

# Review of Studies on KMS in Oil and Gas Contexts

<sup>1</sup>Akbar Badpa, <sup>2</sup>Juhana Salim, <sup>3</sup>Jamaiah Yahaya, <sup>4</sup>Taravat Peyvandi and <sup>5</sup>Maryam Mahdinezhad,  
<sup>1, 2, 3</sup>Faculty of Information Science and Technology, The National University of Malaysia, 43600, Bangi, Selangor, Malaysia  
<sup>4</sup>The Islamic Azad University, Tehran, Iran  
<sup>5</sup>Faculty of Management & Economics, Sultan Idris Education University, Tanjung Malim, Perak, 35900, Malaysia

**Abstract:** Knowledge management system (KMS), as a class of information system, provides the proper infrastructure for knowledge management (KM) practices and processes in organizations. KMS supports KM in knowledge creation, sharing, transfer, and dissemination. In the context of oil and gas industry, although the companies are vastly investing in KMS development, there are a lot of issues with KMS implementation, adoption and usage. Many studies have been carried out on KMS; however, very few review studies have been conducted using systematic literature review. In the context of oil and gas industry, such a review of the KMS researches is almost absent in literature. Therefore, the current paper reviews 25 state-of-the art studies on KMS concerning the focus, methods (quantitative or qualitative) and approaches (variance or process) through systematic literature review. The review of the studies indicates that they have mostly adopted qualitative method and process approach. The study has implication for stakeholders and researchers.

**Keywords:** Knowledge Management, Knowledge Management System, Information Technology, Information Science, Oil and Gas Industry.

## I. INTRODUCTION

Knowledge is the insights, understandings, and practical know-how that allow an individual to act intelligently. Knowledge is an organizations' asset that is manifested in two forms: tangible (explicit knowledge in databases) and intangible assets (tacit knowledge resident in the minds of individuals) (Nonaka&Takuechi 1995). Knowledge has come to be more important than an organization's properties and lands (Hwang 2008; Omotayo 2015; Wu & Wang 2006). Knowledge significantly contributes to decision making, operational management, achieving objectives and competitive advantages. To harvest the real benefit of knowledge, organizations need to conduct knowledge management. Knowledge management promotes the process of identification, creation, sharing, acquisition, transfer, storage, dissemination and application of knowledge. To enhance KM practices and processes, knowledge management system (KMS) needs to be in place. KMS helps organizations to achieve organizational performance and competitive advantages (Alavi & Leinder 2001). One of the industries

pioneer in developing KMS is oil and gas industry (Grant 2013; Leavitt 2002). Oil and gas industry has been developing KMS for different purposes in both upstream and downstream sectors (Cognizant 2012; Desai & Rai 2016), particularly in developing economy. KMS supports marketing, innovation, drilling, exploration, real time communication, decision making, addressing issues of security and safety, human resource, and so on (Grant 2013; Ha et al. 2016). However, there are issues of failure or sluggishness of KMS implementation, adoption and usage in oil and gas industry (Gardiner 2014; Grant 2016; Mughal & Ahmad 2016). Several review studies on the KMS were reported in literature (e.g., Shah & Mahmood 2015). However, in the context of oil and gas industry, while many studies on KMS were carried out, a systematic review study on KMS has yet to be undertaken. This calls for a systematic review study on the focus, methods (quantitative or qualitative), approaches of the researches conducted on KMS in the context of oil and gas industry in developing economy. Therefore the objective of the following paper is to explore what methods and approaches are dominant the study of KMS in the context of oil and gas industry.

## II. BACKGROUND STUDY AND RELATED WORKS

In following sections, first, the definitions of main concepts such as information system (IT), information system (IS), knowledge, knowledge management (KM), knowledge management system (KMS), variance approach and process approach are provided. Subsequently, the review of 25 studies on KMS in oil and gas industry is presented chronologically.

## III. DEFINITION OF CONCEPTS

This section presents some concepts such as IT, IS, knowledge, KM, KMS, variance approach and process approach, their definitions and the sources, as given in Table 1.

## IV. SUMMARY OF STUDIES ON KMS IN OIL AND GAS INDUSTRY

This section summarizes a systematic review of 25 studies on KMS in the context of oil and gas industry, which are presented chronologically. The review analysis examined the focus of study, methods (quantitative vs. qualitative) and approaches (variance vs. process).

Table 1: Definition of concepts

Concept	Definition	Source
Information technology (IT)	IT is referred to as an essential tool useful for running sustainable business activities and processes. The role of IT in KM is to help in searching and retrieving information and knowledge so that the users can enhance their knowledge and apply it to their respective organization's needs	(Alavi & leinder 2001).
Information sytem (IS)	IS is primarily designed with the focus on explicit or codified knowledge. Information system supports and augments organizational KM needs with the purpose of enhancing the KM activities of	(Alavi & leinder 2001).

	individuals and groups.	
Knowledge	Knowledge: knowledge is the insights, understandings, and practical know-how that an individuals possess that allows him/her to function intelligently. knowledge refers to the information used for leadership, supervision, operational management, daily activities, decision making, marketing, and competitive advantages.	Karl Wiig (1996) Sunassee & Sewry 2002). Choi et al. 2008).
Knowledge magement (KM)	KM is a process that transforms the individuals' knowledge into organizational knowledge. It encompasses the acquisition, generation, storage, sharing, and knowledge usage to augment organizational performance and competitive advantages.	(Alavi & Leidner 2001) (Jones 2003)
knowledge magement system (KMS)	KMS is a class of information system employed to support and increase organizational KM for the purpose of obtaining organizational performance and competitive advantage. KMS supports the application of both explicit and tacit knowledge (Alavi & Leidner 2001). KMS facilitates organizational learning through capturing the important knowledge and making it accessible to the employee upon requirement for reuse. KMS refers to technology as well as management of knowledge creation of experiences and insights which reside inside the human minds.	(Alavi & Leidner 2001). (Huang et al. 2008)
Variance approach	The variance approach attempts to explain the phenomenon by examining the relationship between independent and dependent variables based on the principle of objective in nature. The related variance-based studies are examined through predictor factors (independent variables) that determine the outcome (dependent variable) under investigation (Lin, Dean, & Moore 1974). In Information System context, the variance approach offers the core set of theoretical frameworks that seeks to explain the phenomenon such as organizational behavior by investigating individual or organizational level with various factors that determine the outcome of the study through noting simple relationship.	(Lin, Dean, & Moore 1974); (Khandwalla 1984; Black, Carlile & Reppenng 2004; Lee & Hong 2002).
Process approach	Unlike variance approach, process approach does not rely on prediction about the phenomenon but it explains how outcomes develop overtime (Bals et al. 2007; Dean 1986). In this approach, the precursor is regarded as inadequate to cause the outcome but is only held necessary for it to occur (Green 2001). Outcome is partially predictable from the knowledge of process than from the levels of predictor variables since process approach does not discuss causal relationships (Bals et al. 2007). The process approach is able to explore and build understanding of a detailed phenomenon through the lens of process to explain how and why.	(Bals et al. 2007; Dean 1986) Burton-Jones, McLean & Monod 2011; (Green 2001)

Table 2: Summary of studies on KMS in oil and gas industry

Author (s) & Year	Tilte/Focus	Method	Process
Leavitt(2002)	Applying Knowledge Management to Oil and Gas Industry Challenges	Qaulitative /descriptive	Process
Chowdhury & Ahmad (2005)	Critical Success Factors affecting Knowledge Management Implementation in Oil & Gas companies: A Comparative study of four corporations	qualitative	Process
Elgobbi(2008)	Technology and knowledge transfer: case study of the libian oil and gas industry	Quantitative	Variance
Al-Busaidi et al. (2007)	Revealing the Antecedents and Benefits of KMS Use: An Exploratory Study in a Petroleum Company in Oman	Qualitative, interview	Process
Mallam Musa Rabi (2009)	Knowledge Management in Nigeria Oil and Gas Industry: Theoretical Frameworks, Practical Challenges and Opportunities	Qualitative	Process
Al Busaidi et al. (2010)	Sharing Knowledge to A Knowledge Management System: Examining the motivators and the benefits in an Omani organization	Quantitative	Variance
Kun & Jiang (2011)	Circular Economy Strategies of oil and Gas exploitation in China	Qualitative	Process
Mahmood et al. (2011)	Maintenance management system for upstream operations in oil and gas industry: a case study	Qualiative	Process
Matayong &	Factors for KMS Post Adoption: The Exploratory Study in Oil	Quantitive	Variance

Mahmood (2011)	and Gas Industry in Malaysia		
Ramanigopal (2012)	knowledge management for the oil and gas industry: opportunities and challenges	Qualitative	Process
Zoua et al. (2012)	A Knowledge-based Decision Support System for Sulfur Pricing	Qualitative, case study	Process
Akeel (2013)	Evaluation of Information Systems Deployment in Libyan Oil Companies: Towards an Assessment Framework	Qualitative	Variance
Grant (2013)	The Development of Knowledge Management in the Oil and Gas Industry	qualitative, descriptive	Process
de Oliveira (2013)	A Multi-agent System for Oil Field Management	Qualitative case study	Process
El Khatib (2014)	Knowledge Management System: Critical Success Factors and Weight Scoring Model of the Technical Dimensions	Quantitative	Variance
Gardiner (2014)	Creating and appropriating value from project management resource assets using an integrated systems approach	Qualitative: Interview	Process
Wang & Lai (2014)	Examining the adoption of KMS in organizations from an integrated perspective of technology, individual, and organization	Quantitative	Variance
Tanaka (2014)	Toward project and program management paradigm in the space of complexity: a case study of mega and complex oil and gas development and infrastructure projects	Qualitative, case study	Process
Muffat & Crichton (2015)	Investigating Non-Technical Skills through team behavioral markers in oil and gas simulation-based exercises	Qualitative/observation	Process
Al Muzhami (2015)	Challenges in Knowledge Management: Insights from Oil and Gas Industry Saif Al Muzhami University Utara Malaysia	Qualitative, descriptive	Process
Hu et al. (2015)	An Application of Advanced Alarm Management Tools to an Oil Sand Extraction Plant	Descriptive, case study	Process
Li, Liu, Liu (2016)	Why do employees resist knowledge management systems? An empirical study from the status quo bias and inertia perspectives	Quantitative	Variance
Desai & Rai 2016	Knowledge Management for Downstream Supply Chain Management of Indian Public Sector Oil Companies	Quantitative	Variance
Muhamad Khalil Omar et al. 2016	Social Media Usage, Perceived Team-Efficacy and Knowledge Sharing Behaviour among Employees of an Oil and Gas Organisation in Malaysia	Quantitative	Variance
Mughal & Ahmad 2016	Knowledge management: Awareness and adoption in the Oil and Gas Automation industry in Pakistan	Quantitative	Variance

As illustrated in Table 1, many studies on KMS were conducted in the context of oil and gas industry. The reviewed studies have focused on applying KM to oil and gas industry challenges (Leavitt 2002), critical success factors affecting KM implementation (Chowdhury & Ahmad 2005), technology and knowledge transfer (Elgobbi 2008), antecedents and benefits of KMS use (Al Busaidi 2007), KM theoretical framework, practical challenges (Mallam Musa Rabiou 2009), sharing knowledge to a KMS (Al Busaidi 2010), circular economy strategies of oil and gas exploitation (Kun & Jiang 2011), maintenance management system for upstream operations (Mahmood et al. 2011), factors for KMS post-adoption (Matayong & Mahmood 2011), KM opportunities, challenges (Ramanigopal 2012), knowledge-based decision support system (Zoua et al. 2012), evaluation of information systems deployment (Akeel 2013), development of KM (Grant 2013) multi-agent system for oil field (de Oliveira 2013), critical success factors of KMS (El Khatib 2014), project management resource assets (Gardiner 2014), adoption of KMS in organizations (Wang & Lai 2014), project and program management (Tanaka 2014), advanced alarm management tools (Hu et al. 2015), challenges in knowledge management (Al Muzhami 2015), investigating non-technical skills (Muffat & Crichton 2015), awareness and adoption (Mughal & Ahmad 2016), social media and knowledge sharing (Muhamad Khalil Omar et al. 2016), downstream supply chain

management (Desai & Rai 2016), and resisting KMS (Li, Liu, Liu 2016). Most studies are qualitative and process (Leavitt 2002; Chowdhury & Ahmad 2005; Al Busaidi 2007; Mallam Musa Rabiou 2009; Mahmood et al. 2011; Kun & Jian 2011; Zoua et al. 2012; Al Muzhami 2015; Hu et al. 2015; Ramanigopal 2012; Grant 2013; Gardiner 2014; Tanaka 2014), while few studies are quantitative and variance approach (Akeel 2013; Al Busaidi 2010; Desai & Rai 2016; Elgobbi 2008; Khatib 2014; Li, Liu, Liu 2016; Muhamad Khalil Omar et al. 2016; Matayong & Mahmood 2011; Mughal & Ahmad 2016). As discussed, most of the studies reviewed are qualitative and process-oriented, while few studies are quantitative and variance-oriented. Very few studies examined causal relationships. The focus of the studies is on KMS implementation, adoption and usage. Some studies have discussed the issues, challenges and opportunities of KMS.

## DISCUSSION

This paper reviewed 25 studies on KMS in the context of oil and gas industry. The result of review analysis indicates that most of the studies have adopted qualitative method and process approach, while few studies have employed quantitative method with variance approach. Several studies on KMS have explored KMS development in qualitative, case studies. Some studies discussed the issues and opportunities of KMS. Further, very few casual quantitative studies were

conducted. This calls for quantitative studies with the focus on the antecedents of KMS implementation, adoption, and usage. Despite KMS implementation and adoption, KMS usage happens at all levels of an organization and the real success of KMS can be established through determining the critical factors of its usage (Wint 2016). This means that future prospective studies are suggested that be conducted on the antecedents of KMS usage in the context of oil and gas industry in developing economy.

### IMPLICATION

The current study has theoretical implication. This paper has reviewed 25 studies on KMS in terms of focus, methods and approaches in the context of oil and gas industry. This study is unique and is the first study in its kind. This review study highlights that there is a paucity of quantitative studies, particularly casual relationships concerning the antecedents and determinants of KMS implementation, adoption and particularly KMS usage. This implies that further study is needed to be undertaken on the effective factors of KMS usage in the context of oil and gas industry in developing economy. Besides, the reviewed studies are not theoretically supported. This calls for a study founded on the information system theories.

### CONCLUSION

This paper has reviewed 25 published articles and theses on KMS in the context of oil and gas industry mainly in developing economy. The result of the analyzed studies reveals that most studies adopted qualitative methods and process approach, while limited studies have employed quantitative method through variance approach. The review analysis indicates that the studies have mostly are anecdotal, descriptive and case studies, some of which are case studies that have developed KMS without evaluating in causal relationships. This review paper suggests that a causal study on the implementation, adoption, and particularly use of KMS be conducted in oil and gas industry in the context of developing economy to fill the gap in literature.

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*Author's Profile*

Dr. Akbar Badpa (Corresponding Author)  
Faculty of Information Science and Technology, The National University of Malaysia, 43600 UKM Bangi, Selangor, MALAYSIA.  
E-Mel: akbarbadpa74@gmail.com

Professor. Dr. Juhana Salim  
Faculty of Information Science and Technology, The National University of Malaysia, 43600 UKM Bangi, Selangor, MALAYSIA.  
E-Mel: js@ukm.edu.my

Associate Professor Dr. Jamaiah Yahaya  
Head of Doctoral Program, Faculty of Information Science and Technology, The National University of Malaysia Bangi 43600, Selangor, Malaysia  
E-Mel: jhy@ukm.edu.my

Mrs Taravat Peyvandi  
The Islamic Azad University, Tehran, Iran  
E-Mel: taravat.peyvandi@gmail.com

Dr. Maryam Mahdinezhad  
Faculty of Management & Economics, Sultan Idris Education University, Tanjung Malim, Perak, 35900, Malaysia  
E-Mel: maryam.m@fpe.upsi.edu.my