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Knowledge Management Systems Success Factors: An Investigation in Middle-Eastern Organizations

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ABSTRACT

This study examines the social and technical factors that enable a successful knowledge management systems (KMS) deployment in Middle-Eastern organizations based on Davenport and Prusak's [6] success factors. These factors are knowledge-culture, organizational-infrastructure, technical-infrastructure, management-support, vision-clarity, rewards, economic-return, and knowledge-structure. This paper also provides a general profile of KMS in these organizations. Data was collected through a questionnaire filled out by IT managers. Total participants are 31. Results based on single-regression t-tests show that each of the study factors has a significant effect on KMS success except for rewards and economic-return. Results suggest that: (1) social and technical factors are critical for KMS success; (2) IT managers in Middle-Eastern organizations do not consider rewards as an effective or feasible policy for KMS; and (3) KMS is necessary for these organizations regardless of its economic return. The KMS profile shows that the majority of organizations deploy KMS to manage structured-internal knowledge specifically internal reports. As for technologies, organizations utilize more transfer and storage tools than search and retrieval tools.

INTRODUCTION

Knowledge is information integrated with experience, context and reflection. A knowledge management system (KMS) is an information system that manages, stores and distributes knowledge throughout the organization. In the knowledge-based economy, an organization's success is believed to be achieved only through its knowledge management (KM); KM enables organizations to achieve a sustainable advantage [1]. KM is a socio-technical process. Thus, there are several technical and social (related to organization-culture) factors that enable successful KMS deployment in organizations. Several researchers identify many of these factors [2,6,12].

The objective of this study is to examine social and technical factors that enable a successful KMS deployment in Middle Eastern organizations based on Davenport and Prusak's [6] success factors. These factors are knowledge-oriented culture, organizational-infrastructure, technical-infrastructure, management-support, vision-clarity, rewards, economic-return, and standard knowledge-structure. Moreover, this paper provides a general profile of knowledge types and technologies in these organizations' KMSs.

The next section provides a literature review of KMS's processes, models and technologies, and success factors. The literature section is followed by sections on research methodology, data analysis, and discussion and conclusions.

LITERATURE REVIEW

KMS Processes

Organizational KMS generally involve several interdependent knowledge processes: creation, storage/retrieval, transfer, and application [3]. Creation is the development of new organizational knowledge, or codification of the existing knowledge into explicit knowledge for later organizational use. Knowledge can be captured from internal or external sources. Also, it can be extracted from databases, or originated by individuals or groups of individuals. The storage and retrieval process refers to storing the organizational explicit knowledge in electronic storage tools such as databases, and searching/retrieving this stored knowledge for later reuse. Transfer is the distribution of knowledge throughout the organization. Application is the actual utilization of knowledge by organization's employees to complete work-related tasks. Knowledge application is what creates business value, and the source of competitive advantage. Several knowledge types can be managed by KMS [2,6,16]. These types are: structured-internal knowledge, unstructured-internal knowledge, external knowledge, and experts' profiles.

KMS Models and Technologies

Organizations utilize several technologies for KMS. These technologies include databases and artificial intelligence tools (e.g., case-based reasoning and expert systems) [2,6]. Organizations also utilize newer technologies such as groupware and Internet-based webs, electronic mail, discussion forums, electronic whiteboard, search-engines, videoconferencing, intelligent agents, web-browsers, and multimedia-databases.

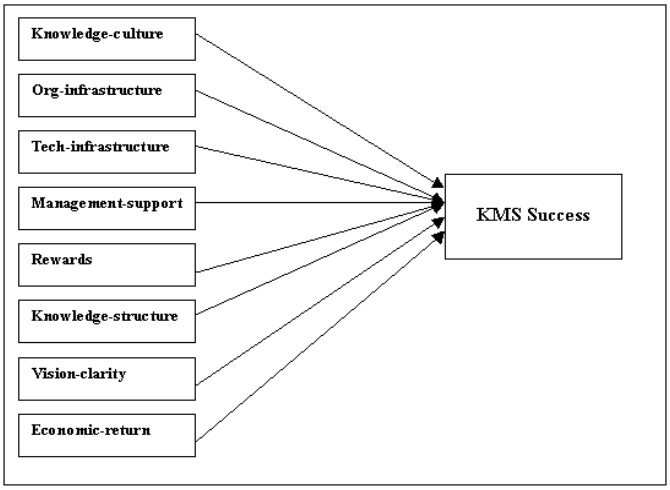
Researchers identify two general models of KMS [2,6,9]. These models are repository and network. The repository model codifies the organization's explicit knowledge. This includes creation, collection, storage, retrieval and dissemination of the knowledge. The repository model is the prevalent form of KMS in organizations [14]. IS technologies, such as relational databases and document management systems, are mostly used in this model. Examples of this model are best-practice repositories that have been developed in consulting companies such as Ernst and Young [1].

Compared to the repository model, the network model does not store knowledge but it stores employees' profiles and/or provides communication channels to transfer knowledge among individuals. This model is based on the assumption that real knowledge resides in individuals' minds (tacit knowledge), and it is difficult to codify and store in a structured way. Several applications of KMS are identified under this model such as yellow pages, knowledge maps, videoconferencing, email and groupware. For instance, the British Petroleum Virtual Teamwork KMS enables employees to share their knowledge through videoconferencing, groupware, and email [6].

KMS Success Factors

Several social and technical factors may affect the success of KMS deployment [1,6,8,12,15]. Based on a qualitative study, Davenport and Prusak reported these factors are knowledge-oriented culture, organizational and technical infrastructure, management-support, vision-clarity, modicum of process orientation, non-trivial motivational aids, multiple-channels for knowledge transfer, link to economic-return, and

Figure 1. Study Framework



standard knowledge-structure[6]. Several aspects define a successful project [6]. They are the growth in resources attached to the project (such as people, or money); the growth in knowledge content and usage; the growth in the number of users; and the evidence of financial returns. In this study, KMS success is measured by the first three aspects. The fourth aspect is captured in the economic-return factor.

STUDY FRAMEWORK

This study examines KMS in Middle-Eastern organizations. First, it provides an initial KMS profile of these organizations. The profile gives information about types of knowledge stored in these systems (structured-internal knowledge, unstructured-internal knowledge, external knowledge, and experts' profiles), and technologies used for different KMS functions (storage, search, retrieval, and transfer). Second, the study quantitatively investigates factors that lead to successful KMS based on some of Davenport and Prusak's study [6]. It specifically examines effects of the following factors on KMS success: knowledge-culture, organizational-infrastructure, technical-infrastructure, management-support, vision-clarity, rewards, knowledge-structure and economic-return. Figure (1) illustrates the study framework.

Knowledge-Culture

Organization-culture is norms that govern employees of an organization [4]. Researchers indicate that organizations should adjust their culture to be knowledge-friendly for successful KMS deployment [6,8,12,15]; a knowledge-friendly culture encourages creation, sharing, access, transfer and utilization of knowledge in organizations.

Hypothesis 1: Higher knowledge-oriented culture improves KMS success

Organizational-Infrastructure

Organizational-infrastructure refers to basic organizational elements that assist in KMS implementation and use [6]. This involves establishing roles and tasks for skilled employees to continuously handle the KMS implementation. For example, it involves establishing roles of chief knowledge officer, knowledge project manager, knowledge reporters, and knowledge network facilitators. Organizational-infrastructure is considered critical to leverage the technological architecture [6,16].

Hypothesis 2: Higher organizational-infrastructure improves KMS success

Technical-Infrastructure

A technical-infrastructure includes technical capabilities to run KMS in organizations. It refers to an accessible common operating environment, which may include desktop computing for each knowledge worker; communication networks, such as Lotus Notes and the Internet, to transfer and access knowledge; and standard software, such as MS Office Suite, to codify and exchange knowledge among employees [6]. Technical-infrastructure is critical to leverage knowledge and create value [6, 8] .

Hypothesis 3: Higher technical-infrastructure improves KMS success

Management-Support

Like other project implementations, KMS also requires senior management-support [6]. Support is needed to promote a knowledge-culture, provide funding and other necessary resources for knowledge infrastructure, and highlight the KMS importance [6,12].

Hypothesis 4: Higher management-support improves KMS success

Rewards

Rewards-policy is an important factor for KMS deployment [6,12,15], because unlike other IS projects, the success of KMS is based on the participation of the organization's employees to create and use knowledge that is stored in these systems. Thus, rewards are essential to motivate people to contribute, use and share knowledge, even across their divisions' boundaries. These rewards or incentives should not be trivial [6].

Hypothesis 5: An effective rewards-policy improves KMS success

Knowledge-Structure

Having a standard knowledge-structure provides easier and faster codification and extraction of knowledge. Davenport and Prusak indicate that having the right knowledge-structure is crucial for many knowledge projects because knowledge is vague in nature and closely linked to people who hold it [6]. Having no standard structure for storage makes it very hard to search a knowledge repository. Also a flexible knowledge-structure that suits each domain of knowledge collaboration is necessary [6].

Hypothesis 6: Higher knowledge-structure improves KMS success

Vision-Clarity

Vision clarity is the precision of the objective [11]. In a KMS project, vision-clarity is essential. Davenport and Prusak [6] found that successful projects paid attention to this factor. Also, effective communication of the project objective is as important as project goal setting. Managers should know when and how to effectively communicate the project objective.

Hypothesis 7: Higher vision-clarity improves KMS success

Economic-Return

Most organizations especially private ones require economic-return to justify the implementation and the continuous maintenance of KMS. An increase in income or sales or a reduction of business cost adds economic value [2,6]. Economic-value might also be gained by indirect benefits such as improvements in cycle time, customers' satisfaction, and employees' satisfaction. Thus, yielding a good economic-return from KMS is considered an important factor for a successful KMS deployment [6].

Hypothesis 8: Higher economic-return improves KMS success

STUDY METHODOLOGY

Sample

The study questionnaire was distributed to information technology managers in 85 organizations in government, banking, telecommunications, aviation, consulting and petroleum sectors in the Gulf Coopera-

tion Council (GCC) countries: Bahrain, Kuwait, Oman, Saudi Arabia, UAE and Qatar. These countries somewhat have the same characteristics. Oil and gas is the major industry in these countries. Banking is also considered the next most important. Thirty questionnaires were personally handed to IT managers, and fifty-five were mailed. Twenty-five questionnaires were returned of those personally handed out, and only six were returned from those mailed. Most of the returned questionnaires, 28 of 31, are from one country, Oman. The questionnaire was filled out by either IT department managers, IT division managers, system managers, or senior IT employees.

Data Collection

Data was collected by a questionnaire. The cover letter asked the managers to fill out the questionnaire for at least one of their organization's KMS systems. The letter defines KMS and its models. Along with organization and systems demographics questions, the questionnaire[1] includes two main parts. The first part includes measurements of KMS success factors. The measurement scale of constructs was based on 5-point Likert scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The questionnaire uses 4 items for success, 4 for knowledge-culture, 5 for organization-infrastructure, 9 for technical-infrastructure, 4 for management-support, 5 for rewards, 5 for knowledge-structure, 3 for vision, and 3 for economic-return. Most of the measurements were developed based on Davenport and Prusak's [6] definitions of these constructs. Success measurements, with minor adjustment, were taken from [7]. Some of technical-infrastructure measurements were based on [8], and some of vision measurements were revised from [11]. The second part includes a selection list of knowledge types and technologies used for KMS functions. This list was developed based on KMS literature. Multiple selections are allowed within each category.

DATA ANALYSIS

Organizations and Systems Demographics

The sample includes 21 public and 10 private organizations. They are 18 non-profit and 13 profit organizations. Eleven of these organizations have less than 500 employees, 4 between 500 and 1000 employees and 8 above 1000 employees. Eleven of the systems included in the study were developed for government organizations, 9 for oil and gas, 3 for education, 3 for banking, 2 for auditors and consultants, 2 for stock exchanges, and 1 for aviation.

Nineteen of the sample systems were identified as repository KMS, 5 as network KMS, and 3 as mixed types; four respondents made no selection. Use of about half of the systems was mandatory. The lifetime of these system is as follows: 1 system is less than 2 years old, 3 are between 2 and 5 years old, 5 are greater than 5 years old and the lifetimes of 12 systems were not reported. Nine of these systems have less than 100 users, 7 have between 100 and 500 users, 4 have greater than 500 users, and 11 were not identified.

KMS Profile

Knowledge Types

Table 1 illustrates types of knowledge that are managed in the study sample. The majority of these systems manage structured internal knowledge such as internal reports, and methodologies and techniques. Most of informal internal knowledge is managed in the form of questions and answers. Customers' knowledge and publications are the most managed forms of external knowledge. Organizations manage both internal and external experts' profiles.

KMS technologies. Table 2 illustrates tools utilized for several KMS functions (storage, search, retrieval and transfer). Generally, organizations utilize more transfer and storage tools than search and retrieval tools for KMS (2.90 and 2.17 tools per organization for transfer and storage versus 1.63 and 1.67 tools for search and retrieval). As for storage technologies, the majority of these systems utilize databases/ datawarehouses and web pages. For search and retrieval, SQL and search engines are the most used tools. Internet, networks and email technologies are the most used tools for knowledge transfer. Few systems are utilizing advanced tools such as expert systems and videoconferencing. These systems mainly belong to private local and international organizations.

Table 1. Types of Knowledge

1. Structured Internal Knowledge		**3. External Knowledge**	
Internal reports	24	Competitive advantage	8
Methodologies & techniques	16	Industry trends	9
Products & marketing	7	Customers' knowledge	11
Others	13	Journal publications	11
		Others	9
2. Informal(unstructured) Internal Knowledge		**4. Expert's Profiles**	
Lessons learned	12	Internal experts	17
Best practices	11	External experts	11
Questions and answers	14		
Others	11		
* Numbers represent total respondents who selected that type of knowledge; n=30			

Table 2. Technologies Used for Several KMS Functions

Storage Technologies		**Retrieval Technologies**	
Databases & datawarehouses	23	SQL	21
Expert systems/case-based reasoning	3	Expert systems/case-based reasoning	3
Document management systems	12	Search engines	14
Web pages	21	Intelligent agents	3
Others	6	Others	9
Total	65		50
AVG	2.17		1.67
Search Technologies		**Transfer Technologies**	
SQL	20	Internet/Intranet/Extranet	23
Expert systems/case-based reasoning	3	Local area network/WAN/MAN	25
Search engines	14	Groupware/Group support systems	4
Intelligent agents	3	Email	18
Others	9	Discussion forums	6
		Videoconferencing/Audioconferencing	6
		Other	5
Total	49	Total	87
AVG	1.63	AVG	2.90
Total and average tools utilized by KMS in an organization is (251; 8.37); n=30			

Measurement Reliability

The internal-consistency reliability was evaluated by Cronbach's alpha. Most of the study constructs have above the recommended reliability alpha, 0.70: organizational-infrastructure (0.92), technical-infrastructure (0.93), management-support (0.84), rewards (0.92), knowledge-culture (0.89), vision (0.89) and economic-value (0.78). Success and knowledge-culture constructs are still above the acceptable reliability alpha, 0.50; they are 0.68 and 0.69, respectively.

Regression Analysis

Table 3 shows descriptive statistics and t-test results of constructs based on 95% confidence. A single-regression t-test was conducted for each of the independent variables and the study dependent variable (success). The following statement illustrates the study regression equation: F (KMS Success) = b0 + b1 independent variable + e. The regression analyses show that factors significantly affect KMS-success are knowledge-culture (0.39)[2], organizational-infrastructure (0.55), technical-infrastructure (0.44), management-support (0.47), knowledge-structure (0.42) and vision-clarity (0.45); while factors that have no effects on KMS success are rewards (.26), and economic-value (0.24). Thus,

Table 3. Descriptive and T-Test Statistics

Construct	Mean	Standard-deviation	N	Beta	t-test	Significance
Knowledge-Culture	3.7581	.7026	31	.394	2.310	.028
Organizational-infrastructure	2.9667	.9441	30	.548	3.467	.002
Technical-infrastructure	3.8943	.7878	31	.443	2.659	.013
Management-support	3.7097	.7162	31	.467	2.841	.008
Rewards	2.8267	.8115	30	.262	1.436	.162
Knowledge-structure	3.3400	.8122	30	.422	2.46	.020
Vision	3.3222	.9569	30	.450	2.665	.013
Economic-return	3.8172	.8248	31	.237	1.314	.199

hypotheses 1, 2, 3, 4, 6 and 7 are supported, while hypotheses 5 and 8 are not supported.

DISCUSSION AND CONCLUSION

Discussion of Findings

The adoption of KMS is still at its infancy in the Middle East. It seems KMS in the Middle East is mostly recognized in the form of a repository model (19 repository vs. 5 network model systems). The majority of organizations deploy KMS to manage structured-internal knowledge, specifically internal reports (24 of 30 organizations). Informal internal knowledge is managed mainly in the form of questions and answers, which is the most structured type in this category. Customers' knowledge and publications are the most managed form of external knowledge. As for IT technologies, organizations utilize more transfer and storage tools than search and retrieval tools. Advanced IT tools such as groupware, videoconferencing and artificial intelligence are mainly utilized by private local and international organizations.

The means of the constructs show that most of Davenport and Prusak's success factors seem to apply to KMS deployment in Middle-Eastern organizations; means are roughly above the scale's midpoint. Single-regressions show that most of study factors have significant effects on KMS-success except for rewards and economic-return variables. Factors in orders of their significance are: organizational-infrastructure, management-support, vision, technical-infrastructure, knowledge-structure and knowledge-culture. Results suggest that a combination of social and technical factors is critical for KMS success. These results support researchers' emphases on the importance of social factors for KMS deployment. Results also suggest that an effective reward-policy is not a significant factor for KMS success. This could be because managers in Middle-Eastern organizations do not consider rewards as an effective or a feasible policy for KMS. Because they operate in developing countries, Middle-Eastern managers may think that because they already spent a lot of money to fund a KMS project, a rewards-policy may add an extra financial burden that they cannot justify. Moreover, the inability to detect the significance of economic-return on KMS success may validate the productivity paradox argument that it is difficult to show financial return from an IS project [5,13,16]. Also, it shows that KMS is necessary for these organizations regardless of its economic return.

Further, multiple-regression was conducted and shows that only organizational-infrastructure (0.79)[3], technical-infrastructure (1.28), and vision (0.45) have significant positive effects on KMS success, while knowledge-structure (-0.63), and economic-value (-0.69) have significant negative effects on KMS success. Some of the independent factors are significantly correlated[4]; this results in collinearity, which may make the multiple-regression results difficult to interpret [10] We recognize that some of these factors are theoretically interrelated; Gold [8] incorporated measurements related to vision, management-support as part of KM-culture factor.

Study Limitations

There are several limitations of this study. First, the low sample size may affect the significance of the results. Second, most of the sample is from one country. Although most of the GCC countries share the same characteristics, the perceptions might be different with other countries in the Middle East. Thus, future research should include a larger sample size and a more diverse Middle Eastern sample to be able to generalize these findings to all Middle-Eastern countries. This study examines KMS success from management's perspective; individual KMS users might have different perceptions of these factors. For instance, rewards-policy might be significant from the individual users' perspective. Thus, future research may conduct this investigation at an individual-usage level.

Implications for Research and Practice

The contributions of the study are as follows: First, it quantitatively validates previous studies on important social and technical factors that affect KMS deployment in organizations. Second, the study provides a list of factors that researchers and practitioners should consider in KMS deployment. Third, by having Middle Eastern participants, the study provides insights about the management and deployment of KMS in Middle Eastern organizations as compared to the vast majority of KMS literature that reports on Western organizations and users. It provides insight about the profile of KMS tools, and socio-technical factors that affect KMS deployment. Cross-cultural study may provide more insight on this. Future research might also carry out this investigation independently for different organization types (private vs. public; profit vs. non-profit, government vs. non-government) or for different industries.

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ENDNOTES

1 You can contact the researchers for a copy of the questionnaire.
2 The number in parenthesis represents beta.
3 The number in parenthesis represents beta.
4 Correlations among the constructs varied from 0.15 to 0.78.

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