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The Effect of KMS Usage on Organizational Performance in Oil and Gas Industry: An Empirical Study in the Context of Developing Economy

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Abstract: Knowledge management system (KMS), as a class of information system, promotes KM practices and initiatives. KMS usage brings about organizational performance. However, although KMS has been around for quite a long time, it has been underused or its usage has led to failure, particularly in the context of oil and gas industry. Few causal studies on the effect of KMS usage on organizational performance have been evidenced though they are inconclusive; however, such study in the context of developing economy has rarely been conducted. Therefore, the objective of the current study is to investigate the influence of KMS usage on organizational performance in a developing economy, Pakistan. This research focuses on understanding the determinants of KMS usage towards organizational performance. The study employed a cross-sectional survey approach and involved 813 knowledge workers in oil and gas industry in the context of a developing country, Pakistan. However, the current paper focuses on the effect of KMS usage on organizational performance. The findings show that there is a strong positive correlation between KMS usage and organizational performance. The study has both theoretical and practical implications.

Keywords*: KM, IT, IS, KMS Usage, Organizational Performance, Developing Economy*

I. INTRODUCTION

Over the last decade, Knowledge Management (KM) has attracted intensive attentions at several organizations. KM is one of the important parts of management practice and is the basic resource for organization and economy (Syed & Xiaoyan 2012). KM, as a concept or an approach, to make it practical and to touch the real economy and results in organizational performance, there is a need of IT tools and technologies (Davenport 2016). Hence, specific technology termed as knowledge management system (KMS) is needed to promote KM practices in organizations (Ramanigopal 2012; Dickel & Moura 2016). According to Rizwi (2013:1), "Knowledge Management System actually refers to a structure for managing knowledge in coalitions/organizations for supporting the creation, capture, storage and dissemination of accurate information". KMS is the synergy between latest technologies and social and structural mechanisms and is needed to improve KM practices in organizations (Oyefolahan et al. 2012). KMS contributes to better utilization of human resources in organization (de Dirección et al. 2015; Krstić, Bojan & Petrović 2012) and supports effective decision making in the organization in knowledge-based economy (Danish et al. 2014; Wint 2016). In order to add value to the developed system, KMS usage is required (Wint 2016). Characteristics such as user-friendliness, ease of use, job fitting, simplicity, robustness, and customization are associated with system and KMS usage that enhance organizational performance (Jiang & Sinton 2011). KMS usage causes sharing of best practices, constructing consistent process as well as managing core competency in organizations (Syed & Xiaoyan). It is argued that KMS contributes to the organizational performance in both developed (Humayun & Gang 2013) and developing economies (Danish et al. 2012).

In developed economy, although the KMS infrastructure is well-developed, the human factor is marginalized. In developing economy, KMS is underdeveloped and human is neglected as well. KMS posits that interaction of human and technology is required to result in effective KM practices. This means that in both contexts, interaction between human and technology is required to bring about organizational performance and competitive advantages (Danish & Munir 2012; Hester 2012).In determining the indices of developed and developing economies, World Bank (2002) reported that there is a positive relationship between knowledge, IT and the level of development across countries since human involvement, proper technology usage and knowledge could influence the sustainable development of countries (Kalim & Lodhi 2002).

This indicates that knowledge and IT in combination contribute to effective organizational performances in both developed (Hester 2012) and developing counties (Kasim 2008). Studies on KMS in developed economy, particularly in oil and gas industry, indicate the positive effect of KMS usage on organizational performance (Braganza et al. 2008; Kun & Jiang 2011; Moffat & Crichton 2015; Tanaka 2014). In the context of developing economy, findings also indicate that KMS usage leads to organizational performance (Akeel 2013; Elgobbi 2008; Gardiner 2014).

As such, KMS usage contributes to the organizational performance in developing economy, where huge amount of money is being invested in IT and KMS development (El Khatib 2014; Gardiner 2014) including Pakistan, where the country has invested in different organizations such as education (Ali & Yousaf 2010), open source technologies (Pasha & Pasha 2012), banking sector (Danish et al. 2014) and energy sector, particularly oil and gas industry (Mughal & Ahmad 2016).However, some cases of KMS usage failure were reported (Shah & Mahmood 2015). It is argued that oil and gas industry

plays an important role in the economy of Pakistan (Mughal & Ahmad 2016).

The growing population in Pakistan, skillful work force, foreign investment in petroleum sectors, and being a hub for energy operations and transit fuel the government decision to focus on knowledge based economy. The practice of knowledge-based economy gives the knowledge the real value and looks at it as a source of performance and competitive advantage (Alvesson & Benner 2016; Andreeva & Kianto 2012). As such, all industries, in Pakistan, particularly oil and gas sector need to take advantage of this opportunity and focus on KM practices and initiatives.

The importance of KMS usage for organizational performance has sparked the recent interest into the KMS usage studies. Some studies are on KMS usage in general (Kekwaletswe & Bobela 2011; Chandio 2011; Wint 2016), while others have particularly focused on oil and gas industry (Ahmadi et al. 2013; Akeel 2013; Elgobbi 2008; Al Muzahmi 2015; El Khatib 2014; Elizabeth et al. 2015; Li, Liu & Liu 2016; Ramanigopal 2012).

Studies highlighted some issues connected with KMS practice such as: lack of employee involvement and participation (Loebbecke &Myers 2016), the impact of social and cultural factors (Kekwaletswe & Bobela 2011; Loebbecke & Myers 2016), human knowledge sharing (Hester 2012), skill and experience and lack of tacit knowledge sharing (Gardiner 2014). A bulk of studies has focused on the technical aspect of KMS usage, while a little research focused on the social factors (Wint 2016).

In oil and gas industry, Al Muzahmi (2015) has spotted some challenges like effective knowledge capturing and development; knowledge retention and sharing; and lack of Information Technology (IT). Li et al. (2016) found that aversion loss, social norms and cost are the main barriers of KMS usage in oil and gasindustry.Ramanigopal (2012) discussed the lack of KM practice in dealing with the challenges of safety in upstream sector of oil and gas. Desai and Rai (2016) have highlighted some issues associated with the improper or lack of KMS usage in the downstream sector of oil and gas such as: lack of sharing of information, insufficient use of system for keeping records, and ineffectively resolving customer complaints. In the context of Pakistan in connection with the KMS study in oil and gas industry, Mughal and Ahmad (2016) focused on KM adoption and have highlighted some issues such as: lack of proper leadership in the organizations, lack of will, lack of formal training, lower involvement of employees, fear of sharing knowledge, lack of trust between the organization's members, time and cost constraints, and tendency to work individually.

In agreement with the above discussion concerning the advantage and issues of KMS usage, a study on KMS usage and its effect on organizational performances, particularly in the context of oil and gas industry in developing economy, is suggested. However, although very few studies were conducted on KMS usage in petroleum industry (Akeel 2013; Al-Busaidi et al. 2010), a causal study, particularly in the context of Pakistan, is almost absent in literature.

Based on the study outline, different sections of research are presented as follows: first, the introduction is presented. Second, the problem statement is discussed. Third, research methodology is deliberated on. Fourth, the data analysis and results are presented. Fifth, the research discussion is provided. Sixth, the research implications including theoretical and practical implications are discussed. Lastly, the research conclusion is presented.

II. PROBLEM STATEMENT

KMS that provides the infrastructure for promoting KM practices in organization is the backbone of organizations in developing economy. KMS helps address the challenges and difficulties of organizations in oil and gas industry in both upstream and downstream sectors (Ahmadi et al. 2013; Akeel 2013;Al Muzahmi 2015; Cognizant 2012;Desai & Rai 2016; Elgobbi 2008; Elizabeth et al. 2015; El Khatib 2014; Li, Liu & Liu 2016; Ramanigopal 2012).

The findings of studies show the numerous advantages of KMS for organizational performance in the context of oil and gas industry (Braganza et al. 2008; Kun & Jiang 2011). KMS increses organiztional performances by facilitating the solution of oil services engineering problems with input from globally distributed experts (Braganza et al. 2008), fostering circular economy strategies of oil and gas exploitation (Kun & Jiang 2011), informed decision making and avoiding cost and delay (Grant 2013), effectively supporting mega and complex development and infrastructure projects (Tanaka 2014), lending support to the enhancement of human resource and team working (Moffat & Crichton 2015), enhancing security and alarm management in oil and gas fields (Hu et al. 2015;Ramanigopal 2012), cutting the cost of production, reproduction of the base of minerals & raw materials, expanding marketing through innovative mechanisms (Ponomarenko & Khaertdinova 2015), boosting revenue, contributing to stable innovative developments along with enhancing the efficiency and competitive advantages, allowing the maximum use of human resources in organizations (Chowdhury & Ahmad 2005; Ponomarenko & Khaertdinova 2015), enhancing the productivity of oil and gas field component, analysis of profitability and decision-making support (Akeel 2013; Oliveira et al. 2013),reducing rework, service & quality improvement, supply chain, increasing responsiveness& profits and supporting better decision making (Mughal & Ahmad 2016).

However, studies have highlighted some KMS usage issues in oil and gas industry in the context of developing economy, such as BP telecommunication issues in Asian countries (Grant 2013), non-technical (cultural & religious) (Al Muzhami 2015; Leavitt 2002), lack of proper balance among departments, sectors and business units in terms of knowledge intensiveness (Matayong & Mahmood 2011), technology penetration impact, lack of skilled work force familiar with KMS (Chowdhury & Ahmad 2005), lack of knowledge among leadership (Jamshidi et al. 2012), challenges with information system, problem solving (Akeel 2013;Ramanigopal 2012), lack of tacit knowledge sharing, strategic leadership and human resource management practices (Gardiner 2014), insufficient technology use and knowledge sharing (Mallam Musa Rabiu 2009; Omar, Dahalan, & Yusoff et al. 2016), low knowledge sharing and low use of information system for keeping records, ineffectiveness in resolving customers' complaints (Desai & Rai 2016), and unwillingness, low involvement of employees, lack of formal training, lack of

trust, tendency to work individually, and time and cost constraints (Mughal & Ahmad 2016). These issues may call for an empirical study in the context of oil and gas industry in developing economy to investigate the effect of KMS usage on organizational performance.

Nonetheless, few studies were conducted on KMS usage in oil and gas companies, which were mostly in developed economy (Carrillo 2004; Moffat & Crichton 2015; Li et al. 2016; Oliveira et al. 2013). Very limited research on KMS usage in oil and gasindustry in developing countries was carried out (Akeel 2013, Mughal & Ahmad 2016; Muhamad Khalil Omar et al. 2016). Limited studies were done on KMS usage and most of them are qualitative (e.g., Gardiner 2014; Ramanigopal 2012). The relationship between KMS usage and organizational performance has rarely been examined in empirical studies. A small scale descriptive study in Pakistan on KMS adoption was performed (e.g., Mughal & Ahmad 2016). In response to KMS failure and paucity of study on KMS usage, Ha et al. (2016) suggested a study. Hence, more research is needed to be conducted to explore the true effect of KMS usage on organizational performance in oil and gas industry context. Such researches may help find solution to KMS usage failure or sluggishness. Thus, investigating the influence of KMS usage on organizational performance not only will determine the importance of KMS but also results in theoretical and managerial/practical implications.Table 1 summaries the studies conducted in the context of oil and gas industry.

Table 1 Summary of studies on KMS in oil and gas industry

Author (s) & year	Focus	Approach	Dimension/Factors	Findings	Gap
Chowdhury & Ahmad (2005)	KM implementation	qualitative/ descriptive	•human (commitment), •technology (IT), •organization (management, organizational structure, learning environment)	•lack of policies, guidelines, learning community	Not empirical, no survey
Elgobbi(2008)	IT and knowledge transfer	Quantitative	•Technology, •Organization (organizational structure), •Human (culture) •Knowledge	•Importance of KMs and tacit knowledge for organizational performance	No IS theory, not KMS usage,
Al-Busaidi et al. (2007)	the antecedents & benefits of KMS use:	Qualitative, interview	•Technology (system quality) •Knowledge (knowledge quality), •Organization (service quality) , •Human (time, trust, organizational culture)	•The importance of both social and technical factors •lack of time	No survey, no theory
Al Busaidi et al. 2010	KMS usage	Quantitative	•Organization (management support, rewards policy), •Technology (system quality, IT service quality) •human (trustworthiness)	•management support, reward policy, system quality were significant	Limited theory, respondent, factors,
Matayong & Mahmood (2011)	KMS adoption	Quantitative	•Human (commitment, trust, political background and religious beliefs); •Technology (robustness, simplicity, user-friendliness, perceived usefulness, perceived ease of use, job fitting, and self-efficacy).	•Significance of both human and technology	Limited theory
Ramanigopal (2012)	KMS implementation	Descriptive	•KMS usage & organizational performance,	•Challenges and advantage of KMS	No survey, no theory
Zoua et al. (2012)	KMS development	Descriptive , case study	•Human (policy), •Technology, •Organization (management)	•Technical support for decision making	No survey, no theory
Akeel (2013)	KMS deployment	Survey	•Human, •Technology, •Organization (management)	•IT and business performance	No IS theory, no KMS usage,
Grant (2013)	Development of KM	qualitative, descriptive	•Human (culture), •Technology, •Knowledge (tacit knowledge & explicit knowledge), •KMS	•The practice of KMS by oil & gas giants but not sufficient	No survey,
Ahmadi et al. (2013)	KMS implementation	Quantitative	•Human (organizational culture), •Technology (IT), •Organization (Organizational structure)	•organizational structure, organizational culture and information technology; • but human resource issue	Limited survey, no IS theory
de Oliveira (2013)	KMS development	Descriptive , case study	•Human, •Technology, •Knowledge	•Problem solving system	no survey,

El Khatib (2014)	KMS success factor	Survey	•Technology, •Knowledge, •KMS usage, •Organizational performance	•strategy and type of business.	Limited survey, no theory
Gardiner (2014)	KMS & integrated system	Qualitative: Interview	•Human, •Organization (leadership), •Knowledge (tacit knowledge)	•tacit knowledge sharing, strategic leadership and HRM practices	No survey,
Wang & Lai (2014)	KMS adoption	Survey	•Technology (KMS self-efficacy & system quality), •Organization (top management support & organizational rewards)	•System quality, leadership, reward are significant; • but self-efficacy insignificant	Limited in terms of theory, dimension, factor,
Tanaka (2014)	KMS development	Qualitative, case study	•Technology •Knowledge	•Knowledge, Human, financing for project are important	No survey,
Muffat & Crichton (2015)	HRM	Qualitative/ observation	•Human •Organization (leadership)	•The success of training in team behavior	No survey
Al Muzhami (2015)	challenges of KM	Qualitative, descriptive	•Human (culture), •Technology (system) •Knowledge	•system, procedure & cultural based issues	No survey
Hu et al. (2015)	KMS development	Descriptive , case study	•Technology	•Oil field security system	No survey
Li, Liu, Liu (2016)	KMS resistance phenomenon	Survey	•Human (loss aversion, social norms) •Organization (transition costs)	•Social norms, •cost, •loss aversion	•Limited in terms of theory, factor, ,
Desai & Rai 2016	KM use	Survey	•Human, •Technology •Organization (management)	•Insufficient use of KMs in downstream	No theory, limited,
Muhamad Khalil Omar et al. 2016	KMS usage	Survey	•Human(team-efficacy), •technology (social media) •knowledge	•positive relationship between social media usage and knowledge sharing; • but team-efficacy not significant	Limited in terms of theory, participant, factor
Mughal & Ahmad 2016	KM adoption	Survey	•KM adoption, •organizational performance	•behavioral, cultural,managerial and resource based support is needed. •positive effect of KM on performance	No theory, limited factors, no KMS usage
The current study	KMS usage	Survey, variance approach	•KMS usage •Organizational performance	----------	----------

As illustrated in Table 1, studies were conducted on KMS, development, implementation, adoption, and usage in the context of oil and gas industry. Most of the studies are qualitative, descriptive, and anecdotal with few quantitative studies. The surveys have rarely investigated the impact of KMS usage on organizational performance. These limitations call for a study of KMS usage towards organizational performance in the context of oil and gas industry in a developing economy like Iran, Oman and Pakistan.

III. RESEARCH METHODOLOGY

The current study investigated the effective factors of KMS usage towards organizational performance in the context of oil and gas industry in three States, namely Send, Punjab, and Baluchistan in Pakistan. However, this study focuses on one of the relationships, i.e., the effect of KMS usage on organizational performance.

A. Operationalised definitions of constructs

KMS usage

KMS is referred to as a class of information system which supports creation, transfer, and application of knowledge in organizations towards organisational performance. Furthermore, two common use types are knowledge sharing and knowledge acquisition & utilization. Broadly speaking, knowledge sharing includes usage behaviors concerning publishing, contributing to discussions, valuing, answering, and commenting, while knowledge acquisition & utilization encompasses usage behaviors concerning searching for and reading about knowledge and answers or the extent of the KMS usage (Alavi & Leidner 2001; Wu &Wang 2006). KMS is represented by knowledge search, knowledge creation, knowledge sharing, knowledge contribution, knowledge transfer and knowledge acquisition, as illustrated in Figure 1.

Knowledge Search refers to the entry point for searching knowledge in databases (Grant 2013). Knowledge creation is associated to the constant transfer, combination as well as conversion of various kinds of knowledge as the users are practicing, interacting and learning (Alavi & Leinder 2001; Nonaka 1994). Knowledge creation is "mainly a human process; technology can facilitate knowledge creation but cannot replace people" (Omotayo 2015:8).Knowledge sharing is associated with an activity through which knowledge is exchanged among coworkers and community in the organizations supported by KMS. Knowledge contribution refers to the knowledge, which is provided to enhance the efficiency of team works and achieve common goals. Knowledge transfer is associated with transferring knowledge from one part of an organization to another. Knowledge acquisition refers to the process of extraction, structuring, and organizing knowledge from one source such as human and using it in software.

Organizational performance

Organisational performance is associated with the organization's success to achieve business goals and objectives (Choi et al. 2008; Deshpande 1993).Organizational performance is represented by profitability, market shares, supply chain efficiency, and customer responsiveness, as displayed in Figure 1. Profitability refers to the generation of more money than expending by an organization. Market shares refer to the percentage of an organization or the markets' total sales obtained by a specific organization over a particular time period. Supply chain efficiency is associated with to dealing with internal process enhancement than customers or stakeholders' needs. Customer responsiveness is connected with the ability and flexibility of business in recognizing and responding to the ever-changing customer's needs.

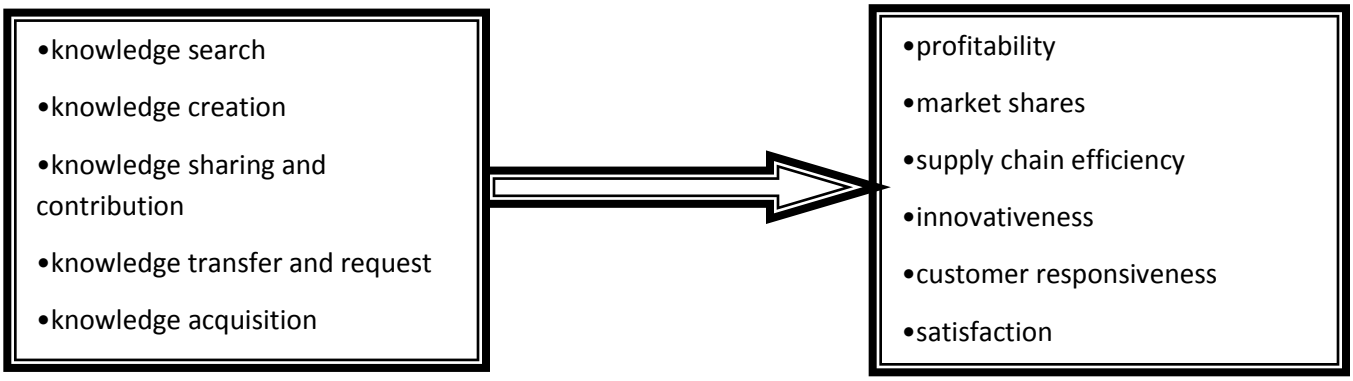

Figure 1 the KMS usage and organizational performance measurement items

B. Research instrument

The current study adapted and developed a questionnaire using the relevant studies on KMS. In fact, the questionnaire has been used to investigate the determinant factors of KMS usage towards organizational performance, where the current study is a part of that work. This study will focus on the effect of KMS usage on organizational performance.

C. Participants

The participants of the study are employees working in oil and gas industry in developing economy, who are familiar with KMS usage and employ it in performing their tasks and activities. The study adopted a clustered random sampling approach to select participants and chose 813 knowledge workers in oil and gas industry in both government and public companies.

D. Data collection procedure

The current study distributed questionnaires face-to-face and through e-mails among 813 employees since the oil and gas companies are scattered in different states, from which 467 respondents returned the questionnaires. Lastly, 428 questionnaires were considered as workable questionnaires and were employed for further data analysis. Therefore, the final response rate was 52.6%, which is suitable acceptable for analysis.

E. Data analysis techniques

The study employed SPSS for preliminary statistics and AMOS performed for SEM and confirmatory factor analysis to examine the effect of KMS usage on organizational performance in oil and gas industry in a developing economy.

IV. DATA ANALYSIS AND RESULTS

This section presents reliability analysis, the demographic profiles of participants, descriptive analysis, and the result of statistical data analysis, which are deliberated on subsequently.

A. Reliability analysis

Table 2 Reliability of constructs

Constructs	Item	Cronbach Alpha
KMS usage	8	0.87
Organizational Performance	6	0.91

As indicated in Table 2, the internal consistencies of KMS usage and organizational performance are 0.87 and 0.91, respectively. This shows that they have high level of reliability and suit the study measurement. Thus, the measurement items are reliable and the constructs are accurate and consistent.

B. Demographic profiles of participants

Table 3 presents the demographic profile of the participants.

Table 3 Demographic profile of participants

Variable	Category	Ferquency	Percent
Gender	Male	332	77.6
	Female	96	22.4
Age	<20	36	8.4
	20-30	168	39.3
	31-40	135	31.5
	41-50	34	7.9
	51-60	40	9.3
	>60	15	3.5
Education	Less than high school	129	30.1
	High school	113	26.4
	Bachelor	88	20.6
	Post graduate	98	22.9
Familiarity with KMS	Yes	370	86.4
	No	58	13.6
The use of KMS for company's tasks	Yes	343	80.1
	No	85	19.9
Place of access to KMS	At work	167	39
	At home	155	36.2
	At public location	106	24.8
Duration of using KMS	Less than one year	175	40.9
	1 to 2 years	119	27.8
	3 to 4 years	42	9.8
	5 to 6 years	42	9.8
	More than 6 years	50	11.7

As illustrated in Table 3, the demographic profiles of participants comprise of gender, age, education, familiarity with KMS, KMS usage for company tasks, the place of access to KMS and duration of KMS usage. From the total number of participants, 332 (77.65%) respondents are males, while 96 (22.45%) participants are females. It is observed that, the majority of the respondents are males (77.6%). In reference with age, 39.3% belong to the age group 20-30, while 3.5% are 60 and above. Regarding education level, 30.1% had the education level of less than high school; whereas 20.6% had bachelor certificate and 98 (22.9%) have post graduate certificates. Most of employees are familiar with IT-based system and KMS (86.4%). The highest rate of accessibility place is 39% (167) and they mostly have access to KMS at home (39%). The range of experience of using KMS is between less than one year (27.8%) and more than six years (11.7%).

C. Descriptive analysis

KMS usage

KMS usage construct was measured by 8 items. Table4 indicates descriptive results of measured items of this construct: mean, SD, varience, Skewness, and Kurtosis.The construct was measured based on a seven-point Likert scale.

Table 4. Descriptive statistice of measured items of KMS usage construct (KMSU)

No.	Item	Mean	Std.Deviation	Variance	Skewness	Kurtosis
1	I frequently use KMS to search knowledge in my work.	4.48	1.82	3.33	-.38	-.96
2	I frequently use KMS to contribute to knowledge in my work.	5.28	1.63	2.66	-.66	-.12
3	I regularly use KMS to search knowledge in my work.	4.85	1.76	3.09	-.86	-.25
4	I regularly use KMS to contribute to knowledge in my work.	4.72	1.76	3.07	-.64	-.60
5	I use KMS to help me make decisions.	4.38	1.82	3.30	-.26	-.11
6	I use KMS to help me record my knowledge.	4.66	1.82	3.30	-.63	-.79
7	I use KMS to share my general knowledge.	4.49	1.79	3.22	-.46	-.84
8	I use KMS to share my specific knowledge.	4.74	1.76	3.09	-.66	-.61

Table 4 shows that the respondents frequently, regularly use KMS to search knowledge and to contribute to their work. The participants also agreed that they use KMS to help them make decisions; to help them record their knowledge; and to share their general and specific knowledge.

Organizational performance

The participants were asked to give their idea on the degree to which their company succeeds in achieving business goals and objectives. The construct was measured by 6 items based on a seven-point Likert scale. Table 5 presents the mean, SD, varience, Skewness, and Kurtosis of each item.

Table 5 Descriptive statistice of measured items of organizational performance construct (OP)

No.	Item	Mean	Std.Deviation	Variance	Skewness	Kurtosis
1	The use of KMS improves my company's profitability.	5.40	1.46	2.15	-.14	-.13
2	KMS usage enhanced my company's market shares.	5.19	1.65	2.72	-.55	-.12
3	The KMS usage has maximized my company's supply chain efficiency.	5.26	1.73	2.99	-.47	-.12
4	My company's customers get timely responses via KMS.	5.27	1.58	2.48	-.53	-.12
5	KMS usage enhances my company's innovativeness.	5.33	1.60	2.57	-.83	-.13
6	KMS usage leads to customer satisfaction.	5.23	1.56	2.51	-.72	-.12

Table 5 indicates that the participants agreed that the use of KMS improves their company's profitability. The respondents also agreed that KMS usage enhances their company's market share. They concurred that the KMS usage has maximized their company's supply chain efficiency. In addition, the participants agreed that their company's customers get timely responses via KMS. Moreover, the participantsconcured that KMS usage enhances their company's innovativeness. Finally, the table shows that the participants opine that KMS usage leads to customer's satisfaction.

D. Test of Normality

Table 6 presents the result of normality of data related to KMS usage and organizational performance.

Table 6 Tests of Normality

Construct	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	DF	Sig.	Statistic	DF	Sig.
KMSU	.214	428	.000	.900	428	.000
OP	.210	428	.000	.844	428	.000

a.Lilliefors Significance Correlation

The existence of data normality was examined by two tests, namely Kolmogorov-Smirnov and Shapiro-Wilk tests. As indicated in Table 6, all statistics for both tests are significant, indicating there is a departure from normality of data. Yet, these two tests have been considered as sensitive to large sample sizes such as 428 sample size in this study; hence, they tend to be significant. However, skewness and kurtosis statistics were found less than ±1 (Tables 4&5). Therefore, it can be assumed that there is no major problem for lack of normality in the data of this study.

E. Expletory factor analysis

Test of communalities based on exploratory factor analysis was performed. The result of communalities is given in Table 7, that presents the communalities of constructs 'KMS usage' and 'organizational performance' based on exploratory factor analysis (EFA).

Table 7 Communalities

Constructs' items	Initial	Extraction
KMSU1	1.000	0.821
KMSU2	1.000	0.598
KMSU3	1.000	0.717
KMSU4	1.000	0.834
KMSU5	1.000	0.786
KMSU6	1.000	0.764
KMSU7	**1.000**	**0.392**
KMSU8	1.000	0.701
KMSU9	1.000	0.834
OP1	1.000	0.759
OP2	1.000	0.678
OP3	1.000	0.731
OP4	1.000	0.703
OP5	1.000	0.769
OP6	1.000	0.697

As shown in Table 7, communalities between the measured items loaded on EFA model vary from 0.392 for the item KMSU7 to 0.834 for the item KMSU4 (Table 5.20). The lowest communality of the item KMSU7 indicated that this item was the weakest measured item, which was removed and the number of KMSU items reduced to 8 items.

Pearson Correlation

Table 8 illustrates the Pearson correlation between KMS usage and organizational performance.

Table 8: Pearson Correlation Matrix

Constructs		
Mean	4.75	5.34
Standard deviation	1.49	1.37
1. KMS usage		
2. Organizational performance	.16**	

**. Correlation is significant at the .01 level (2-tailed).
*. Correlation is significant at the .05 level (2-tailed).

As indicated in Table 8, the Pearson correlation between KMS usage and organizational is positively significant (.16**). This means that an increase in KMS usage leads to an increase in organizational performance. The mean and standard deviation for KMS usage and organizational performance are (4.75, 1.49), and (5.34, 1.37), respectively.

Validity

This section presents the measurement of the indicators of KMS usage and organizational performance, as given in Table 9.

Table 9 The measurement of the indicators of KMS usage and organizational performance

Construct and item description	Standardized Factor Loadings
KMS Usage (α =0.87, CR =0.91, AVE =0.53, HSIC =0.15)	
1. I frequently use KMS to search knowledge in my work.	.84
2. I frequently use KMS to contribute knowledge in my work.	.62
3. I regularly use KMS to search knowledge in my work.	.78
4. I regularly use KMS to contribute knowledge in my work.	.77
5. I use KMS to help me make decisions.	.80
6. I use KMS to help me record my knowledge.	.61
7. I use KMS to share my general knowledge.	.80
8. I use KMS to share my specific knowledge.	.77
Organizational Performance (α =0.91, CR =0.91, AVE =0.63, HSIC =0.38)	
1. The use of KMS improves my company's profitability.	.83
2. KMS usage enhanced my company's market shares.	.83
3. The KMS usage has maximized my company's supply chain efficiency.	.64
4. My company's customers get timely responses via KMS.	.80
5. KMS usage enhances my company's innovativeness.	.83
6. KMS usage leads to customer satisfaction.	.80

As demonstrated in Table 9, in order to assess discriminant validity, the AVE for each construct was compared to the highest corresponding squared inter-construct correlation (HSIC). The criterion to meet discriminant validity is that AVE must be larger than HSIS. AVE and HSIC values for each construct are indicated in Table 6. As indicated in the Table, the AVE estimates of the constructs were greater than their HSIC, which demonstrated a high level of discriminant validity of the constructs.

Regression analysis

Table 10 presents the result of regression analysis between KMS usage and organizational performance (KMSU→ OP).

Table 10: Regression estimates of constructs

Hypothesis	Path	Estimate (β)	S.E	C.R	P	Result
H1	KMSU→ OP	0.83	0.73	12.86	0.03	Significant

As presented in Table 10, the standardized regression weight and critical ratio for KMS usage (KMSU) to organizational performance (OP) were 0.83 and 12.86 respectively. The results thus show that there is a strong relationship between KMS usage and organizational performance at the significant level of 0.05 (□=0.83, CR=12.86, P<0.05). The results also suggested that KMS usage has a significant and positive effect on organizational performance in petroleum industry, implying that an increase in KMS usage would exert a positive influence on organizational performance. Thus, management needs to facilitate and encourage KMS usage in oil and gas industry.

DISCUSSION

The current study investigated the effect of KMS usage on organizational performance in the context of oil and gas industry in a developing economy, Pakistan. The result of data analysis demonstrated that the standardized regression weight and critical ratio for KMS usage (KMSU) to organizational performance (OP) were 0.83 and 12.86, respectively. The findings suggest that KMS usage has a significant and positive impact on organizational performance in oil and gas industry. This implies that an increase in KMS usage would positively augment organizational performance. In short, the study found that KMS usage is a significant determinant of organizational performance. In a causal sense, the high KMS usage leads to high organizational performance, consistent with the findings of literature stream on KMS usage (Abbas 2012; Abdullah et al. 2013; Ching-Lin Huang 2008; Choi, Lee et al. 2010; Diane 2010; Fugate et al. 2009; Elbashir, Collier & Davern 2008; Chang Lee et al. 2005; Lee et al. 2005; Shu-Mei 2008; Rasul et al. 2012). Therefore, the knowledge workers in oil and gas industry in developing economy are aware of the benefits of KMS usage and attempt to practice it towards organizational performance. The implication is that management should facilitate KMS usage towards organizational performance and competitive advantages.

Knowledge workers use KMS to search knowledge, contribute to knowledge, communicate information and knowledge, and share general and specific knowledge (Wu & Wang 2006).Users search knowledge in data bases using search engines for the purpose of important information such as technical performance data, managerial performance data, best practices, supplier and customer information, company yellow pages, and so on (Grant 2013). They can use portals with personalized single point access to the contents to communicate knowledge and share their general and specific knowledge.This implies that management should encourage and facilitate KMS usage through facilitating knowledge seeking, communicating ideas, information, knowledge, and contributing to knowledge.The organizational performance is achieved through improving profitabilityand productivity (Chowdhury & Ahmad 2005; Oliveira et al. 2013), enhancing company's market share (Ponomarenko & Khaertdinova 2015;Ramanigopal 2012), maximizing supply chain efficiency, getting timely response, enhancing innovativeness (Mughal & Ahmad 2016),and increasing customer satisfaction (Desai & Rai 2016). However, the benefits of KMS usage should be considered in the lights of the inherent limitations and issues.

V. RESEARCH IMPLICATIONS

This study has two kinds of implications, namely theoretical and practical which are discussed respectively.

A. Theoretical implications

Previously, the importance of KMS usage for organizational performance has been emphasized, but the effect of KMS usage on organizational performance, particularly in the context of oil and gas industry in developing economy, has remained

unexplored. This sparked the present study to be undertaken in the context of oil and gas industry in a developing economy, Pakistan. The current study uses a wide range of indicators to examine the influence of KMS usage on organizational performance. The findings support arguments in the prior literature on the impact of KMS usage on organizational performance. The study investigated an area of research which was almost neglected in oil and gas industry in developing economy. The study measured the relationship between KMS usage and organizational performance using both descriptive analysis and casual relationship via SEM, which is the contribution of the study.

B. Practical implications

As oil and gas industry is at the forefront of KMS development, it has been investing huge amount of money in developing IT-based system and KMS to enhance organizational performance (Cognizant 2012; Grant 2013). The study indicated that there is a strong relationship between KMS usage and organizational performance. As such managersshould take measures to enhance KMS usage towards organizational performance through facilitation and encouragement. Management can also use the scale of KMS practice as a checklist for organizations to evaluate themselves based on the degree of using KMS towards organizational performance and competitive advantages.As KMS usage is represented by searching, contributing, creating, transferring, and sharing knowledge among knowledge workers, management should facilitate, promote and encourage searching knowledge, contributing to knowledge, communicating information and knowledge, and sharing general and specific knowledge. So, when knowledge workers are reluctant to use KMS, management intervention is needed to encourage and facilitate KMS usage (Hsu 2008).

The findings also suggest that managers should accelerate KMS usage to address different problems and issues in both upstream and downstream oil and gas sector. KMS can help address the technological innovations issues, acquisitions, offshore drilling,, human resource management, environmental issues, offshore megaprojects, security, safety, logistic, maintenance, productivity, real time collaboration technologies, cost reduction, productivity, decision making, and solving technical problems (Cognizent 2012; Ramanigopal 2012).KMS can deal with marketing, customer service quality, communities of practice, responsiveness, innovation, supply chain, decision making, and profitability, (Mughal & Ahmad 2016). Therefore, the current study may support the translation of the findings on KMS usage towards organizational performance intoreal practice in organizations.

CONCLUSION

This study investigated the effect of KMS usage on organizational performance in the context of oil and gas industry in a developing economy, Pakistan. The study found that there is a strong relationship between KMS usage and organizational performance. The study has addressed an area that has been underexplored, particularly in oil and gas sector in developing economy. The finding of the study has both theoretical and practical implications. However, further study is needed to substantiate our findings.

n the basis of the current research, the following future researches may be of interest. A longitudinal study to examine the dynamic impact of KMS usage on organizational performance would be suggested. Further, a research with mixed method approach using both survey and interview may be recommended. This research might be repeated in the other Asian country to re-examine the influence of KMS usage on organizational performance. A study on the issues of and barrios to KMS usage and organizational performance may be suggested.

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