permanent loss of knowledge to the organization. Thus, organizations sometimes establish information technology support for K-M to retain, recall, and utilize the knowledge by other workers.

The traditional benefits of the K-M system comprise of the capability of an entity in terms of responsiveness, flexibility, productivity, innovativeness, and improved decision making (Stata & Almond, 1989; Alavi & Leidner, 1999). Egbu, Hari and Renukappa (2002) in this regard iterated that K-M provides the evolutionary platform for the emergence of new technologies and it also helps to improve existing processes in the organization which ultimately are proved beneficial for the organization. It was also demonstrated by Carrillo & Chinowsky (2006) that K-M helps the organizations to increase their business by securing more projects and clients. Yang, Chen, and Wang (2012) supported the view by starting that K-M practices are crucial to boosting innovativeness and creativity in the organization which enables the organization to be more productive and thus K-M is positively associated with the performance of an organization.

One of the major issues regarding K-M is that most of the benefits provided by the activities related to K-M are intangible (Lee, Lee & Kang, 2005) and there is certainly a need to employ rigorous system to evaluate the usability and importance of K-M and related system in the organizational context. Lee, Lee and Kang (2005) in this regard suggested an index to estimate the performance of K-M and argued that K-M can instigate efficiency in the work processes of an organization. Much of the initial focus of the research associated with the effectiveness and value of K-M and K-M systems was related to the quantitative aspect of performance such like cost reduction and technical soundness of K-M systems (Ong & Li, 2007); but real benefits of the implementation of the K-M are rather intangible or qualitative (Lee, Lee & Kang, 2005). Thus, the concept of user satisfaction was proposed by Cyert and March (1963) for the very first time to grasp and measure the success of the K-M system and its application in the organization. Forcada et al. (2013) found that respondents have diverse opinions about the value and benefits of K-M.

Implementation of K-M

Quintas, Lefrere and Jones (1997) provided that implementation of the K-M requires considerable implications concerning other elements, for example, human resource, skill/technology, processes, and philosophy/culture. Holsapple and Joshi (2000) on the other hand identified three forces that influence K-M in an organization, such as managers, resources, and environment. Manager influences are further divided into four factors i.e., exhibition of leadership in K-M activities, coordination of K-M activities, controlling K-M activities, and measurement of K-M activities. Probably technology is considered as a significant element of K-M in an entity as Davenport and Prusak (1998) entailed that technology is a main component of K-M. Serban and Luan (2002) iterated that technological enablement is the foundation on which the K-M framework is built and without technological infrastructure, the concept and application of K-M would just have been a philosophical idea.

Kulkarni, Ravindran and Freeze (2007) proposed a model of K-M where they deemed proper implementations of K-M system with an appropriate support of the organization and its higher administration essential as some structural and procedural changes are necessary to facilitate knowledge usage and knowledge sharing. Forcada et al. (2013) in this regard provided that organizations make appointments of the knowledge managers to fix the responsibility of K-M in the organization to implement K-M strategy. The effective execution of the K-M requires the system to be sound about six dimensions i.e., quality, satisfaction, survival, overall benefits, and information quality (DeLone & McLean, 2003).

Barriers to Implementation of K-M

`

But the quest of K-M is not easy and is hindered by many limitations, problems, and barriers. The basic problem according to Quintas, Lefrere and Jones (1997) is related to the conceptualization of the concept of knowledge and implementation of K-M. The perceptual and awareness problems still prevail in many organizations concerning the K-M as also indicated by Wong and Aspinwall (2005) who provided survey results for the SMEs not practicing K-M as to why these SMEs were not practicing K-M. They indicated that two major reasons for not utilizing K-M in SMEs were about the lack of awareness or knowledge about K-M namely SMEs were either uncertain about the possible benefits of K-M or SMEs not even experience it. Robinson, Carrillo, Anumba and Ah-Ghassani (2005) in this regard deemed organizational culture to be the main restrictive factor to hinder the successful application of K-M in an organization.

Ruggles (1998) provided the main difficulties companies encounter while implementing K-M in organizations. The main difficulties were changing the behavior of the people, measurement-related issues about the performance of knowledge assets & initiatives, in determining as to what comprises the knowledge and what knowledge is to be managed, getting the resources allocated for K-M activities and defining the standardized procedures relating to the K-M.

Holsapple and Joshi (2000) opined that fiscal resources define the maximum as to what extent an organization could afford to expand on its knowledge activities and this lack of financial resources limits the organization's ability to build knowledge and IT infrastructure while Gold, Malhotra and Segars (2001) deemed organizational culture to be the main barrier to effectively implement K-M in an organization while Carrillo et al. (2004) deemed factors like insufficient funding, unstandardized work processes, organizational culture and lack of time to be the main challenges faced by effective K-M in an organization.

Edwards and Kidd (2003) also elaborated on the dysfunctional aspects of organizations about their K-M activities i.e., lack of trust between individuals, the culture of the organization, and interlink management strategies and the learning of organization. Forcada et al. (2013) in this regard indicated that the major hindrances with regard to the application of K-M system are relating to the employees' mentality, lack of employees involvement, and more focus on individual work than teamwork.

K-M and Organizational Performance

Many studies are conducted to evaluate the effect of K-M on the corporate performance (Lee & Choi, 2003; Marqués & Simón, 2006; Tanriverdi, 2005; Kianto, 2011; Andreeva & Kianto, 2012); but empirically only a few studies found the significant and clear relationship of the K-M activities on the performance of the firms (Marques & Simón, 2006). Some studies found a direct impact of K-M on firm performance, while others propose a mediated relationship in this regard (Andreeva & Kianto, 2012). The theoretical relationship of K-M and organizational performance is derived through firms' knowledge-based viewpoint, which posits that the variation in the performance of the organizations within a specific sector could be explained by their stock of knowledge and by their ability to create and develop knowledge (Grant, 1996).

The same notion was provided by Chang and Chuang (2011) who proposed that K-M effects the performance of the firm through the organizational aspects of business strategy and infrastructure capability. They also empirically proved the effect of K-M on corproate performance. Another model concerning the channel by which K-M imitates corporate performance is proposed by Mithas, Ramasubbu and Sambamurthy (2011).

Lee, Lee and Kang (2005) stated that the process of knowledge flow within the organization enhances the efficiency of work processes in an organization and also affects managerial performance positively. Marques and Simón (2006) also posited a positive effect of K-M practices on the overall firm's performance. Chang and Chuang (2011) stipulated that the ability of the K-M to affect firm performance is directed through the organizational infrastructure and organizational strategy.

López-Nicolás and Meroño-Cerdán (2011) investigated the impact of K-M on firm-level creativity and performance. The findings showed that K-M strategies of codification and personalization have a direct as well as indirect impact on firm performance. The positive effect on firm creativity is also sought and in turn, firm creativity channelizes the effect of K-M on performance indirectly. Bhatti, Zaheer and Rehman (2011) assessed the influence of K-M practices on firms' performance in Pakistan. The enablers of K-M considered by the study are culture/philosophy, intellectual capital, processes, and strategies.

_____

`

Yang, Chen and Wang (2012) also provided a positive empirical evidence between K-M and the project performance in project-based organizations where performance was depicted by costs, time schedules, quality, and safety performance of the project. Andreeva and Kianto (2012) sought to link K-M activities and performance of the organization. A recent study by Liu, Song and Cai (2014) tried to address the K-M-performance relationship nexus by basing it on dynamic capabilities perspective and proposed the impact of K-M capability (KMC) and performance of the firm is mediated by organizational agility.

Research Methodology

This study aims to highlight the perceptions of the individuals associated with the automation industry to assess the implications of K-M in the industry. Therefore, this study uses a positivist approach because this study seeks to generalize the findings of this research to the Oil & gas Automation sector in Pakistan. This research adopts a systematic procedure whereby the questionnaire was floated to collect quantitative data. This research is based on the opinions and perceptions of individuals i.e., service providers and end-users of the Oil & gas Automation sector. So, primary data collection was proceeded using the survey as a data collection tool. Ghauri and Gronhaug (2002) entailed that a survey is a widely used research design for social and business studies. The study uses factual surveys whereby the focus of the research is to unveil facts on the phenomenon. The study aimed at ascertaining the current perceptual differences of service providers and end-users on K-M which calls for a cross-sectional investigation whereby data is collected only one point in time.

The population of the study comprised all of the end-users and service providers related to the Oil & gas Automation sector in Pakistan. A random procedure was adopted to locate potential respondents and a total of 200 questionnaires were floated among end-users and service providers of the automation industry. Out of 200 questionnaires, a total of 132 questionnaires were received back out of which 51 were end-users and the remaining 81 were service providers.

The study used questionnaire a data collection instrument which was devised with the help of previous studies (Sverlinger, 2000; Forcada et al., 2013; Yang, Chen & Wang, 2012; Gold, Malhotra & Segars, 2001; Robinson, et al., 2005; Carrilo & Chinowsky, 2006; Alavi, Kayworth & Leidner, 2005; David & Fahey, 2000; Alavi & Leidner, 1999). The questionnaire was composed of seven parts where the first part of the questionnaire asked the respondent about their general familiarity with the term K-M and whether K-M is being adopted by their organization or not. The second part of the questionnaire contained questions relating to the importance of the K-M. The third part asked questions to the respondents on the implementation of the K-M system. The fourth part of the questionnaire contained questions for the measurement of K-M, the fifth part had measurement scale of performance and the sixth part solicited the responses of the respondents on the barriers relating to K-M adoption in Oil & gas Automation sector. The last part of the questionnaire contained questions relating to the general demographic information on the respondents.

To validate the questionnaire, a pilot study was conducted first whereby a total of 26 responses were considered. These respondents were administered questionnaires before the actual data collection phase of the study and these responses are also not included in the final analysis of the study. According to Sekaran (2003), the basic purpose of the pilot study is to make sure that the questionnaire is clear and understandable to the respondent so that valid and reliable data could be collected by the questionnaire. Moreover, Cronbach's Alpha was also used to establish the reliability of the questionnaire. According to Tavakol and Dennick (2011), Cronbach's Alpha is the most adopted measure to check the reliability of a multi-item scale. A cut off value of .7 was used to check whether the scale is reliable or not. All the indicators passed the test which shows that all of the variables used in the study were reliable.

This study used the survey method of data collection where questionnaires were sent online to the people working in service providers or end-user organizations in the Oil & gas Automation sector in Pakistan.

`

Empirical Analysis

Awareness of respondents about K-M

Table 1 shows to both service-providers and end-users on the question asking them whether they know about K-M or not? Out of a total of 132 responses, 81 were service providers, and the remaining 51 ended users of the automation industry.

Table 1: Awareness of K-M

Group * Do you know about K-M? Cross tabulation

		Do you know about K-M?		Total
		Yes	No	
Group	Service Provider	69	12	81
	End User	51	0	51
Total		120	12	132

To check the statistical significance, the test of Chi-Square was performed and the results are shown in Table 2.

Table 2: K-M Awareness: Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.311[a]	1	.004		
Continuity Correction [b]	6.615	1	.010		
Likelihood Ratio	12.468	1	.000		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	8.248	1	.004		
N of Valid Cases	132				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.64.
b. Computed only for a 2x2 table

Chi-Square yielded the Pearson Chi-Square value of 8.311, which indicates that the difference of awareness is significant at a 1% level of significance whereby end users are more aware of the K-M than service providers in the Oil & gas Automation sector.

Demographics of respondents

This part of the analysis provides the demographical distribution of the respondents of the study. Table 3 provides the type of respondent distribution of the respondents. Table 3 provides the type of respondent information as to whether the respondent was the service provider or end-user.

Table 3: Type of respondents

		Frequency	%	Valid %	Cumulative %
Valid	Service Provider	69	57.5	57.5	57.5
	End User	51	42.5	42.5	100.0
	Total	120	100.0	100.0	

Table 4 provides the gender distribution of the respondents. It was found that out of a total of 120 respondents there were only 3 females' respondents and the remaining 117 respondents were all male.

Table 4: Gender of respondents

Group * Gender Cross tabulation

		Gender		Total
		Male	Female	
Group	Service Provider	66	3	69

`

	End User	51	0	51
Total		117	3	120

Table 5 provides the nature of job classification of the respondents to end-users and service providers whereby out of a total of 120 respondents 93 were of non-managerial posts and the remaining 27 were of managerial posts.

Table 5: Job nature of the respondents
Group * Nature of the Job Cross tabulation

		Nature of the Job		Total
		Managerial	Non-Managerial	
Group	Service Provider	15	54	69
	End User	12	39	51
Total		27	93	120

Table 6 provides information about the experience of the respondents both on total experience and experience with the current organization. It was found that on average each respondent had a total experience of 8.76 years along with a standard deviation of 6.94 whereby minimum was .25 years and the maximum was 33 years of total experience.

Table 6: Experience of the respondents

		Total Work Experience	Experience with the Current Organization
Service Provider	Mean	7.00	2.82
	N	69	69
	SD	7.66	4.07
	Minimum	.25	.08
	Maximum	33.00	18.00
End-User	Mean	11.15	4.24
	N	51	51
	SD	4.98	2.64
	Minimum	6.00	1.00
	Maximum	25.00	8.00
Total	Mean	8.76	3.42
	N	120	120
	SD	6.94	3.59
	Minimum	.25	.08
	Maximum	33.00	18.00

Importance of K-M

This part of the analysis provides the notions of the respondents about usability and the importance of K-M in the context of their organization and industry. A total of 11 questions relating to the importance of the K-M were asked from both end-users and service providers on a five-point Likert scale. This part of the analysis provides the opinion of both end-users and service providers in this regard. Table 7 responds to both end-users and service providers about the importance of K-M.

_____

`

Table 7: Importance of K-M

	Service Provider			End-User			Total		
	Mean	N	SD	Mean	N	SD	Mean	N	SD
K-M improves decision making within the organizations of automation industry.	3.91	69	0.98	4	51	0.49	3.95	120	0.81
K-M improves the delivery time of the organizations in automation industry.	3.87	69	1.08	3.76	51	0.55	3.83	120	0.89
K-M brings service improvements in the organizations of automation industry.	4	69	0.99	4.06	51	0.54	4.03	120	0.82
K-M strengthens the relationship of the organizations in the automation industry with both their suppliers and their customers.	3.69	69	1.09	3.53	51	0.78	3.63	120	0.97
K-M brings quality improvements for the organizations in automation industry.	4.09	69	0.94	4	51	0.60	4.05	120	0.81
K-M enables an organization to respond to customers in a quick manner in automation industry.	4.22	69	0.98	3.82	51	0.79	4.05	120	0.92
K-M reduces rework in automation industry.	4	66	0.91	4.29	51	0.58	4.13	117	0.79
K-M could prove to be a strategic asset/ competitive advantage in automation industry.	4.04	69	0.76	3.88	51	0.68	3.98	120	0.73
K-M improves profits of the organizations in automation industry.	3.82	69	1.01	3.71	51	0.67	3.77	120	0.88
K-M makes conflict management easier .	3.61	69	0.93	3.71	51	0.83	3.65	120	0.89
Proper implementation of K-M may result in reduction of litigation cost.	3.55	66	0.89	3.35	51	0.98	3.46	117	0.93

_____

`

A subsequent analysis by taking the average of all 11 factors was conducted and an independent sample t-test was used to see whether service providers overall differ with end-users in their opinion on overall importance and value of K-M or not. Table 8 provides descriptive statistics in this regard.

Table 8: Importance of K-M: Group statistics

	Group	N	Mean	SD	Std. Error Mean
Importance	Service Provider	69	3.88	.74	.089
	End User	51	3.83	.41	.058

The overall importance score of the service provider was found to be 3.88 along with a standard deviation of .74. This score is a bit higher to the mean score yielded by end-users i.e., 3.83 along with a standard deviation of = .41. To assess the significance of the mean difference, the results of the independent sample t-test are provided in Table 9. To check equality of variances, Levene's test for equality of variances was conducted which yielded F- statistics of 10.872 indicating that variances are not equal at a 1% level of significance. Thus, the row of equal variance not assumed was used to establish the significance of the mean difference. The mean difference of .05435 was not found significant, as the t-statistics of .512 was quite lower. Thus, service providers and end-users did not perceive the overall importance of the K-M differently.

Table 9: Importance of K-M: T-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Importance	Equal variances assumed	10.8	.001	.47	118	.637	.054	.114	-.1730	.281
	Equal variances not assumed			.51	110.5	.609	.054	.106	-.1558	.264

Implementation of K-M

This part of the analysis provides the perceptions of both end-users and service providers for the implementation of K-M. Table 10 provides the implementation status of the K-M system in the organizations of the respondents in the oil & gas automation sector. Out of 120 total respondents, a total of 111 respondents opined that their organization has some K-M system in place.

Table 10: Implementation of K-M System
Group * Do your organization has some K-M System in place? Cross tabulation

		Do your organization has some K-M System in place?		Total
		Yes	No	
Group	Service Provider	63	6	69
	End User	48	3	51
Total		111	9	120

_____

`

Table 11 provides the opinion of the respondents both service providers and end-users for the factors, which are deemed important in the implementation of K-M in the Oil & gas Automation sector. A total of 6 factors were considered in this regard whereby the first factor was an integrated K-M information system.

Table 11: Factors important for implementation of K-M

Group	Service Provider			End-User			Total		
	Mean	N	SD	Mean	N	SD	Mean	N	SD
An integrated K-M information system is necessary for the implementation of K-M system in the automation industry.	3.82	69	1.06	3.94	51	0.73	3.88	120	0.93
Appointment of K-M manager is essential for the effective implementation of K-M system in automation industry.	3.42	57	1.10	3.64	51	0.91	3.53	108	1.02
Top management involvement & support is required for effective implementation of K-M system in automation industry.	3.69	69	1.09	4.06	51	0.55	3.85	120	0.91
A supportive and encouraging organizational culture is a must for a better implementation of the K-M system in the automation industry.	4.27	66	0.76	4.24	51	0.55	4.26	117	0.67
Preparation of budgets and allocation of resources is essential for effective implementation of K-M system in automation industry.	3.78	69	0.72	3.82	51	0.93	3.80	120	0.82
The development of a strategy, which outlines the objectives of the K-M system, is important for successful K-M implementation in the automation industry.	4	69	0.89	4.06	51	0.55	4.03	120	0.76

`

Table 12 provides group statistics for the overall, opinion of the respondents, whereby overall implementation mean yielded by service providers was 3.81 along with a standard deviation of .76.

Table 12 Implementation of K-M: Group statistics

	Group	N	Mean	SD	Std. Error Mean
Implementation	Service Provider	69	3.81	.76	.09
	End User	51	3.96	.41	.06

An Independent sample t-test was conducted to check the statistical significance of the difference of opinion between service providers and end-users. Table 12 provides the results of the t-test. Before proceeding to the t-test, first of all, assumption of the equality of variances is verified by Levene's test for equality of variances which yielded an F-statistics of 7.84 indicating that variances are not equal at 1% level of significance. The mean difference of -.15 was not found significant because of a lower t-statistic of only -1.39 which indicates that there exists no significant difference on the opinion between service providers and end-users about the implementation of K-M in Oil & gas Automation sector.

Table 13: Implementation of K-M: T-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Imple.	Equal variances assumed	7.8	.01	-1.28	118	.20	-.15	.12	-.38	.08227
	Equal variances not assumed			-1.39	109.6	.17	-.15	.11	-.36	.06413

Barriers to K-M

This section of the analysis discusses the opinion of the respondents about the barriers to K-M. A total of 8 barriers were considered in this study and the opinions of both service providers and end-users were sought on these barriers. Table 13 provides descriptive of the responses on barriers, from a viewpoint of service providers, end-users, and whole sample.

`

Table 14: Barriers to K-M

	Service Provider			End-User			Total		
	Mean	N	SD	Mean	N	SD	Mean	N	SD
Time & costs constraints	3.26	69	1.23	3.59	51	1.04	3.40	120	1.16
Lack of proper leadership in the organization	3.91	69	1.11	3.77	51	1.01	3.85	120	1.07
Lack of will	4.22	69	0.98	3.88	51	0.97	4.08	120	0.99
Lack of formal training.	3.91	69	1.11	3.24	51	0.95	3.63	120	1.09
Lower involvement of employees.	4.22	69	1.15	3.18	51	1.21	3.78	120	1.28
Lack of trust between members of the organization.	3.69	69	1.34	3.18	51	1.11	3.48	120	1.27
Tendency of high potential people to work individually.	3.57	69	1.18	3.18	51	1.05	3.40	120	1.14
Fear of people that sharing knowledge would undermine their importance in the organization.	4.00	69	0.99	2.94	51	0.95	3.55	120	1.09

`

Descriptive statistics

This part of the analysis provides descriptive statistics for the dependent and independent variables of the study i.e., performance and K-M. Table 14 provides descriptive statistics for the dependent and independent variables of the study whereby K-M is the independent variable and performance is the dependent variable. The overall mean for K-M is 3.45 along with a standard deviation of .72. The dependent variable of the study i.e., performance yielded an overall mean value of 3.49.

Table 15: Descriptive Statistics

	Service Provider			End-User			Total		
	Mean	N	SD	Mean	N	SD	Mean	N	SD
K-M	3.36	69	0.82	3.58	51	0.55	3.45	120	0.72
Perf.	3.38	69	0.72	3.65	51	0.41	3.49	120	0.62

Correlation Analysis

This part of the analysis provides the correlation analysis whereby the relationship between K-M and performance is sought out. Table 15 provides a correlation matrix, which provides a correlation coefficient for the relationship between K-M and performance. Correlation analysis yielded a correlation coefficient of .679, which indicated a positive relationship between K-M and performance of the organizations in the Oil & gas Automation sector having some representation in Pakistan. The relationship is moderate is significant at 1% level of significance. Thus, a positive relationship between K-M and organizational performance could be sought out from the correlation analysis.

Table 16: Correlation Analysis

		K-M	Performance
	Pearson Correlation	1	.679**
K-M	Sig. (2-tailed)		.000
	N	120	120
	Pearson Correlation	.679**	1
Performance	Sig. (2-tailed)	.000	
	N	120	120

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

Regression analysis

Table 16 provides a model summary for the regression whereby K-M is considered as the independent variable and organizational performance as the dependent variable. R square of the model is .462, which entails the explanatory power of the model whereby the model predicts 46.2% variation in the independent variable of performance.

Table 17: Regression (Model summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.679a	.462	.457	.45860

a. Predictors: (Constant), K-M

Table 17 provides ANOVA results, which provides an F-statistic of 101.133 indicating that the model is a good fit at a 1% level of significance.

`

Table 18: Regression (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	21.269	1	21.269	101.133	.000[b]
	Residual	24.817	118	.210		
	Total	46.086	119			

a. Dependent Variable: Performance

b. Predictors: (Constant), K-M

Table 18 provides coefficients of the study whereby K-M yielded a regression coefficient of .584 along with a t-statistic of 10.056. This indicates that K-M has a positive impact on the performance of the organization in the Oil & gas Automation sector having some representation in Pakistan and impact is also significant at a 1% level of significance. Overall, this study found a positive impact of K-M on organizational performance entailing that K-M could effectively be used to enhance the performance of the organizations in the Oil & gas Automation sector.

Table 19: Regression (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.482	.205		7.241	.000
	K-M	.584	.058	.679	10.056	.000

a. Dependent Variable: Performance

Discussion

The basic purpose of this research was to explore the implications of K-M for the Oil & gas Automation sector having some representation in Pakistan. Apart from that, perceptual differences between service providers and end-users of the industry are also sought in the study. Overall, this study found some perceptual differences between end-users and service providers for conception, importance, and implementation of K-M whereby it was found that end users are more aware of the concept of K-M as compared to the service providers. Moreover, service providers gave more weight to the K-M importance of bringing responsiveness, strengthening the relationship with customers and supplier, and improvement in delivery time while end-users stressed more on the reduction of rework and service improvements. Service providers also had strong notions of K-M being a strategic asset. Concerning the implementation of the K-M in the industry, it was found that most of the organization in Oil & gas Automation sector has implemented the concept of K-M in some shape and important factor deemed essential for the implementation of K-M were supportive and encouraging organizational culture and development of a strategy with clear goals relating to K-M. Both service providers and end-users had the same opinion and no significant perceptual differences were found in this regard. This study also explored the barriers towards implementation of the K-M in the industry and it was found that lack of will was the most important barrier for K-M implementation in the Oil & gas Automation sector. Other important variables in this regard were found to be a lack of proper leadership and lower employee involvement in K-M initiatives. The overall perceptual difference, however, was not sustained in the analysis, there was an indication of the differences of perception for individual importance and implementation factors. K-M overall seems to have multifaceted implicates for the contemporary organizations in the Oil & gas Automation sector where K-M effects various efficiency and performance-related facets of the organization including a reduction in rework, service & quality improvements, increased responsiveness & profits and better decision making. K-M could also be proved to be a strategic asset for the organization.

_____

`

The implementation of K-M seems a bit complicated where factors like supportive culture, clear objectivity, integrated information system, top management support, and budget allocations were deemed important factors for the better implementation of the K-M system. This entails that K-M as a multifaceted concept requires integrated implementation efforts from all aspects of the organization. Various personal factors like lack of will, less leadership support, lack of employee involvement, no formal training, and the reluctance of people to share knowledge seemed significant barriers in the implementation of K-M system and practices within Oil & gas Automation sector. These findings are consistent with the previous literature on the topic which deems K-M as a strategic asset of the organization and deems K-M beneficial for various aspects of the organizational efficiency and performance (Stata & Almond, 1989; Alavi & Leidner, 1999; Egbu, Hari and Renukappa, 2002; Carrillo & Chinowsky, 2006; Yang, Chen & Wang, 2012). K-M as a multifaceted concept having confusion is also widely elaborated (Spender, 1996; Kulkarni, Ravindran & Freeze, 2007; Cheng et al. 2011) and implementation of K-M has always been considered tricky requiring support from people, culture, technology and other resources (Quintas, Lefrere & Jones, 1997; Holsapple & Joshi, 2000; Forcada et al., 2013).

This study also found a positive and significant impact of K-M on organizational performance in Oil & gas Automation sector, which is also supported by literature on this topic (López-Nicolás & Meroño-Cerdán, 2011; Yang, Chen & Wang, 2012). Thus, implementation of the K-M might be a daunting, tricky, and complex task and it could be very beneficial for the long-term survival and sustainability of the organization in a competitive marketplace.

Conclusion

The oil & gas sector is an important segment of the world's economy as the whole world depends upon this industry to meet its energy requirements. The modern era of production and utilization of resources is characterized by automation, whereby automation not only brings efficiency into the production process but also enhanced production to many folds. K-M provides a contemporary solution to the problem whereby organizations working in the automation segment of the sector could effectively exploit the fruits of K-M and be more competitive in the market. This study in this regard explores the possibilities and implications of K-M for Oil & gas Automation sector having some representation in Pakistan whereby the perceptual difference of K-M concerning importance and implementation of K-M were also sought out between the stakeholders of service providers and end-users of the industry and impact of K-M on organizational performance of Oil & gas Automation sector was also investigated.

This study found some perceptual differences between end-users and service providers, whereby it was found that end users are more aware of the concept of K-M as compared to the service providers. Both service providers and end-users acknowledged the value and importance of the K-M as a tool of quality and process improvement and profit enhancement. Some perceptual differences in this regard were found for the benefits of responsiveness, improvement of delivery time, strengthening of relationship with suppliers & customers, reduction in rework, and service improvement whereby service providers gave move weight to the first three factors while end-users stressed more on last two factors. While in the overall analysis, no significant perpetual differences were found for the importance of K-M between end-users and service providers. Concerning the implementation of K-M, it was found that most of the organizations in the automation industry have implemented K-M in some shape while factors like supportive and encouraging culture and development of a strategy with clear goals related to K-M were found important for effective implementation of K-M in the automation industry. Both end-users and service providers seemed to endorse the notion and no significant perceptual differences between end-users and service providers about the implementation of the K-M were found by this study. Lack of will, lack of leadership, and lower employee involvement were deemed important barriers to the implementation of K-M in the industry. Lastly, the study provided evidence of a positive impact of the K-M on the performance of the organizations I Oil & gas Automation sector having some representation in Pakistan.

This study indicates the value of K-M as a strategic asset, which improves the efficiency and effectiveness of the organizations under study. Further, it was also noted that K-M as a concept has multifaceted implications whereby it not only provides multifaceted benefits to the organizations pursuing it but also requires the involvement of multiple stakeholders for effective

`

implementation. These multifaceted implications of the concept make it a difficult construct to grasp, implement, and evaluate.

Reference

Abdul-Rahman, H., Yahya, I. A., Berawi, M. A. & Wah, L. W. (2008). Conceptual delay mitigation model using a project learning approach in practice, *Construction Management and Economics*, 26 (1), 15–27.

Alavi, M., & Leidner, D. E. (1999). Knowledge management systems: issues, challenges, and benefits. *Communications of the AIS*, *1*(2es), 1.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 25(1), 107-136.

Alavi, M., Kayworth, T. R., & Leidner, D. E. (2006). An empirical examination of the influence of organizational culture on knowledge management practices. *Journal of management information systems*, *22*(3), 191-224.

Andreeva, T., & Kianto, A. (2012). Does knowledge management really matter? Linking knowledge management practices, competitiveness and economic performance. *Journal of Knowledge Management*, *16*(4), 617-636.

Asrar-ul-Haq, M., & Anwar, S. (2016). A systematic review of knowledge management and knowledge sharing: Trends, issues, and challenges. Cogent Business & Management, 3(1), 1127744.

Bergeron, B. (2003). *Essentials of knowledge management* (Vol. 28). John Wiley & Sons.

Bhatti, W. A., Zaheer, A., & Rehman, K. U. (2011). The effect of knowledge management practices on organizational performance: A conceptual study. *African Journal of business management*, *5*(7), 2847-2853.

Carrillo, P., & Chinowsky, P. (2006). Exploiting knowledge management: The engineering and construction perspective. *Journal of Management in Engineering*, *22*(1), 2-10.

Carrillo, P.M., Robinson, H.S., Al-Ghassani, A.M. and Anumba, C.J., (2004). Knowledge Management in UK Construction: Strategies, Resources and Barriers. *Project Management Journal*, 35(1), 46-56.

Chang, T. C., & Chuang, S. H. (2011). Performance implications of knowledge management processes: Examining the roles of infrastructure capability and business strategy. *Expert Systems with Applications*, *38*(5), 6170-6178.

Cheng, M. Y., Peng, H. S., Huang, C. M., & Chen, C. H. (2012). KM-oriented business process reengineering for construction firms. *Automation in Construction*, 21, 32-45.

Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. *Englewood Cliffs, NJ*, *2*.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Harvard Business Press.

David, W., & Fahey, L. (2000). Diagnosing cultural barriers to knowledge management. *The Academy of management executive*, 14(4), 113-127.

Delone, W. H. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*,*19*(4), 9-30.

Edwards, J. S., & Kidd, J. B. (2003). Knowledge management sans frontieres.*Journal of the Operational Research Society*, *54*(2), 130-139.

Egbu, C. O., Hari, S., & Renukappa, S. H. (2005). Knowledge management for sustainable competitiveness in small and medium surveying practices. *Structural Survey*, *23*(1), 7-21.

Forcada, N., Fuertes, A., Gangolells, M., Casals, M., & Macarulla, M. (2013). Knowledge management perceptions in construction and design companies. *Automation in construction*, *29*, 83-91.

Gartner, G. (1998). Grappling with e-knowledge. *Computer world*, 32(1), 43.

Ghauri, P. G., & Gronhaug, K. (2002). K.(2005) Research methods in business studies: A practical guide. Essex: Pearson education limited.

Glass, J. (2005). A best practice process model for hybrid concrete construction. *Construction Management and Economics,* 23 (2), 169–184.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: an organizational capabilities perspective. *Journal of Management Information Systems*, 18(1), 185-214.

Grant, R. M. (1996). Toward a Knowledge-Based Theory of the firm. *Strategic management journal*, *17*(S2), 109-122.

`

Hislop, D., Bosua, R., & Helms, R. (2018). Knowledge management in organizations: A critical introduction. Oxford University Press.

Holsapple, C. W., & Joshi, K. D. (2000). An investigation of factors that influence the management of knowledge in organizations. *The Journal of Strategic Information Systems*, 9(2), 235-261.

Kianto, A. (2011). The influence of knowledge management on continuous innovation. *International Journal of Technology Management*, *55*(1), 110-121.

Kromann, L., Malchow-Møller, N., Skaksen, J. R., & Sørensen, A. (2020). Automation and productivity—a cross-country, cross-industry comparison. Industrial and Corporate Change, 29(2), 265-287.

Kulkarni, U. R., Ravindran, S., & Freeze, R. (2007). A knowledge management success model: theoretical development and empirical validation. *Journal of Management Information Systems*, 23(3), 309-347.

Lee, H., & Choi, B. (2003). Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination. *Journal of management information systems*, 20(1), 179-228.

Lee, K. C., Lee, S., & Kang, I. W. (2005). KMPI: measuring knowledge management performance. *Information & Management*, 42(3), 469-482.

Liu, H., Song, D., & Cai, Z. (2014). Knowledge management capability and firm performance: the mediating role of organizational agility. Retrieved from http://pacis2014.org/data/PACIS_mainconference/pdf/pacis2014_submission_321.pdf

López-Nicolás, C., & Meroño-Cerdán, Á. L. (2011). Strategic knowledge management, innovation and performance. *International Journal of Information Management*, *31*(6), 502-509.

Marques, D. P., & Simón, F. J. G. (2006). The effect of knowledge management practices on firm performance. *Journal of Knowledge Management*, *10*(3), 143-156.

Metaxiotis, K., Ergazakis, K., & Psarras, J. (2005). Exploring the world of knowledge management: agreements and disagreements in the academic/practitioner community. *Journal of knowledge management*, 9(2), 6-18.

Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How Information Management Capability Influences Firm Performance. *Mis Quarterly*, *35*(1), 237-256.

Ong, C. S., & Lai, J. Y. (2007). Measuring user satisfaction with knowledge management systems: scale development, purification, and initial test. *Computers in Human Behavior*, 23(3), 1329-1346.

Penrose, E. (1959). *The theory of the growth of the firm*. Oxford University Press.

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic management journal*, 14(3), 179-191.

Quintas, P., Lefrere, P., & Jones, G. (1997). Knowledge management: a strategic agenda. *Long range planning*, *30*(3), 385-391.

Quintas, P., Lefrere, P., & Jones, G. (1997). Knowledge management: a strategic agenda. *Long range planning*, 30(3), 385-391.

Robinson, H. S., Carrillo, P. M., Anumba, C. J., & Al-Ghassani, A. M. (2005). Knowledge management practices in large construction organisations. *Engineering, Construction and Architectural Management*, *12*(5), 431-445.

Roos, G., Pike, S., & Fernstrom, L. (2012). Managing intellectual capital in practice. Routledge.

Ruggles, R. (1998). The state of the notion. California management review,40(3), 80-89.

Serban, A. M., & Luan, J. (2002). Overview of knowledge management. *New Directions for Institutional Research*, *2002*(113), 5-16.

Sekaran, U. (2003). Research methods for business. Hoboken.

Spender, J. C. (1996). Organizational knowledge, learning and memory: three concepts in search of a theory. *Journal of organizational change management*, 9(1), 63-78.

Stata, R., & Almond, P. (1989). Organizational learning: The key to management innovation. *The training and development sourcebook*, 2.

Sverlinger, P. O. (2000). *Managing knowledge in professional service organisations. Technical Consultants Serving the Construction Industry*, Chalmers Reproservice, Gothenburg, Sweden.

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS quarterly*, 311-334.

`

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, *2*, 53.

Williams, R. (2011) A Knowledge Process Cycle. In: Schwartz, D.G, &. Te'eni, D. (Eds.): Encyclopaedia of Knowledge Management, 2nd Edition. IGI Global, ISBN 9781599049311, pp 853-866. Retrieved from: http://www.igi-global.com/chapter/knowledge-processcycle/49033

Wollschlaeger, M., Sauter, T., & Jasperneite, J. (2017). The future of industrial communication: Automation networks in the era of the internet of things and industry 4.0. IEEE industrial electronics magazine, 11(1), 17-27.

Wong, K. Y. and Aspinwall, E. (2005). An empirical study of the important factors for knowledge-management adoption in the SME sector. *Journal of Knowledge Management*, 9 (3), 64-82.

World Bank (2000). *Higher education in developing countries: Peril and promise.* Washington D.C., USA.

Yang, L. R., Chen, J. H., & Wang, H. W. (2012). Assessing impacts of information technology on project success through knowledge management practice. *Automation in Construction*, *22*, 182-191.

Yang, L. R., Chen, J. H., & Wang, H. W. (2012). Assessing impacts of information technology on project success through knowledge management practice. *Automation in Construction*, *22*, 182-191.