Knowledge Management Practices in UAE Construction Sector

ممارسات إدارة المعرفة فى قطاع الانشاءات بدولة الإمارات العربية المتحدة

by

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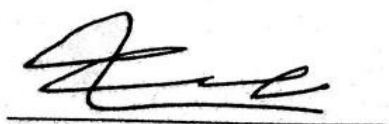

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ABSTRACT

Knowledge management (KM) considered as project asset that add value to the projects and organizations as its useful in delivering the project on time , within budget and with high quality standards to satisfy projects owner. The main purpose of this study to (1) investigate the awareness level of the concept of Knowledge Management (KM) in the construction industry in United Arab Emirates (UAE) and the important benefits of using KM system in both employees and organization, (2) explore the resources required to implement KM initiatives (3)identify the main barriers to KM implementation and (4) identify the critical KM adoption success factors.

The main findings of this study are (1) there is a growing awareness of the important benefits of KM within UAE construction sector but still they are at early stages to gain highest values of KM , (2) almost all companies are providing infrastructure for sharing information and knowledge using more than one kind of resources , (3) the main barrier to implement KM is the nature of construction project in UAE and lack of post projects reviews and documentation , (4) the most critical factors affecting successful implementation of KM in UAE construction companies are leadership commitment , KM strategy and organizational cultural.

ملخص البحث

تعتبر إدارة المعرفة بمثابة عنصر مهم من العناصر الاساسية للمشروع التي تضيف قيمة إلى المشاريع وكذلك المنظمات والتي تساعدعلى الانتهاء من المشروع في الوقت المحدد ، وفي حدود الميزانية ومعايير الجودة العالية لإرضاء أصحاب المشاريع. إن الهدف الرئيسي من هذه الدراسة هو (1) التحقق من مستوى الوعي لمفهوم إدارة المعرفة في قطاع البناء في دولة الإمارات العربية المتحدة والفوائد الهامة لاستخدام نظام ادارة المعرفة لكل من الموظفين والمؤسسة ، (2) تحديد الموارد المطلوبة لتنفيذ مبادرات إدارة المعرفة (3) لتحديد العوائق الرئيسية أمام تنفيذ ذلك و (4) تحديد عوامل النجاح .

النتائج الرئيسية لهذه الدراسة هي (1) هناك وعي متزايد بالمنافع الهامة لإدارة المعرفة في قطاع البناء في الإمارات العربية المتحدة ولكن لا تزال في مراحل مبكرة للحصول على أعلى النتائج ،(2) تقريبا جميع الشركات توفر البنية التحتية لمشاركة المعلومات والمعرفة باستخدام أكثر من نوع من الموارد ، (3) يتمثل العائق الرئيسي لتنفيذ نظام ادارة المعرفة في طبيعة مشاريع البناء في دولة الإمارات العربية المتحدة ونقص المراجعات بعد الانتهاء من تنفيذ المشاريع ، (4) أهم العوامل التي تؤثر على التنفيذ الناجح لإدارة المعرفة في شركات البناء في دولة الإمارات العربية المتحدة هي ضرورة التحفيذ من قبل ادارة المنظمة ، وكذلك وضع استراتيجية لإدارة المعرفة بالمؤسسة وتهيئة بيئة العمل لذلك .

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Chapter 1 - Introduction

1.1 Background Information

Knowledge considered as one of the most strategically asset for any organization. However, fragmented Knowledge through project based and task oriented nature of construction sector hinder implementing Knowledge Management (KM). Without adapting KM approach project team members frequently disband upon the completion of project without conducting post project reviews and disseminating the lessons learned. Thereby there is a need to develop solutions that allow gathering and access such knowledge. Construction sector in UAE still in its infancy and in need for a structured approach to manage knowledge derived from construction projects.

The core components of Knowledge Management are (1) people who produce and consume organization knowledge, (2) processes that create and manipulate knowledge and (3) technology that provide the right tools for accessing and sharing knowledge. So organizations should focus on all components of KM for higher benefits gained through successful implementation of KM.

Construction projects are in knowledge intensive environments where many of interconnected components are working together in a complex approaches. Knowledge in construction projects is frequently tacit knowledge and highly based on individual experience which increase complexity of capturing and reusing it and most of the exciting KM systems can only work with explicit knowledge. Construction organization have a combination of staff's experience (tacit knowledge) supported by standard procedures and process to access

explicit knowledge. Constructions companies developing strong industry profiles showing the quality of their work and highlighting their staff relevant experience.

So managing knowledge efficiently is necessary to increase the performance of projects and deliver higher quality of projects. One of the major risks of project collapse is interrelated to the lack of applying the essential knowledge , skills , tools and techniques to project activities (PMI 2017). In addition today's recognized project management practices don't adequately include the vital knowledge management processes to get highest value from project output.

(Srikantaiah 2010)assume that if knowledge is managed properly in construction projects, then the project would:

i. Provide faster access to information and knowledge to project members at any time in any location which lead to less confusion between team members.
ii. Improve the decision making process for project managers and also top management of organization all over life cycle of project when knowledge effectively shared.
iii. Improve customer satisfaction.
iv. Help in creating a collaborative environment.
v. Improve both performance and quality of the project.
vi. Reduce cost and time of project by encouraging reuse of knowledge.
vii. Identify and minimize risks as a result of enhancing knowledge flow in all project process which lead to fewer uncertainty to deal with.

1.2 Purpose of the Research

The aim of this dissertation paper is to analyze the status of KM implementation in project based organizations especially for construction projects, and provide recommendations that can help organizations to choose appropriate KM tools, process and strategies that will help

in the successful KM implementation. The main objectives of this research can be summarized as follow:

- Investigate current practices of knowledge Management in the construction industry.
- Examine the important benefits of using KM in the construction field.
- Explore the resources required to implement KM strategies.
- Identify barriers to implement KM in construction organization.
- Recommendations that can help organizations to choose appropriate KM tools, process and strategies that will help in the KM implementation in the construction industry.

1.3 Research Questions

The main research questions of this research are:

- What is the awareness level of the need for KM in UAE construction companies?
- What resources are required to implement KM initiatives?
- What are the barriers to KM implementation?
- What are the critical KM adoption success factors?

1.4 Research Rationale

- Lack of research investigating KM implementation in construction companies in UAE.
- Provide relevant factors which may influence the successful implementation of KM in construction industry.
- Help construction companies for effective implementation of KM based on success factors in KM adoption.

Chapter 2 - Literature Review

2.1 Introduction

The main objectives of this chapter to present the development of knowledge management concept and its rapidly growing importance in managing construction projects.The literature review has (3) main sections. The first section include a review of definitions for Knowledge , knowledge Management and project management , the second section highlight KM in project based organizations , the third section include KM in construction companies , forth section discuss KM adoption in UAE and finally last part include KM related works.

The articles and dissertations in this literature review were identified using academic database like ProQuest,EBSCO andIEEE Xplore

The following keywords were used for searching: Knowledge,Knowledge management, Project management, Construction projects knowledge.

2.2 Knowledge and Knowledge Management

2.2.1 Definitions of Knowledge

A review of knowledge literature shows different definitions of knowledge, some authors define knowledge in relation to information and data, others define knowledge as either (1) aprocess of applying expertise, (2) an object that can be stored and accessed, (3) a capability,(4) a state of knowing and understanding, (5) a condition of having access to information . These different conceptions of knowledge lead to different approaches and strategiesrelated to managing knowledge in an organization and a different point of view of the role of KM system(Alavi, M. and Leidner 2001). Examples of important Knowledge definitions as follow:

- (Davenport, Thomas H and Prusak 1998)" A fluid mix of experience ,values, contextual information, and expert insights that provides a framework for evaluation and incorporating new experience and information. It originates in and is applied in the minds of knower's. In organizations , it often become embedded not only in documents or repositories but also in organizational routines , process , practices , and norms".
- (Alavi, M. and Leidner 2001)" Knowledge is a justified belief that increase an entity's capacity for taking effective actions ".
- (Mcinerney 2002)" Knowledge is the awareness of what one knows through study , reasoning, experience or association , or through various other types of learning ".
- (Bennet & Bennet 2004)" Knowledge is the capacity to take effective action, with the recognition that capacity include both potential and actual ability. knowledge can be in a person minds and/or in their implementation of the right action in a given situation".

Figure (2.1) showing hierarchy of knowledge creation processes which called (Knowledge Pyramid DIKW) from data to information to knowledge and finally as expertise or wisdom. Data is just raw facts and numbers without any processing and represented with the least value of meaning to individuals at the bottom. individuals transform that data to information by adding meaning to it , then information transformed to knowledge through different process in the individual mind which is most useful in solving problems and taking right decision. Knowledge and experience represented with high value of meaning to individuals .and finally knowledge transformed to expertise with additional training and education

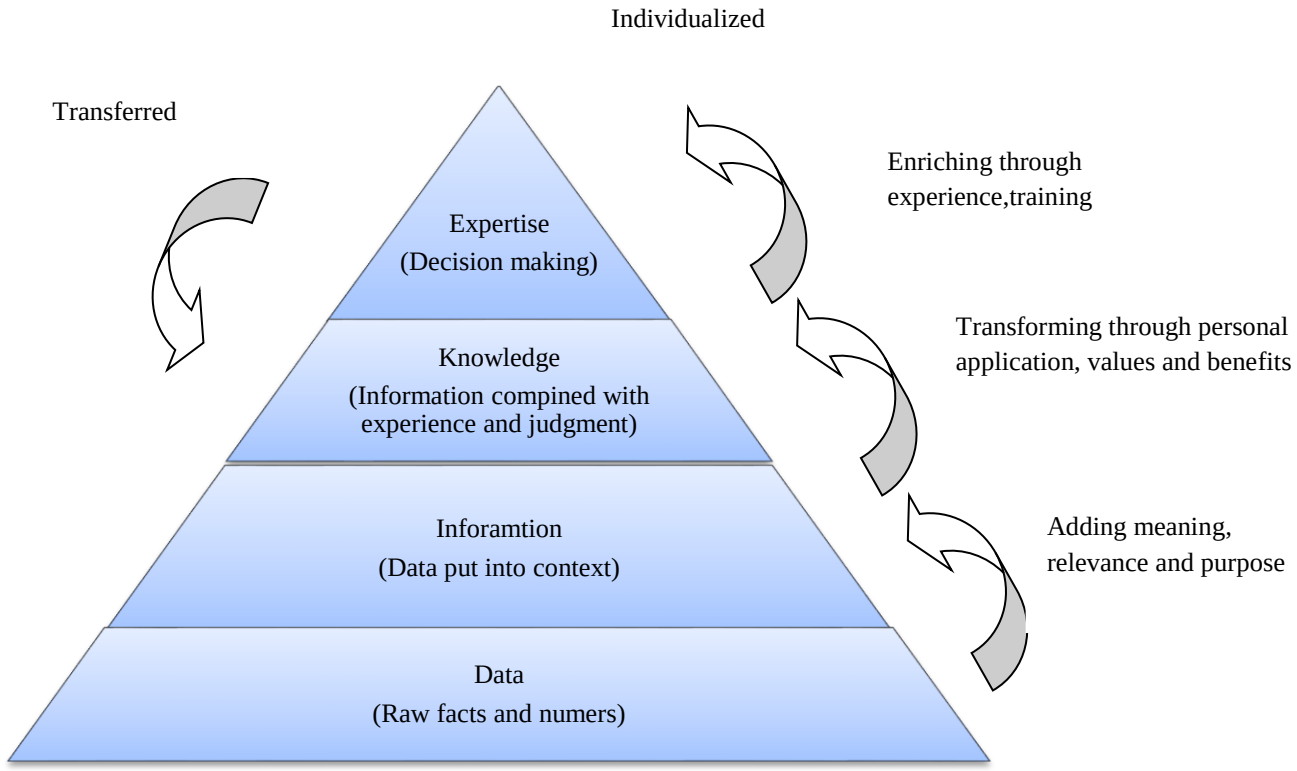

Figure 1Knowledge Pyramid adapted from (Arif et al. 2009)

2.2.2 Types of Knowledge

According to (Nonaka et al. 2000)knowledge is classified to tacit knowledge and explicit knowledge.

Tacit knowledge : stored in individual's heads which combines information with in-sights ,experience , skills and intuitions that are not documented or verbalized. Tacit knowledge could help people and organizations to find solutions to problems and reduce opportunities of repeating same mistakes. tacit knowledge is difficult to be managed ,captured and shared as its context specific and highly personal . Tools and techniques should be applied for utilization of tacit knowledge that can facilitate knowledge sharing and collaboration among organization staff . In the context of construction projects there are examples of tacit knowledge , include skills of estimation projects costs acquired over time through experience

of preparing tenders , communication with clients and personal experience gained from projects processes

Explicit Knowledge : refers to knowledge that stored as written documents or procedures and expressed in formal language and can be managed easily. This kind of knowledge captured, codified, retrieved and consequently easier to share. Examples of explicit knowledge in the context of construction projects include drawings , design specifications , textbooks, reports and construction manuals. Table (2.1) showing knowledge types in construction project context.

Tacit Knowledge Exists in	Explicit Knowledge Exists in
• Face to face communication • Training • Presentation • Video conferences • Best practices • Telephone conversation	• Emails • Internet / Intranet • Books & publications • Group ware • Data warehouse • Self study materials

Table 1Knowledge Types in project context (Srikantaiah et al. 2010)

According to (Nonaka et al. 2000)theory of knowledge creation, there are four modes of interaction that result in the creation of knowledge which called SECI model as shown in figure (2.2), The four process are , Socialization, Internalization , Externalization and Combination . The output of knowledge creation process is four types of knowledge assets which is vital for organizations to create values , namely , experiential , systemic , conceptual and routine knowledge.

	To Tacit	To Explicit
From Tacit	**Socialization (S) Process** Experiential Knowledge • Verbal communication • Continues interaction • learning	**Externalization (E) Process** Conceptual Knowledge • Write book • Design • Training course
From Explicit	**Internalization (I) Process** Systemic Knowledge • Reading a textbook • Written instructions • Documents and manuals	**Combination (C) Process** Routine Knowledge • Email , document management system • organizational routines

Table 2knowledge Creation Theory Adapted from (Nonaka et al. 2000)

2.2.3 Knowledge Management (KM)

Knowledge Management can take the form of idea management system within organization enabling employees experiences and ideas to be captured and shared (Lin et al. 2006). knowledge management addresses the problem of inadequacy ,low quality and poor organization of project knowledge. KM focus both on proper access for both explicit knowledge and tacit knowledge which is frequently difficult to locate and retrieve. knowledge creation and sharing process is now generally recognized as vital for efficient working in construction projects and improving organizational competitiveness.

There is no common definition for knowledge management , as such the following definitions can be cited as follow

- (Mcinerney 2002) " Knowledge management is an effort to increase useful knowledge within the organization . ways to do this include encouraging communication , offering opportunities to learn , and promoting the sharing of appropriate knowledge artifacts"

- (Donk & Riezebos 2005) "Knowledge Management is the process of acquiring , developing, measuring , distributing , and providing a return on organizational intellectual assets through a set of defined methods, tools , techniques and values"
- (Bennet & Bennet 2004) " Knowledge Management is the systematic process of creating , maintaining and nurturing an organization to make the best use of its individuals and collective knowledge to achieve sustainable competitive advantage or achieving high performance "
- (Nevo & Chan 2007)"Knowledge Management addresses polices , strategies and techniques aimed at supporting an organization' competitiveness by optimizing the conditions needed for efficiency improvement , innovation , and collaboration among employees"

From an organization point of view KM is about making sure the experience and skills of the project team and stakeholders are used before , during and after completion of project. the most important part of KM is creating an atmosphere of trust between project team so that people are motivated to share their knowledge. Even the best knowledge management tools will not work if people are not motivated to share what they know or to pay attention to what others know. knowledge is share using amixture of Information management and knowledge management tools and techniques

There are two different strategies organizations have adopted to implement KM , first the Information Technology (IT) centric strategy by using IT tools and technique to facilitate capturing , storing , accessing and sharing of knowledge using electronic data base. Second is the Human Resource Management (HRM) centric strategy which focus on motivation of employees to share knowledge to achieve organization goals(Carrillo, Patricia and Chinowsky 2006)

Knowledge management tools and techniques help team members to work together and share their tacit and explicit knowledge and create new knowledge. selection of sufficient tools and techniques in a project depend on the nature of the project , level of diversity among team members and the degree of innovation involved. Both knowledge and information management tools and techniques should be connected to project processes and at the end of the project the information is transferred to an organizational process asset called a lesson learned repository .

KM Tools and techniques which can be applied face to face or virtually include but are not limited to :

- Networking including informal and online social interaction.
- Communities of practices.
- Meetings and Virtual meetings.
- Discussion forums.
- Seminars and conferences for knowledge sharing.
- Workshops for problem solving , learning reviews and lesson learned.
- Training which involves interaction between team members
- Ideas management techniques.

Information management tools and techniques help team members to create and share knowledge , they include but are not limited to :

- lesson learned register
- library services
- information gathering
- project management information system

2.3 Knowledge Management in Project-Based Organizations

As per Project Management Body Of Knowledge which document best practices of project management, project is a defended as (PMI 2017)" A project is temporary endeavor undertaken to create a unique product , services or result. the temporary nature of projects indicates a definite beginning and end . The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met or when the need for the project no longer exists".

Project management (PM) is the application of knowledge, skills ,tools and techniques to project activities to meet project requirements. PM is integration of 47 logically grouped project management processes categorized into 5 process group. Project management involves managing project resources which include people, material, money the most important resource that need to be managed skillfully is managing people skills and knowledge. Projects managers are normally concentrate to deliver the project on time and within budget . To achieve that all involved teams in the project must cooperate and share information otherwise projects may fail for reasons beyond the required resources allocated to the project

Project life cycle is a set of project phases which identify activities and processes that will be performed in each phase ,which deliverables will be produced , who is involved in each phase and how management will control and manage work of each phase. Type of project deliverables and time required to complete project are key factors to determine appropriate project life cycle.

Knowledge is created and flows through allphases of project life cycle. Project managers seek that knowledge to address various issues and problems related to resources,schedules , risks ,

procurement , planning , communications and conflicts. Earlier the main objective for project management focused on developing tools and techniques , currentlyproject management has shifted its focus for capturing tacit knowledge and success based criteria. it's the responsibility of top management in organizations to manage more effectively the knowledge gained by learning from success or failure of their completed projects so that new projects in the organization can benefit as its vital for long term sustainability (Srikantaiah et al. 2010)

(Sokhanvar, Shahram and Matthews, Judy and Yarlagadda 2014) classify project knowledge to 8 types of knowledge and assumed that all types of knowledge could have explicit or tacit dimensions , as shown in table (2.2)

Types of knowledge	Tacit or Explicit knowledge
Project Management Knowledge	PMK are addressed in standard (explicit) also, exist in PM's experience (tacit) so It could be both tacit and explicit
Knowledge about Processes/procedures	Procedures and processes generally are addressed through instructions and manual, so, it is more explicit than tacit
Technical Knowledge	Technical knowledge could be found in text books, however, their application is important which normally reside in people's mind, so, we assume that it is more tacit knowledge
Knowledge about Clients	This type of knowledge is more tacit since it is not easy to codify all of relations with clients.
Costing Knowledge	Since costing happens through documents but this type of knowledge is more explicit.
Legal and Statutory Knowledge	Documentation of laws and regulation is essential, therefore, this knowledge is more explicit knowledge and obtained through documents.
Knowledge about Supplier	Similar to knowledge about client, this type of knowledge is more tacit knowledge
Knowledge of Who Knows What	If organization has a good system to recognize and capture address knowledge owners it could be explicit, otherwise it is tacit

Table 3 Types of Knowledge adapted from (Sokhanvar, Shahram and Matthews, Judy and Yarlagadda 2014)

Managing knowledge is an important function in project management. According to PMBOK Guide, knowledge management activities exist in each phases of project life cycle , and mainly emphasis on the creation and sharing of explicit knowledge such as documents ,procedures and plans that flow through all phases of project. PMBOK guide 6th Edition

added new process called " Manage project Knowledge" which is part of project integration management knowledge area(Markus Klein 2016)

The new process " Manage Project Knowledge" use exciting knowledge of project to produce new knowledge to meet the project objectives and contribute to organizational learning. The key benefits of this process to improve the project outcome by leveraging prior organization knowledge and new created projects knowledge will be available to support future organization projects. The inputs , tools and technique and output of that process are shown in table (4)

Manage Project Knowledge		
Inputs	**Tools & Techniques**	**Outputs**
1. Project Management Plan (all components)	1. Expert Judgment with specialized training in : • Knowledge management • Information management • Organizational learning • Knowledge and information management tools • Relevant information from other projects	1. lesson learned register 2.Project management plan updated 3. Organizational process assets updates
2. Project Documents • Lesson learned register • Project team assignments • Resource breakdown structure • Stakeholders register	2. Knowledge Management	
3. Deliverables	3. Information Management	
4. Enterprise Environmental factors • Organizational , stakeholders and customer culture	4. Interpersonal and team skills • Active listening • Facilitation	

• Geographic distribution of facilities and resources • Organizational knowledge experts • Legal and regulatory requirements	• leadership • networking • Political awareness	
5. Organizational Process assets • Organizational standard policies , processes and procedures • Personal administration • Organizational communication requirements • Formal knowledge sharing and information sharing procedures		

Table 4Manage Project Knowledge Process (PMI 2017)

PMBOk Guide6th Edition identifies ten (10) knowledge area table (5) that are important to the success of any project , each knowledge area include a set of processes , inputs ,techniques & tools and outputs

	Knowledge Area	**Project Knowledge**
1	Project Integration Management	Project knowledge concerning the integrating processes covers from initiating to closing phases of the project
2	Project Scope Management	Project knowledge that include all process required to successfully complete the project, include scope planning and scope definition
3	Project Time Management	Knowledge of logical sequence of activities in project Include all process required to successfully deliver project on time
4	Project Cost Management	Project knowledge that Include all process required to complete the project within approved budget Knowledge of budget for each activity should be defined and monitored

5	Project Quality Management	Project knowledge that Include quality planning and quality assurance to ensure the deliverable meet the objectives for which it was undertaken
6	Project Human Resource Management	Project knowledge for effective management of project team members in away that insure a successful completion of project
7	Project Communication Management	Include communication plan , information distribution and performance reporting
8	Project Risk Management	Risk management plan , risk identification and risk mitigation
9	Project Procurement Management	Include all processes required for procurement of material and products to insure successful completion of project
10	Project Stakeholder Management	Include all process required to engage all stakeholders interested or affected by the project

Table 5Knowledge Area in (PMI 2017)

2.4 Knowledge Management in Construction Projects

(Tserng & Lin 2004) "Knowledge management in the construction phase of construction project life cycle deals primarily with the process of creating value from knowledge about construction operations , organizations and companies. knowledge of projects are shared systematically using web based and intranet technologies ".Construction process can be improved and executed with less time and cost of solving the problems if knowledge effectively shared among the project team. Knowledge of many projects resides with project managers, it's essential to know the importance value of knowledge that they gained from projects success or failure and the value of sharing that knowledge .By managing project knowledge effectively project can be successfully delivered to the client on time within budget and with high quality(Srikantaiah et al. 2010).

Table (6) presents statements of KM problems during the construction phase of construction projects :

<table>
<tr><td colspan="4">Knowledge Management problems during Construction of the project</td></tr>
<tr><td>1-Problems for acquisition and using Tacit Knowledge:</td><td colspan="3">2 - Problems for acquisition and using Explicit Knowledge</td></tr>
<tr><td rowspan="2">• loss of experience
• loss of Know-how
• Problem-solution loss
• loss of innovation</td><td rowspan="2">2.1 Information is saved incompletely</td><td colspan="2">2.2 Information is saved completely or partly</td></tr>
<tr><td>Paper based format
• Extra process to transfer the documents into electronic files
• Over occupied storage space
• Difficulties of search and reuse</td><td>Electronic format:
• Inefficient process of search and reuse
• Non classification of information
• Uncentralized storage of information</td></tr>
</table>

Table 6Problem statement of KM in Construction Projects (Tserng & Lin 2004)

(Lin et al. 2006)identifies 5 phases for construction KM lifecycle :

1. Knowledge Acquisition **:** is the process of collecting related data and information for project.
2. knowledge Extraction : is the process of transforming data and information into knowledge. Experience and expert's thought also captured.
3. knowledge Storage : knowledge and information are stored in a central database to prevent redundant data .
4. knowledge Sharing : this process enables employee who need to apply knowledge of a project can easily access relevant knowledge by using the exciting KM system.

5. Knowledge Update : is the process of continually update existing knowledge, unacceptable knowledge must be identified and updated

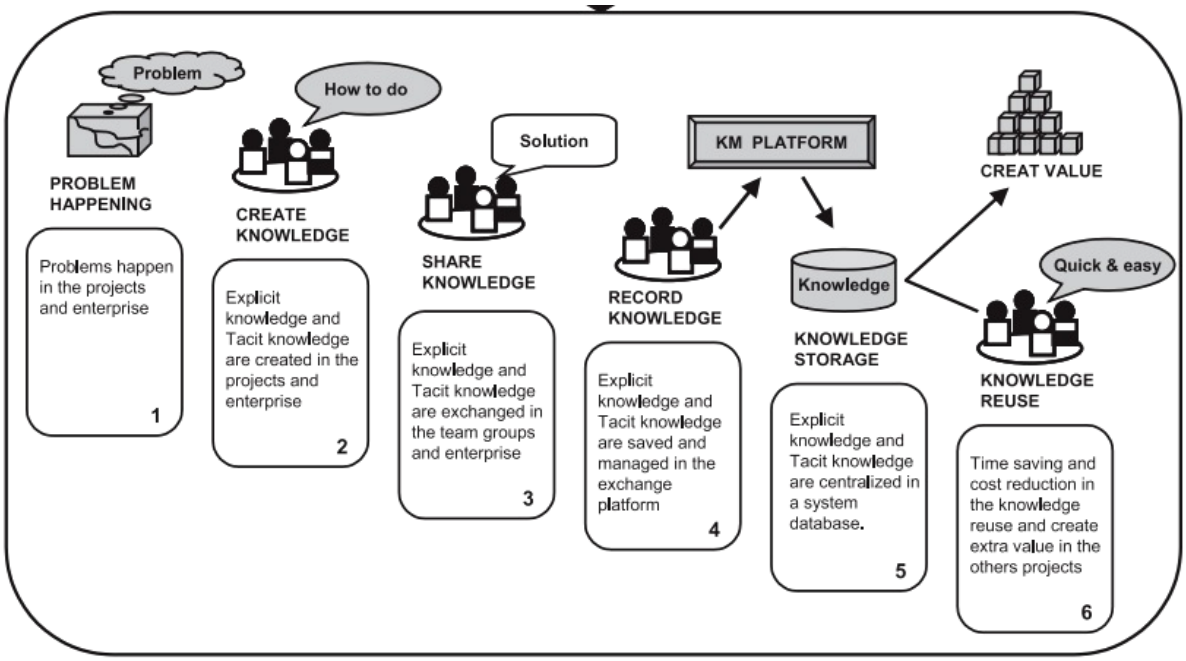

Figure 2KM process in construction project (Tserng & Lin 2004)

2.5 Adoption of Knowledge Management in UAE

Competitive knowledge economy is one of the strategic priorities for UAE government to achieve UAE vision 2021. Shifting to knowledge based , highly productive and competitive economy through investment in innovation , research , science and technology(UAE Vision 2017)

UAE Public and Private Sector

(Siddique 2012)collect baseline data of KM initiatives in both public and private UAE organizations (270 companies) in order to assess their progress towards the adoption of KM. Nearly 50% of the surveyed organizations are unaware of the KM concept which is most important barriers for KM implementation as shown by data surveyed in figure(3). In addition most surveyed companies have currently focused onlymanagement of explicit

knowledge practices with arelative neglect of tacit knowledge, none of the surveyed companies hire KM officer or KM manager.

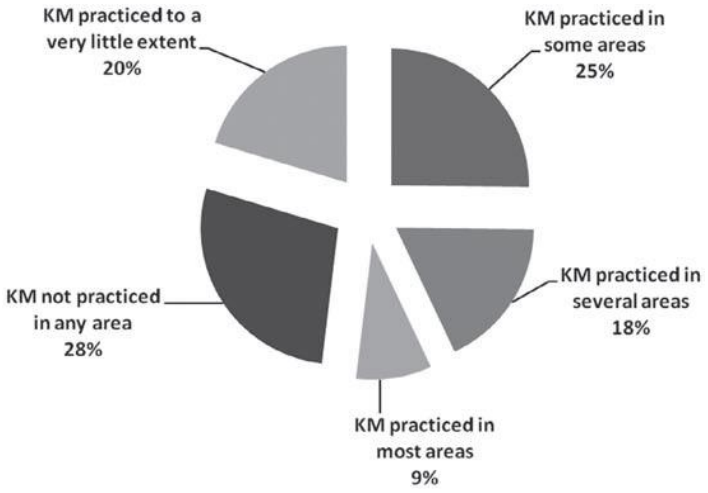

Figure 3level of KM Practice in UAE (Siddique 2012)

Dubai School of Government (DSG) published a report in 2011 about KM in public sector across the government of Dubai (Biygautane & Al-yahya 2011)which identifies a range of obstacles to KM in Dubai's public sector , and put set of recommendation as shown in table (7).

Barriers for KM	Set of recommendation
Ambiguity of KM concept to most of the organizations employees	Spend more in training and organizing workshops for employees to increase the clarity of the KM concept as crucial role for the development of organization
Tacit knowledge is not properly maintained and difficult to access	Create tools to capture, document and share tacit knowledge
Lack of effective leadership	Hire knowledge officer who promote values and practices associated with KM
False believe in hierarchal nature of knowledge	Developing and utilizing the human aspect of KM process by establish mechanism that ensure that tacit knowledge of employees stored safely and remain in the organization

Table 7Obstacles to KM in Dubai's public sector (Biygautane & Al-yahya 2011)

(Boumarafi, Behdja and Jabnoun 2008)addressed in his study for UAE business organizations a positive association between KM and performance improvement in terms of organizational efficiency , customer satisfaction , decision making , quality and financial benefits . There are four dimensions of KM widely applied in UAE organizations (1) organizational culture , (2) organizational infrastructure, (3) technical infrastructure , and (4) management support , however other 2 dimensions (reward and vision clarity) were not broadly used in UAE.

Dubai Electricity and Water Authority (DEWA 2015)

With their ultimate goal to be sustainable learning organization ,DEWA has been adapting KM approach since 2009 that are aligned with Dubai Government Strategic initiatives (DEWA 2015). DEWA implement KM activities as follow :

a) **Knowledge identification:** DEWA developed two tools for identification of knowledge , first tool called "Expert Locater" that connect team members who need particular knowledge to team members who own the knowledge that help in building integrated team , succession planning , reduces the dependency on outsourcing , increase organization knowledge bank and help in generating new ideas. Second tool "Knowledge Asset Identification "identified the exciting knowledge assets that DEWA own via intranet like database ,books, procedure and experts

b) **Knowledge Sharing :**DEWA encourage employees to share knowledge which acquired through trainings or conference by sharing it with colleagues, this initiatives called "Post Training Knowledge Sharing Programme" .

c) **Knowledge capture :**DEWA provide spaces called " knowledge centers " that host knowledge sharing activities , also DEWA has smart library provide online access to lot of technical and management eBooks and eJournals .

d) **Knowledge Creation :** DEWA create new short films that document common technical process , these films will be useful for new staff or exciting staff to learn new skills

Government of Abu Dhabi

"Musharaka , Excellence through knowledge " (Al-Ain Municipality KMS (Musharkah) 2017)is a major knowledge management framework which launchedby the Department of Municipal Affair (DMA)in 2011to exchange knowledge and for better collaboration between Abu Dhabi , Western region and AL Ain municipalities. Musharaka initiatives aims to enable employees to share knowledge and best practices to improve the quality of services municipalities provided and increase their employees productivity and performance.

Musharaka Key Knowledge Management activities:

- Assign a management consultant to develop KM framework.
- Assessment study was conducted which is called "Knowledge Readiness " to asses current context and strategies that will support knowledge management
- Knowledge management system is developed using Microsoft SharePoint services as shown in figure (4)
- Knowledge Management office was formed within DMA and in each municipality
- Assign each division a " knowledge Champion " who is the concerned for all knowledge management related issues.

Figure 4Knowledge management system "Musharaka"

2.6 Related Works

Table (8) summarizes aims and findings of surveys which analyze the awareness and implementation of KM in construction industries in different countriesall over the world :

Author	Focus Group	Aims of study	Findings
(Issa & Haddad 2008)	Construction companies in USA	Impacts of organizational culture and IT infrastructure on knowledge sharing	Knowledge sharing increased between employeesifadequate organizational culture , shared trust between employees and organization and IT tools used.
(Carrillo 2004)	Consultant And Contractors companies in UK	Level of understanding of KM benefits , required resources and identify barriers to KM implementation	- 75% of companies aware of benefits of KM - 45% of companies appointed a person or group to manage knowledge within organization ,budget ,and IT tools used too -Lack of standard work processes is main barrier for KM implementation

(Forcada, N., Fuertes, A., Gangolells, M., Casals, M. and Macarulla 2013)	Spanish construction sector	Perception of KM implementation	- Systematic KM is not generally used. - organizational cultural is critical to successful KM implementation
(Robinson et al. 2005)	Large UK construction organization	Asses KM practices and barriers influencing the development of KM	Successful KM implementation depend on : - proper strategy formulation - link between business strategy and KM strengthen
(Carrillo, Patricia and Chinowsky 2006)	USA & UK Engineering design and Construction Companies	Identify best practices by investigates case studies of KM initiatives and activities undertaken by Six Engineering design and Construction Companies	- KM activities undertaken by design companies different from those who undertaken by construction companies - Only one company of total 6 has KM strategy implemented.
(Arif et al. 2009)	Construction engineering consultancy in UAE	Developed amodel that could be used for assess the knowledge retention capability of an organization , this model validated on aconstruction engineering consultancy in UAE	The maturity of knowledge retention was noted as being between two and three
(Tserng & Lin 2004)	108 construction contractors and engineering firms in Taiwan	Percentages of perceived benefits to construction projects through KM	- 23% increase innovation ability - 23% decrease the probability of repeated problems -12% increase intelligent asset -12% improve job effectively -17% improve training effectively - 13% experience reused

Table 8 KM in different countries

Chapter (3) - Data Analysis

3.1 Introduction

This chapter shows the response rate in addition to the results of the reliability using Cronbach's Alpha as depicted in section 3.2 and section 3.3 respectively.

The descriptive analysis of the data collected is also presented. Broadly, this chapter depicts the general characteristics of the sample. It shows characteristics of the respondents, namely profession in the company, years of job position, company's major role in construction field, number of employees in the company and number of years of the company in construction field. Analysis was distributed into four sub-sections, as follows:

1. Section A: Background Information
2. Section B: Knowledge Management Awareness
3. Section C: KM Practice within your Organization
4. Section D: Knowledge Management Barriers and Challenges

3.2 Methodology

A questionnaire survey to be designed and forwarded to both consultant and contracting companies in UAE in order to collect data about KM tools , strategies and barriers for successful implementation. the survey will be addressed to managing director and project managers. Its divided in four sections and having 21 questions was developed to collect responses online using Google forms , that will generate initial data on KM practices in UAE construction industry. Aspects covered in survey include different characteristics of the companies , knowledge resources and initiatives undertaken by organizations in addition to

knowledge management systems implemented , knowledge management barriers and challenges and finally critical success factors for KM adaption

Before sending the survey to the organizations , two executives were personally contacted to obtain feedback from executives working in construction field and have wide experience in project and knowledge management. questions was added , deleted and also refined to bring more clarity to the survey. accordingly questionnaire was developed and then mailed to different construction organizations

The questionnaire used in this research adapted from previous studies (Siddique 2012; Forcada, N., Fuertes, A., Gangolells, M., Casals, M. and Macarulla 2013) with some modification of questions to capture KM issues related to construction sector in UAE was sent to all respondents via email. 55 respondents filled in the survey through the website.

3.3 Reliability test

The internal consistency of the questions related to the research questions in this study were tested using Cronbach's alpha. The most commonly used test for this purpose is the Cronbach's alpha(Gliem & Gliem 2003).The Cronbach's alpha coefficient ranges from 0 to 1 and the closer it is to 1 the greater the internal consistency of items in the scale Gliem et al 2013 cited George and Mallery (2003) who provided the following rules of thumb for Cronbach's alpha coefficient interpretation:

Alpha (α) < 0.5 unacceptable
Alpha (α)> 0.5 poor
Alpha (α) > 0.6 questionable
Alpha (α)> 0.7 acceptable
Alpha (α) > 0.8 good
Alpha (α) > 0.9 excellent

Research Questions	Number of items	Cronbach's alpha	Interpretation
Awareness level of the need for KM in UAE construction companies	29	.85	Good
Resources required to implement KM initiatives	23	.70	Acceptable
Barriers to KM implementation	24	.72	Acceptable
Critical KM adoption success factors	8	.82	Good

Table 9 Results of the Internal consistency test using Cronbach's Alpha

Table (9) shows that the Cronbach's Alpha coefficients for the four research questions range from .7 to .85 which considered either acceptable or good.

3.4 Characteristics of the Sample

3.4.1 Section A: Background Information

Table 10What is your main profession in the company / Project?

	Frequency	Percent	Valid Percent	Cumulative Percent
Top Management	8	14.5	14.5	14.5
Senior Management	10	18.2	18.2	32.7
Project Manager/Construction Manager	15	27.3	27.3	60.0
Management Team Member	16	29.1	29.1	89.1
Technical Staff and Admin	6	10.9	10.9	100.0
Total	**55**	**100.0**	**100.0**	

Table (10) shows that the majority of the respondents are from the management team members with a percentage equals to 29.1% followed by Project manager/construction manager who represent 27.3% of the sample. While the top management and senior management represent 14.5% and 18.2% of the sample respectively. The least represented

group is the technical staff and administrative with a percent equals to 10.9% of the entire sample. In summary, 89.1% of the respondents were with managerial roles.

Table 11 How many years of experience do you have working in construction projects?

	Frequency	Percent	Valid Percent	Cumulative Percent
From (1-5) Years	3	5.5	5.5	5.5
From (6-10) Years	8	14.5	14.5	20.0
From (11-20) Years	30	54.5	54.5	74.5
More Than 20Years	14	25.5	25.5	100.0
Total	**55**	**100.0**	**100.0**	

The results shown in table (11) show that slightly more than half of the sample have experience ranges from 11 to 20 and around one quarter of them exceeded 20 years of experience. Respondents with experience ranges from 6 to 10 years accumulated for 14.5% of the sample while the least experiences people represent only 5.5% of the sample. These frequencies give more confidence in the results due to the respondents significant experience in construction projects.

Table 12How would you classify your organization's major role in construction field?

	Frequency	Percent	Valid Percent	Cumulative Percent
Project Management	7	12.7	12.7	12.7
Supplier / Manufacturer	2	3.6	3.6	16.4
Client	6	10.9	10.9	27.3
Contractor	18	32.7	32.7	60.0
Engineering Consultant	21	38.2	38.2	98.2
Other:	1	1.8	1.8	100.0
Total	**55**	**100.0**	**100.0**	

Table (12) reveals that the majority of the participating companies are engineering consultants with a percent equals to 38.2% followed by contractors with a percent equals to 32.7%. The project management companies represent 12.7% of the sample, while

supplier/manufacturers, clients and companies from other role represent 12.7%, 3.6% and 1.8% of the sample respectively.

Table 13How many employees are working in your organization?

	Frequency	Percent	Valid Percent	Cumulative Percent
From (1-50) employees	11	20.0	20.0	20.0
From (51-100) employees	10	18.2	18.2	38.2
From (101-500) employees	10	18.2	18.2	56.4
More Than 500 employees	24	43.6	43.6	100.0
Total	**55**	**100.0**	**100.0**	

It is obvious from table (13) that the majority of companies have more than 500 employees, which is expected in the field of construction companies. Companies with employees not exceeding 50 represent 20% of the sample. While companies with employees ranging from 51 to 100 and from 101 to 500 have the same percent that equals to 18.2%.

Table 14The number of years of (your Organization) in Construction Field in UAE?

	Frequency	Percent	Valid Percent	Cumulative Percent
From (1-5) Years	9	16.4	16.4	16.4
From (6-10) Years	14	25.5	25.5	41.8
From (11-20) Years	11	20.0	20.0	61.8
More than 20 Years	21	38.2	38.2	100.0
Total	55	100.0	100.0	

Table (14) shows that the majority of companies have an experience in construction filed in UAE that exceeds 20 years with a percent equals to 38.2% ,followed by companies with experience ranges from 6 to 10 years. Almost one quarter of companies has experience ranging from 6 to 10 years. The least experience companies represent 16.4% of the sample. In summary, around 58% of the companies have experience that exceeded 10 years.

Table 15Is there any kind of knowledge management system available in your organization ?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes , there is a KM system available	24	43.6	50.0	50.0
There is no KM system available at the moment but we are working on one	7	12.7	14.6	64.6
No , but we are considering the possibility	14	25.5	29.2	93.8
We have no KM system and are not planning to have one	3	5.5	6.3	100.0
Total	48	87.3	100.0	
Missing System	7	12.7		
Total	55	100.0		

As per table (15) , 43.6% of the companies who responded to this question have a KM system available and 12.7% said that they do not have, but are working on one. Slightly more than quarter of the companies do not have but are considering the possibility. Only three companies said that they do not have and are not planning to have one. Seven companies have not responded to this question.

Table 16Who is responsible for knowledge management activities in your company?

	Frequency	Percent	Valid Percent	Cumulative Percent
Top Management	23	41.8	51.1	51.1
Department Manager	18	32.7	40.0	91.1
Knowledge officer/manager	4	7.3	8.9	100.0
Total valid	45	81.8	100.0	
Missing System	10	18.2		
Total	55	100.0		

It is obvious from table (16) that the responsible party for knowledge management activities is the top management with a percent equals to 41.8%. 32.7% of the companies assign the

responsibility to department managers, while only 7.3% of the companies assign the responsibility of KM to knowledge officer/manager. Ten companies have not provided any answer to this question.

3.4.2 Section B: Knowledge Management Awareness

Table 17 Below types of knowledge used in construction projects , in your organization please indicate the importance of each?

	Not at all Important		Not very important		Quite important		Very important	
	Count	%	Count	%	Count	%	Count	%
Q6_1 [Project Management Knowledge]	0	0.0%	2	3.6%	14	25.5%	39	70.9%
Q6_2 [Knowledge about processes / Procedures]	0	0.0%	1	1.8%	17	30.9%	37	67.3%
Q6_3 [Technical Knowledge]	0	0.0%	1	1.8%	17	30.9%	37	67.3%
Q6_4 [Knowledge about clients]	0	0.0%	0	0.0%	21	38.2%	34	61.8%
Q6_5 [Costing Knowledge]	1	1.8%	4	7.3%	17	30.9%	33	60.0%
Q6_6 [Knowledge about suppliers]	1	1.8%	9	16.4%	22	40.0%	23	41.8%
Q6_7 [Contract Management knowledge]	1	1.8%	3	5.5%	18	32.7%	33	60.0%

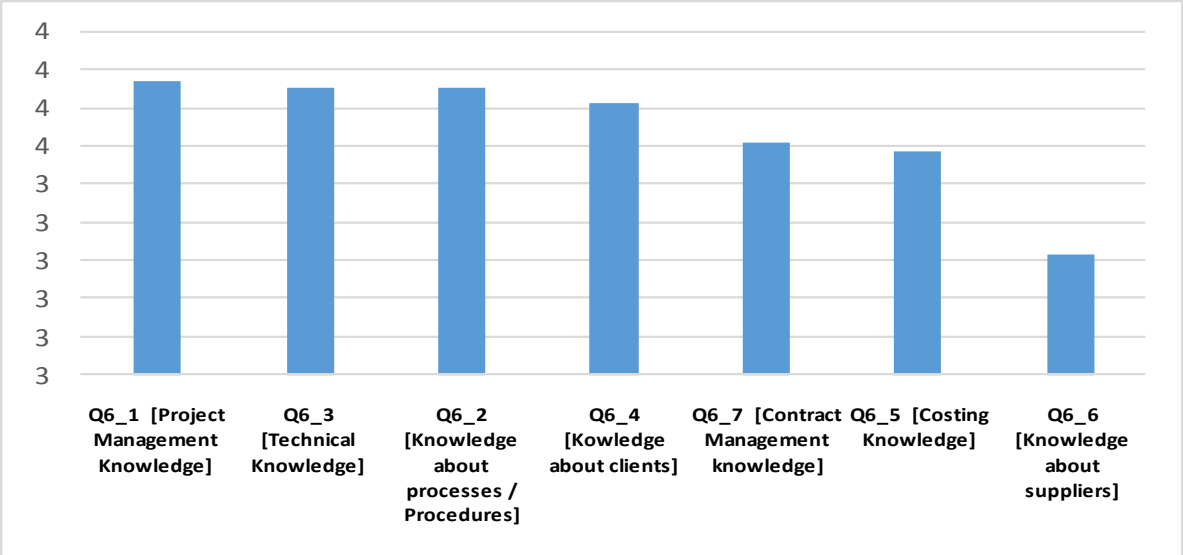

Chart 1 Order of types of knowledge according to importance

Table (17) shows that respondents consider all type of management as important. However, they believe that project management knowledge is the most important while the knowledge about suppliers is the least important. Chart (1) shows the order of types of knowledge according to importance.

Table 18Please indicate Knowledge Management related resources your organization currently using

	Yes		No	
	Count	%	Count	%
Q7_1 [Electronic mail]	53	96.4%	2	3.6%
Q7_2 [library or reading room]	49	89.1%	6	10.9%
Q7_3 [Workflow]	43	78.2%	12	21.8%
Q7_4 [Shared Data Base]	41	74.5%	14	25.5%
Q7_5 [Video Conferencing]	24	43.6%	31	56.4%
Q7_6 [Electronic Document Management System]	15	27.3%	40	72.7%

Table (18) indicates that not all knowledge management resources are used by companies in the sample. Almost all companies use electronic mail with a percent equals to 96.4%, while

less than third of them use electronic document management system. Chart (2) below shows the order of resources according to percentage of usage.

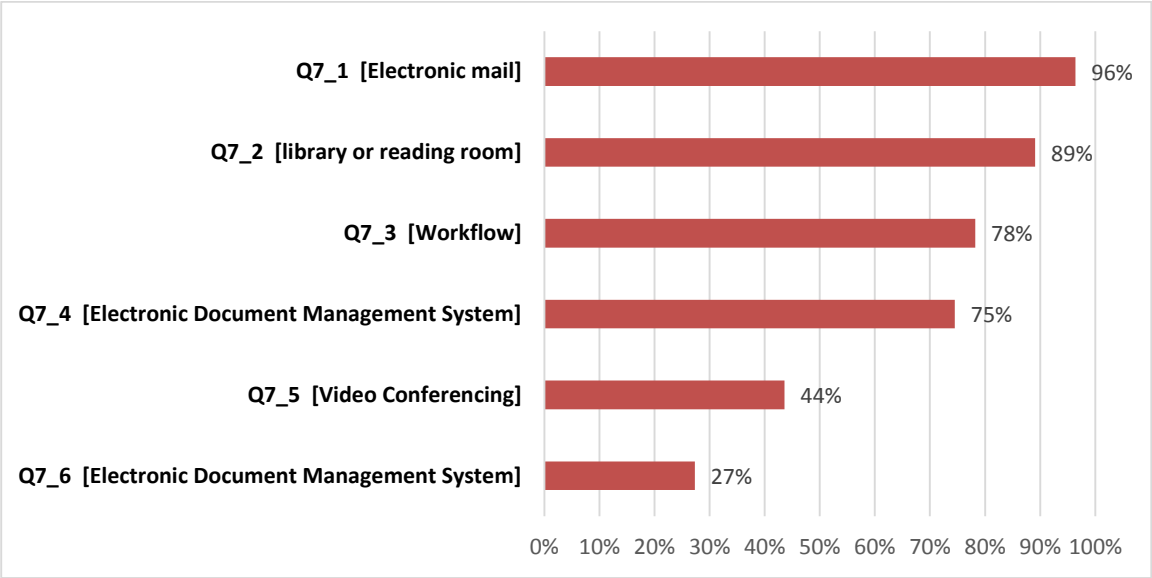

Chart 2 Order of resources of knowledge according to percentage of usage

Question 8: Does you company recognize knowledge as a strategic asset

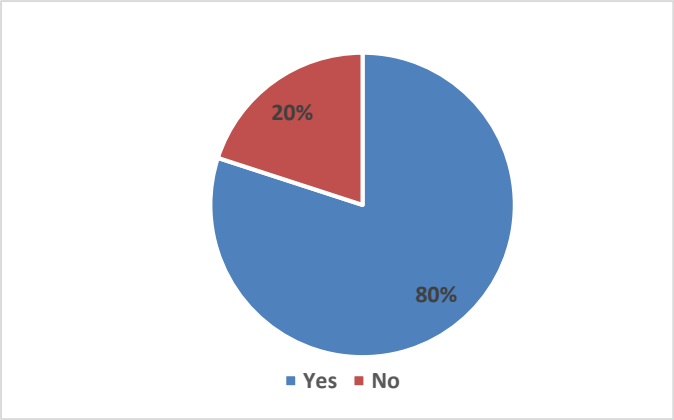

Chart 3 Distribution of respondents according to their recognition of knowledge as strategic asset

Chart (3) above shows that 80% of the companies consider knowledge as a strategic asset. However coming sections will shed some light on the usage of knowledge management in the companies.

Questions9: Are you personally aware of any situation in your organization in which costly errors or mistakes were made because of insufficient knowledge?

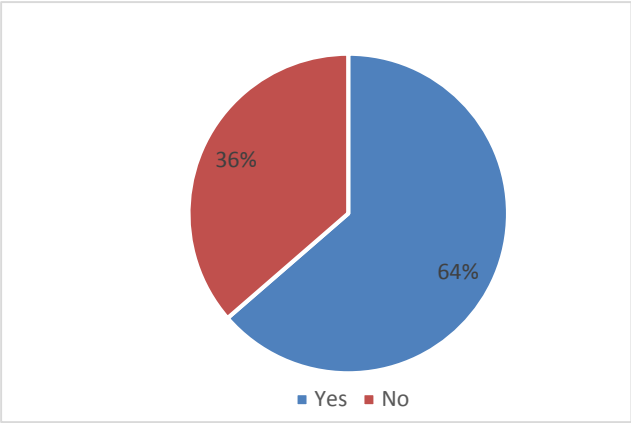

Chart 4 Distribution of respondents according to their answers to question 9

Chart (4) shows that almost two thirds of companies have experienced costly errors or mistakes because of insufficient knowledge. Table (19) will investigate the reasons behind these costly errors or mistakes.

Table 19If you have answered Yes , were they caused by the following reasons?

	Yes		No	
	Count	%	Count	%
Q10_1 Insufficient technological knowledge	13	23.6%	42	76.4%
Q10_2 Loss of knowledge of vital importance	8	14.5%	47	85.5%
Q10_3 Insufficient knowledge about competitors	7	12.7%	48	87.3%
Q10_4 Insufficient knowledge about customers	6	10.9%	49	89.1%
Q10_5 Insufficient Knowledge about process	13	23.6%	42	76.4%
Q10_6 Employees cannot interpret or use available information	13	23.6%	42	76.4%
Q10_7 Knowledge unavailable when needed	12	21.8%	43	78.2%
Q10_8 Repetition of previous errors	8	14.5%	47	85.5%

Table (19) shows the major reasons behind respondents experiencing costly errors or mistakes. Chart (5) shows that the most prevailing reasons are insufficient technological knowledge, insufficient knowledge about process and employees cannot interpret or use available information. These weaknesses can be addressed by more orientation and capacity building. The least prevailing reasons are insufficient knowledge about competitors and insufficient knowledge about customers. These results indicate that companies focus more on the rivals more than focusing on their internal resources.

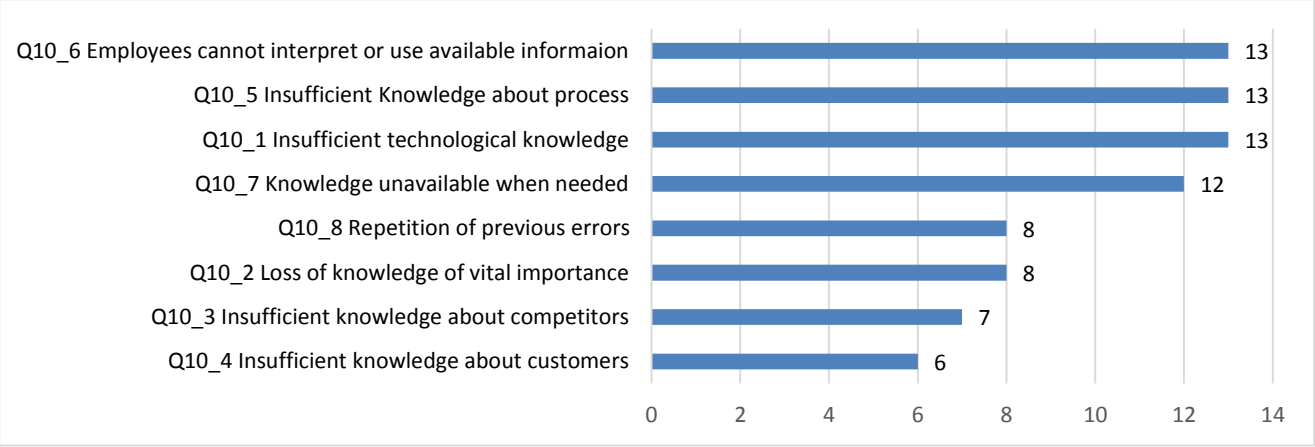

Chart 5 Reasons behind experiencing costly errors or mistakes

Table 20 What are major obstacles for introducing new ideas and technologies in your organization?

	Yes		No	
	Count	%	Count	%
Q11_1 Organizational culture	21	38.2%	34	61.8%
Q11_2 Budgetary constraints	33	60.0%	22	40.0%
Q11_3 Problem with existing IT infrastructure	10	18.2%	45	81.8%
Q11_4 Problem in identifying business needs	13	23.6%	42	76.4%
Q11_5 Top Management doesn't support	16	29.1%	39	70.9%
Q11_6 Other	0	0.0%	55	100.0%

Results shown in table (20) indicate that the most prevailing obstacle is the budget constraint as reported by 60% of the sample, followed by organizational culture as reported by 38.2% of the sample. The least important reasons is the problem with IT infrastructure. Chart (6) shows the order of obstacles according to occurrence.

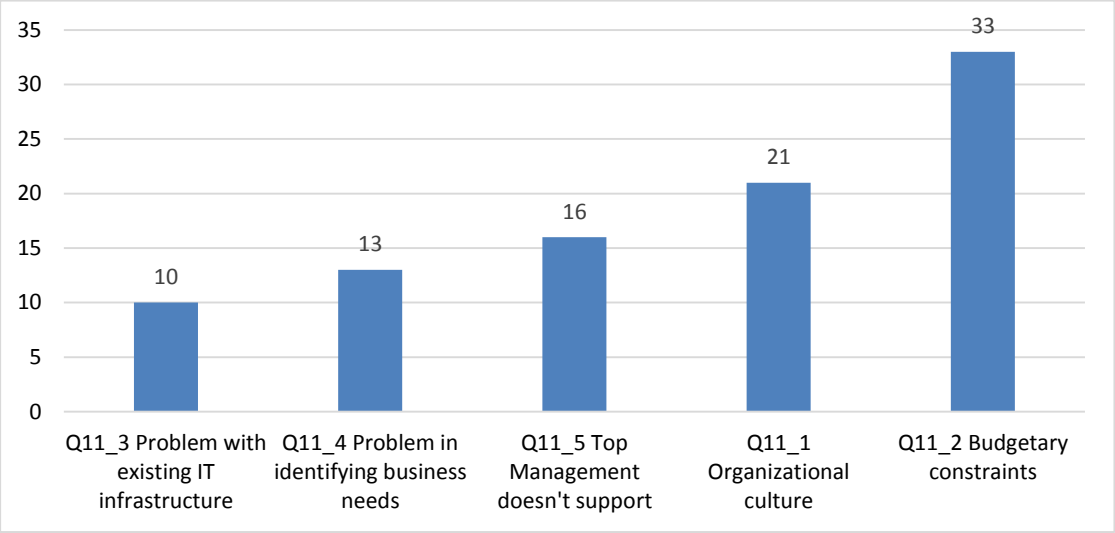

Chart 6 Reasons behind experiencing costly errors or mistakes

3.4.3 Section C: KM Practice within your Organization

Table 21 Which KM initiatives your company has taken over last 2 years ?

below is number of possible initiatives that companies might consider to enhance Knowledge management initiatives

	Yes		No	
	Count	%	Count	%
q13_1 Started encourage knowledge sharing across departments.	21	38.2%	34	61.8%
q13_2 Provide training sessions to employees showing how to share and transfer knowledge.	25	45.5%	30	54.5%
q13_3 Developed processes for applying knowledge learned from past experience success of failures	18	32.7%	37	67.3%

q13_4 Develop a written knowledge management strategy or policy.	19	34.5%	36	65.5%
q13_5 Build data base system for good work practices, lesson learned and provide access to employees for sharing knowledge.	18	32.7%	37	67.3%
q13_6 Preparing written documentation such as lesson learned , training manuals , articles for publications	14	25.5%	41	74.5%
q13_7 Capture and uses knowledge obtained from others (competitors , clients , suppliers)	12	21.8%	43	78.2%
q13_8 Hire knowledge officer to manage company knowledge.	5	9.1%	50	90.9%
q13_9 Nothing	6	10.9%	49	89.1%

Table (21) shows that almost half of the companies in the sample (45.5%) have provided training sessions to employees showing how to share and transfer knowledge, followed by starting encouraging knowledge sharing across departments conducted by 38.2% of respondents. Six companies reported that they have not done any initiative to enhance knowledge management. It is obvious that companies are not keen in hiring knowledge officers to manage company knowledge. This is manifested in the low number of companies doing so; only five companies have hired a specialized person to manage knowledge management in the company.

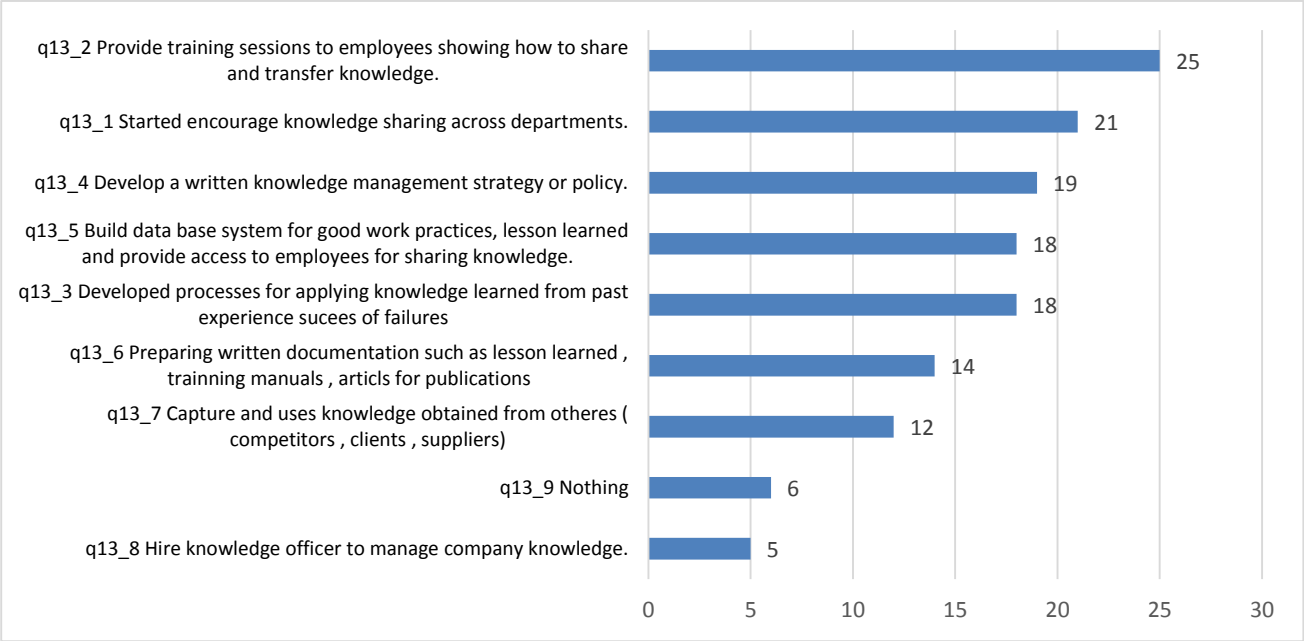

Chart 7 Initiatives undertaken by companies to enhance knowledge management sorted by frequency.

Table 22How effectively do you share knowledge in your organization?

	Not used		ineffective		Not very effective		Effective		Very effective	
	Count	%	Count	%	Count	%	Count	%	Count	%
q14_1 [Company internal documents (sharing folder, reports)]	10	18.2%	0	0.0%	5	9.1%	21	38.2%	19	34.5%
q14_2 [Company Web site]	11	20.0%	5	9.1%	16	29.1%	12	21.8%	11	20.0%
q14_3 [Workshops ,Conferences ,Seminars]	13	23.6%	1	1.8%	9	16.4%	22	40.0%	10	18.2%
q14_4 [Project groups and teams]	11	20.0%	2	3.6%	4	7.3%	24	43.6%	14	25.5%
q14_5 [lesson learned from projects]	13	23.6%	1	1.8%	10	18.2%	18	32.7%	13	23.6%
q14_6 [Video conferencing]	22	40.0%	2	3.6%	14	25.5%	11	20.0%	6	10.9%
Q14_7 [Online Databases]	15	27.3%	2	3.6%	10	18.2%	18	32.7%	10	18.2%
Q14_8 [Training and development programs]	12	21.8%	1	1.8%	10	18.2%	20	36.4%	12	21.8%

Table (22) reveals that the most effective tool in knowledge management is the company internal documents (sharing folder, reports). This tool is used by 81.8% of the sample. In addition to that, 34.5% of the sample reported that this tool is very effective and 38.2% said it is effective. The second effective tool reported by the respondents is the projects groups and teams which is used by 80% of the sample. 25.5% said it is very effective and 43.6% said it is effective.

Video conferencing is the least effective tools because only 60% of the sample used it. 10.9% of the sample think it is very effective while 20% think it is effective.

Chart (8) shows the order of tools according to their effectiveness as evaluated by the respondents. The left most tool is the most effective one while the right most tool is the least effective one.

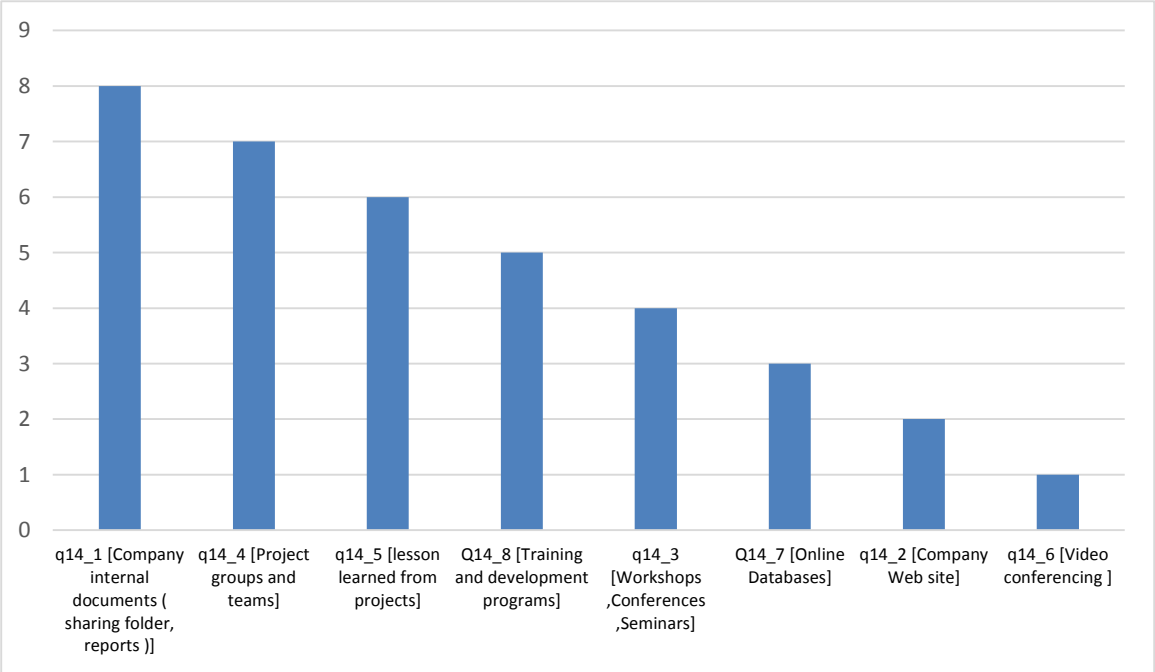

Chart 8 Order of knowledge management tools according to their effectiveness

Table 23 Qualify the effectiveness that Knowledge Management System can offer your company in the following aspects:

	Not at all beneficial		Somewhat beneficial		Beneficial		Quite beneficial		Very beneficial	
	Count	%	Count	%	Count	%	Count	%	Count	%
Q17_1 [Decision Making Improvement]	1	2.1%	0	0.0%	3	6.4%	17	36.2%	26	55.3%
Q17_2 [Efficiency improvement]	0	0.0%	1	2.1%	4	8.5%	21	44.7%	21	44.7%
Q17_3 [Group work improvement]	0	0.0%	0	0.0%	7	14.6%	21	43.8%	20	41.7%
Q17_4 [Protect organization from loss of knowledge due to workers departures]	0	0.0%	1	2.0%	3	6.1%	24	49.0%	21	42.9%
Q17_5 [Costs cuts]	0	0.0%	1	2.0%	8	16.3%	22	44.9%	18	36.7%
Q17_6 [Flexibility improvement]	0	0.0%	0	0.0%	5	10.6%	27	57.4%	15	31.9%
Q17_7 [Time reduction to solve problems]	0	0.0%	1	2.0%	4	8.2%	21	42.9%	23	46.9%
Q17_8 [Customers and suppliers relations improvement]	1	2.2%	1	2.2%	6	13.0%	23	50.0%	15	32.6%
Q17_9 [Quality improvement]	0	0.0%	0	0.0%	5	10.0%	25	50.0%	20	40.0%
Q17_10 [Improve Project Performance]	0	0.0%	1	2.1%	5	10.6%	18	38.3%	23	48.9%
Q17_11 [Improve innovation]	0	0.0%	4	8.3%	7	14.6%	21	43.8%	16	33.3%

Table (23) indicate that all respondent perceive that knowledge management System can offer their companies benefits in all aspects. This is obvious from the very small numbers of respondents who answered not at all beneficial or somewhat beneficial to the above questions. Decision making improvement, in particular, is perceived as the highest potential benefit, followed by time reduction to solve problems and improving project performance. The least perceived benefit is pertaining to improving innovation..

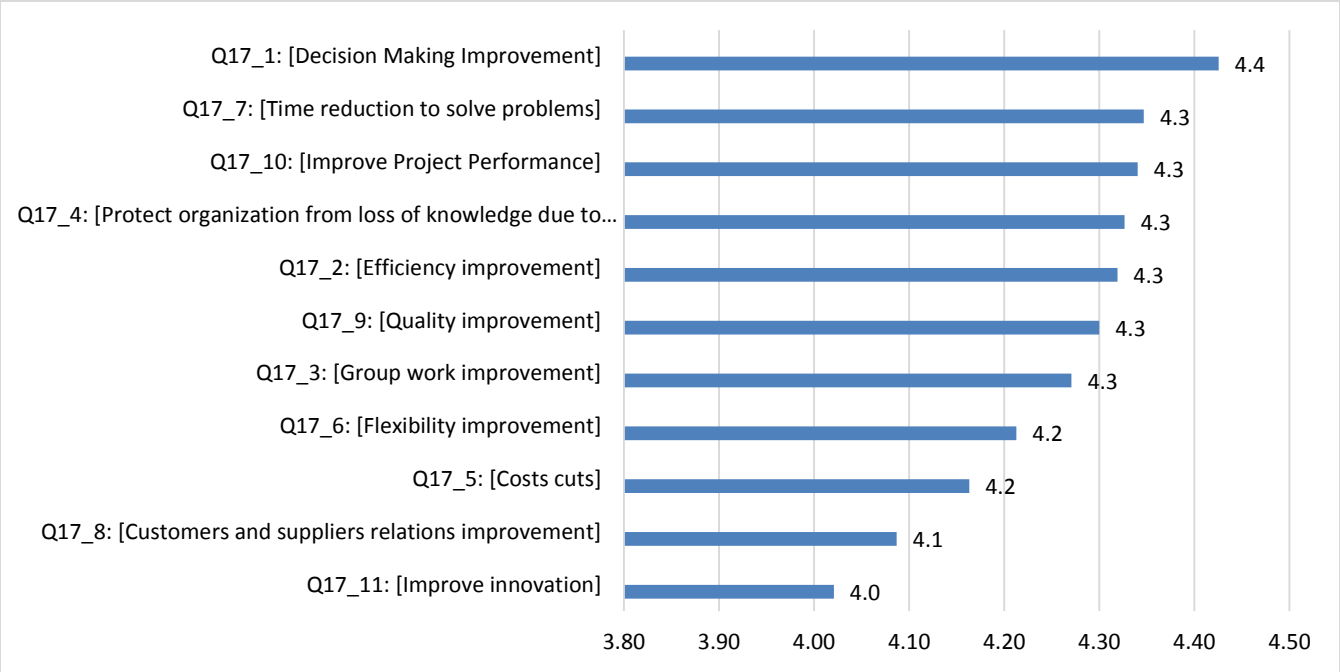

Chart 9 Order of perceived effectiveness knowledge management system can offer to companies according to effectiveness

3.4.4 Section D: Knowledge Management Barriers and Challenges

Table 24What are the Critical success factors in Knowledge Management adoption ?

	Not at all important		Not very important		Quite Important		Very Important	
	Count	%	Count	%	Count	%	Count	%
Q18_1 [Leadership Commitment]	0	0.0%	0	0.0%	19	34.5%	36	65.5%
Q18_2 [Organizational Cultural]	0	0.0%	1	1.8%	29	52.7%	25	45.5%
Q18_3 [Quality System]	0	0.0%	3	5.5%	26	47.3%	26	47.3%
Q18_4 [Resources]	0	0.0%	7	12.7%	18	32.7%	30	54.5%
Q18_5 [Continues training and education]	0	0.0%	4	7.3%	24	43.6%	27	49.1%
Q18_6 [information Technology]	1	1.8%	6	10.9%	20	36.4%	28	50.9%
Q18_7 [Knowledge Management strategy]	1	1.8%	5	9.1%	17	30.9%	32	58.2%
Q18_8 [Human resource management]	1	1.9%	5	9.3%	20	37.0%	28	51.9%

Table (24) reveals that the most critical factor in knowledge management adoption is the leadership commitment. 65% of the sample rated this factors as the most critical one. This is followed by knowledge management strategy with 58.2% of respondents who believe that it is critical and the third critical factor was the organizational culture. Information technology was rated as the least critical and this may be because the IT infrastructure is well built but the utilization is not optimal. Chart (10) shows the factors sorted according to their criticality as rated by the respondents.

Chart 10 Success factors sorted by their criticality as evaluated by respondents

Table 25 What are the obstacles to developing a Knowledge Management system?

	Yes		No	
	Count	%	Count	%
Q19_1 The nature of construction projects(eg. non repetitive work , pressure to complete on schedule ,changing employees in different phases	26	47.3%	29	52.7%
Q19_2 Lack of organization culture for knowledge creation and sharing.	6	10.9%	49	89.1%
Q19_3 Lack of structured procedure to implement Knowledge Management System.	20	36.4%	35	63.6%

Q19_4 Lack of the awareness of the importance of KM in construction organizations.	7	12.7%	48	87.3%
Q19_5 Lack of technology and techniques for knowledge capture and sharing.	18	32.7%	37	67.3%
Q19_6 Lack of resources in terms of budget , staff and IT infrastructure.	25	45.5%	30	54.5%
Q19_7 Employee resistance to share their knowledge	19	34.5%	36	65.5%
Q19_8 Lack of post project reviews and project documentation	21	38.2%	34	61.8%
Q19_9 Others	0	0.0%	55	100.0%

Table (25) reveals that the most prevailing obstacle to develop a knowledge management system is the nature of construction projects which was identified by 47.3% of the sample, followed by lack of resources in 45.5% of the sample. The third obstacle is the lack of post project reviews and project documentation which is prevailing in 38.2% of the sample. The least considered obstacle is the lack of organization culture for knowledge creation and sharing with only 10.9% of the sample identifying it as an obstacle.

Chart (11) sorts the obstacles according to their importance as reported by respondents.

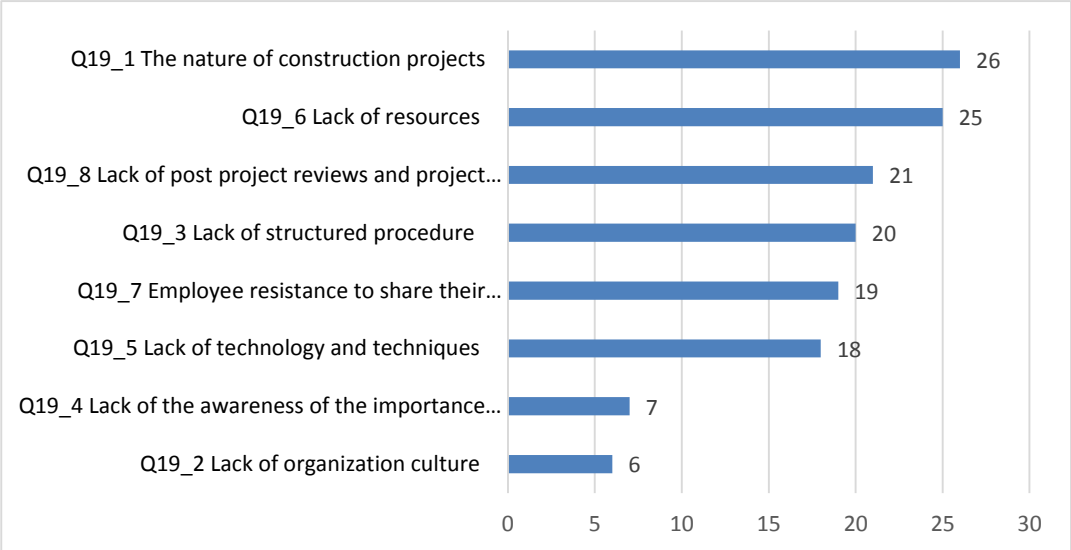

Chart 11 Order of obstacles to developing a knowledge management system according to frequency of respondents

Table 26Why you don't practice Knowledge Management in your organization?

	Yes		No	
	Count	%	Count	%
Q20_1 Lack of time	26	47.3%	29	52.7%
Q20_2 Top management doesn't support KM	18	32.7%	37	67.3%
Q20_3 Most of employees have poor understanding of the KM concept	22	40.0%	33	60.0%
Q20_4 Employees are unaware of KM potential benefits	13	23.6%	42	76.4%
Q20_5 Organization culture is not conducting to sharing of knowledge	9	16.4%	46	83.6%
Q20_6 Company is satisfied with its current infrastructure and performance	3	5.5%	52	94.5%
Q20_7 Lack of financial resources	11	20.0%	44	80.0%
Q20_8 Have never heard	3	5.5%	52	94.5%
Q20_9 Not interested	2	3.6%	53	96.4%

Table (26) shows that lack of time is the most prevailing reason behind not using knowledge management in the organizations as reported by 47.3% of the sample. This is followed by the believe that most of employees have poor understanding of the KM concept which occurred in 40% of the sample. The third most important reason is attributed to top management not supporting knowledge management as reported by 32.7% of the sample. The least important reason is people not interested as reported by 3.6% of the sample or because respondents have never heard of it as in 5.5% cases of the sample.

Chart (12) shows the reasons behind not using knowledge management is organizations sorted according to respondents.

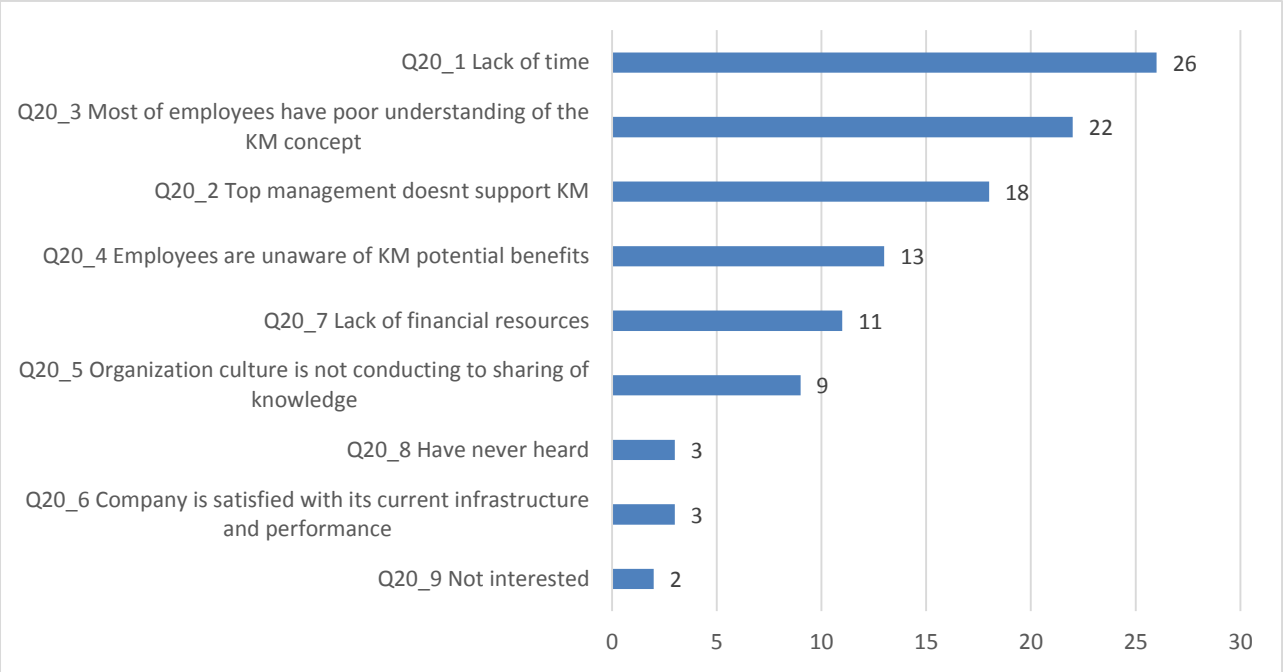

Chart 12 Order of reasons behind not using knowledge management system according to frequency of respondents

Table 27Do you believe you may be currently missing out on business opportunities by failing to successfully exploit available knowledge?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	46	83.6	83.6	83.6
No	9	16.4	16.4	100.0
Total	55	100.0	100.0	

Table (27) reveals that majority of the respondents (83.6%) believe that they are currently missing out on business opportunities by facility to successfully exploit available knowledge, while 16.4% answered no. This table clearly indicates the benefits KM can bring to companies.

3.5 Chapter Summary

The chapter showed several statistics of the collected data. The chapter showed the results of the internal consistency results of the questionnaire used, described the characteristics of the respondents and the companies they work for, and showed the descriptive analysis of the findings of data collected from the survey. Awareness of knowledge management factors were highlighted, in addition to the practices within the respondents' organizations. The final section was dedicated to exploring the knowledge barriers and challenges.

SPSS was used to generate the descriptive statistics, while Microsoft word was used to generate graphs and pie-charts. The next chapter is dedicated to discussion of the findings.

Chapter - 4 Findings and Recommendations

Current study offers preliminary data regarding KM awareness level of UAE construction companies , resources required to have KM system , barriers in KM implementation and critical factors for successful implementation of KM. Questionnaire used in this study may not reflect the views of KM in construction industry in general as its difficult to establish the validity of respondents. Results are discussed based on four topics covered in the survey as follow :

4.1 Awareness level of the need for KM in UAE construction companies

The results of the survey showing that the majority of the participating companies are engineering companies with more than 500 employees and have an experience of 20 years in construction field in UAE.

Respondents construction companies consider that:

- All types of knowledge used in construction projects are very important.
- Knowledge is strategic asset for almost all companies.
- Two thirds of companies have experienced costly errors or mistakes because of insufficient knowledge applied.
- Nearly half of companies have knowledge management system implemented in their organizations.
- Nearly all respondents aware of the benefits of applying KM system in decision making improvement , time reduction to solve problems and improving project performance.
- Less number of initiatives companies had taken over last 2 years.
- Only five companies have hired knowledge officer to manage company knowledge.
- Majority of respondents believe that they are currently missing out business opportunities if available knowledge not shared.

If we combined all these data together we can say that there is a growing awareness of the important benefits of KM within UAE construction sector but still they are at early stages to gain highest values of KM.

Recommendation

Construction companies should invest more in creating, sustaining a knowledge culture and increasing the KM awareness level by :

- Conduct more training sessions and workshops showing to their employees return values if they share knowledge between each other's , that create " Sharing Culture".
- Provide a climate where project team feel secure in their jobs and involved with KM initiatives.
- KM concept should be integrated to companies objectives and strategy.

4.2 Resources required to implement KM initiatives

Different types of resources and tools have been identified for supporting knowledge sharing. The results of survey showing almost all companies are providing infrastructure for sharing information and knowledge using more than one kind of resources. Almost all companies have electronic mail (96.4%) , have library or reading room (89.1%) and using electronic document management system (75%).

Also we measure how effectively employees using these resources for sharing knowledge. Company internal document sharing considered to be the easiest and most effective tool for sharing knowledge.

Recommendation:

Construction companies should make proper planning for the implementation of KM by

promote the use of technologies such as web application and social media tools for knowledge sharing , Human resource department should be involved also not only IT department.

4.3 Barriers to KM implementation

A clear understanding of obstacles to KM implementation is important in order to help construction companies to find solutions to overcome these barriers. we can summarize these barriers for surveyed organizations as follow

- The nature of construction project in UAE and lack of post projects reviews and documentation.
- Resources required in terms of budget ,staff and IT infrastructure
- Lack of time to participate in KM activities .
- Top management doesn't fully support implementation of KM system by developing required processes and written KM strategy.
- Organization cultural doesn't fully support introducing new ideas and technologies.

Recommendation

These challenges and barriers that have an effect on the successful management of knowledge cause the need for more structured approach of tools and strategies for utilizing knowledge in construction organization.

- Focus more in KM processes that easily access, store and share tacit knowledge.
- Build long relationships and trust between team members and organization
- Arrange times and places for knowledge sharing
- Evaluate employees performance based on sharing of information and knowledge.

4.4 Critical KM adoption success factors

The most critical factors affecting successful implementation of KM in UAE construction companies are leadership commitment , KM strategy and organizational cultural. IT infrastructure was rated the least critical factor and this may be because of its utilization is not optimal.

(Charles 2004) identifies factors that promote knowledge sharing support from senior management ,link to economic strategy , performance and knowledge vision, technological infrastructure (internet , intranet and databases) , organizational infrastructure

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Appendix

Knowledge Management Survey

The primary objectives of this survey is to investigate Knowledge Management practices currently undertaking by UAE organizations in the construction industry.

Your participation in this survey will be very much appreciated and we assure you that your answers to survey questions will be kept confidential and used only for statistical analysis.

Knowledge is created and flows through all areas of project management and all phases of the project life cycle

Knowledge : "is information combined with experience, context, interpretation and reflection. It is high value form of information that is ready to apply to decisions and actions"

Knowledge Management : " It consist of processes to capture, distribute, and effectively use knowledge"

Section A : Background Data

In this section we would like to request some background information on your experience and your organization

1. What is your main profession in the company / Project?
   - Top Management
   - Senior Management
   - Project Manager/Construction Manager
   - Management Team Member
   - Technical Staff and Admin

2. How many years of experience do you have working in construction projects?
   - From (1-5)Years
   - From (6-10)Years
   - From (11-20)Years
   - More Than 20Years
3. How would you classify your organization's major role in construction field?
   - Project Management
   - Supplier / Manufacturer
   - Client
   - Contractor
   - Engineering Consultant
   - Other:
4. How many employees are working in your organization?
   - From (1- 50)employees
   - From (51 - 100)employees
   - From (101 - 500)employees
   - More Than 500 employees

5. The number of years of (your Organization) in Construction Field in UAE?
    - More than 20 Years
    - From (11 - 20)Years
    - From (1 - 5) Years
    - From (6 - 10)Years

Section B : Knowledge Management awareness

6. Below types of knowledge used in construction projects , in your organization please indicate the importance of each?

Type of Knowledge / Importance	Very important	Quite important	Not very important	Not at all Important
Project Management Knowledge	○	○	○	○
Knowledge about processes / Procedures	○	○	○	○
Technical Knowledge	○	○	○	○
Knowledge about clients	○	○	○	○
Costing Knowledge	○	○	○	○
Knowledge about suppliers	○	○	○	○
Contract Management Knowledge	○	○	○	○

7. Please indicate Knowledge Management related resources your organization currently using

Resource	Yes	NO
Electronic Mail	○	○
Shared Data Base	○	○
Work Flow System	○	○
Document Management System	○	○
Video Conferencing	○	○
Library or reading room	○	○

8. Does your company recognize knowledge as a strategic asset?
    - Yes
    - NO

9. Are you personally aware of any situation in your organization in which costly errors or mistakes were made because of insufficient knowledge?
    - Yes
    - NO

10. If you have answered Yes , were they caused by the following reasons?
    - Insufficient technological knowledge
    - Loss of knowledge of vital importance
    - Insufficient knowledge about competitors
    - Insufficient knowledge about customers
    - Insufficient Knowledge about process
    - Employees cannot interpret or use available information
    - Knowledge unavailable when needed
    - Repetition of previous errors

11. What are major obstacles for introducing new ideas and technologies in your organization?
    - Organizational culture
    - Budgetary constraints
    - Problem with exciting IT infrastructure
    - Problem in identifying business needs
    - Top Management doesn't support
    - Other

Section C : KM Practices within your organization

12. TO what extent does your organization practice "Knowledge Management"?
    if your answer is "My organization Doesnt practice KM in any area " please answer only section D
    - My organization Does not practice KM in any area
    - My organization practice KM to a very little area
    - My organization practice KM in Several areas
    - My organization practice KM in most areas
    - My organization practice KM in all areas

13. Which KM initiatives your company has taken over last 2 years ?
    below is number of possible initiatives that companies might consider to enhance Knowledge management initiatives
    - Started encourage knowledge sharing across departments.
    - Provide training sessions to employee showing how to share and transfer knowledge.
    - Developed processes for applying knowledge learned from past experience sucees of failures.
    - Develop a written knowledge management strategy or policy.
    - Build data base system for good work practices, lesson learned and provide access to employees for sharing knowledge.
    - Preparing written documentation such as lesson learned , trainning manuals , articls for publications
    - Capture and uses knowledge obtained from otheres (competitors , clients , suppliers)
    - Hire knowledge officer to manage company knowledge.
    - Nothing

14. How effectively do you share knowledge in your organization?

	Very effective	Effective	Not very effective	ineffective	Not used
Company internal documents (sharing folder, reports)	○	○	○	○	○
Company Web site	○	○	○	○	○
Workshops ,Conferences ,Seminars	○	○	○	○	○
Project groups and teams	○	○	○	○	○
lesson learned from projects	○	○	○	○	○
Video conferencing	○	○	○	○	○
Online Databases	○	○	○	○	○
Training and development programs	○	○	○	○	○

15. Is there any kind of knowledge management system available in your organization ?
    - ○ Yes , there is a KM system available
    - ○ There is no KM system available at the moment but we are working on one
    - ○ No , but we are considering the possibility
    - ○ We have no KM system and are not planning to have one

16. Who is responsible for knowledge management activities in your company?
    - ○ Top management
    - ○ Department Manager
    - ○ Knowledge officer / manager
    - ○ Other

17. Qualify the effectiveness that Knowledge Management System can offer your company in the following aspects:

	Very beneficial	Quite beneficial	Beneficial	Somewhat benificial	Not at all beneficial
Decision Making Improvement	○	○	○	○	○
Efficiency improvement	○	○	○	○	○
Group work improvement	○	○	○	○	○
Protect organization from loss of knowledge due to workers departures	○	○	○	○	○

Costs cuts	○	○	○	○	○
Flexibility improvement	○	○	○	○	○
Time reduction to solve problems	○	○	○	○	○
Customers and suppliers relations improvement	○	○	○	○	○
Quality improvement	○	○	○	○	○
Improve Project Performance	○	○	○	○	○

Section D: Knowledge Management Barriers and Challenges

18. What are the Critical success factors in Knowledge Management adaption ?

	Very Important	Quite Important	Not very important	Not at all important
Leadership Commitment	○	○	○	○
Organizational Cultural	○	○	○	○
Quality System	○	○	○	○
Resources	○	○	○	○
Continues training and education	○	○	○	○
information Technology	○	○	○	○
Knowledge Management strategy	○	○	○	○
Human resource management	○	○	○	○

19. What are the obstacles to developing a Knowledge Management system?
    - The nature of construction projects(eg. non repetitive work , pressure to complete on schedule ,changing employees in different phases)
    - Lack of organization culture for knowledge creation and sharing.
    - Lack of structured procedure to implement Knowledge Management System.
    - Lack of the awareness of the importance of KM in construction organizations.
    - Lack of technology and techniques for knowledge capture and sharing.
    - Lack of resources in terms of budget , staff and IT infrastructure.
    - Employee resistance to share their knowledge.
    - Lack of post project reviews and project documentation.
    - Other

20. Why you don't practice Knowledge Management in your organization?
    - Lack of time
    - Top management doesn't support KM
    - Most of employees have poor understanding of the KM concept
    - Employees are unaware of KM potential benefits
    - Organization culture is not conducting to sharing of knowledge
    - Company is satisfied with its current infrastructure and performance
    - Lack of financial resources
    - Have never heard
    - Not interested

21. Do you believe you may be currently missing out on business opportunities by failing to successfully exploit available knowledge?
    - Yes
    - No