

# KNOWLEDGE MANAGEMENT FOR PUBLIC BUILDING MAINTENANCE IN KUWAIT

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The concept of knowledge management (KM) has been introduced to organizations in various industries to improve their performance. In the construction and building sector, companies seek innovative concepts to cope with economic and competitive pressures and to deal with complex projects. Even with the lack of competitive environment, public organizations have also been introduced to KM to cope with tight budgets and to answer calls for improvement of services. In the case of Kuwait, issues such as loss of gained knowledge, repetition of mistakes and reinventing the wheel in dealing with problems can lead to preventable additional expenses and time wastage. Several IT and KM applications were introduced into facilities management (FM) and building maintenance (BM) services to improve the performance of organizations. This paper presents a methodology to implement KM concept into management of public maintenance departments in Kuwait. The objectives include investigating the current attitudes towards KM, mapping main organizational process for maintenance and lastly developing a KM system for public building maintenance. The main output of this paper is an outlined organizational process showing several opportunities for managing knowledge that will increase the effectiveness of BM process.

Keywords: building maintenance, knowledge management, Kuwait, public sector.

## INTRODUCTION

Kuwait is considered one of the wealthy countries as it has one of the highest per capita incomes in the world. However, even though the country seems secure with large oil revenues and reserves, it is perhaps one of the most vulnerable to the impact of future oil peak crisis (Roaf *et al.* 2009). Therefore, measures need to be taken to increase efficiency of public organizations to be prepared when calls for tighter expenditures are made. One of such is the use of knowledge of employees and organizations to improve performance. Several issues were observed by the lead researcher during his professional work in the public maintenance (BM) departments in Kuwait, such as discarding of documents after project completion or expiry of maintenance contract resulting in new experience or knowledge being simply forgotten with time. This may lead to efforts and time to be mostly consumed in “reinventing the wheel” in dealing with repeated projects, mistakes or recurring issues. Furthermore, it is understood that most public BM departments in Kuwait follow the traditional organizational breakdown structure (OBS) in management where levels of communications are limited to within the hierarchy. Therefore, isolated and scattered maintenance teams may be formed that depend solely on the knowledge and experience of their division heads or colleagues within the same team.

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For teams working in branches located in different regions, the management approach will result in missed opportunities to benefit from other people's experiences, starting from scratch in solving problems and repeating mistakes every so often.

These issues can lead to preventable additional expenses, time wastage, inefficient performance, and lower value for money spent on maintaining the public buildings. Developing KM system that addresses such issues and provides accessibility to employees working in different locations to capture, reuse and share knowledge and experiences will have a positive impact on the performance of public departments.

Cong and Pandya (2003) and BSI (2005) argued that much of the literature on KM has been directed towards the private sector when compared to what has been addressed of KM in public sector. As a result, this research is primarily aimed to investigate KM within public sector. Furthermore, Collison and Parcell (2004) stated that there are three drivers for KM in organizations: people, process and technology, where the later is employed by employees to follow the organizational process. The lack of using KM systems and applications within Kuwaiti public sector was the other main driver for this study. Therefore, this research aims to develop a KM system to help improve the management of public building maintenance in Kuwait. The study objectives are:

1. To explore the awareness and attitudes of KM in the Kuwaiti public building maintenance departments.
2. To Map the main processes and stages of services provided by building maintenance departments.
3. To develop knowledge capture and retrieval web-based application to be used within the Kuwaiti public building maintenance departments.

The paper will address building maintenance and examine the current procedures for the BM in Kuwait. Afterwards, the study will review knowledge management applications used in BM, and then propose the fieldwork of the research methodology to implement the proposed KM system.

## **BUILDING MAINTENANCE**

BM is seen as an activity in the larger context of facilities management (FM) (Peter Barrett and Baldry 2003) and simultaneously is considered as part of the construction sector (Ali *et al.* 2006; Doran *et al.* 2009). However, little considerations were offered to improvement and "free thinking" in the delivery of services of building maintenance (RICS 2009). This perhaps is due of BM and FM seen as "non-core" functions that provide "supportive" services in organizations (Waheed and Fernie 2009) and with spending is commonly regulated by renewed budgets (CIOB 1990). None the less, with pressure on businesses in private and public sectors, practical relevance of FM is increasingly being recognized by organizations (Pathirage *et al.* 2008). Within the area of public sector, Barrett and Baldry (2003) stated that decisions, policies and processes of FM are largely influenced by non-financial aspects related to standards of public service terms, public accountability and probity to meet needs, expectations and interests of various and authoritative stakeholders. Such issues place increasing pressure on public sector including FM and BM to improve delivery of services.

In Kuwait, public development and maintenance projects have been witnessing solid government spending which comprised 11% of the total state budget NBK (2006). With continuing large surpluses in public budget from oil revenues (NBK 2009), it is

expected that the public expenditure will maintain its firm support to construction and renovation projects. Public construction departments also provide their services to maintain buildings owned by the State of Kuwait. Such services range from single repair works to bespoke refurbishment and reconstruction projects. Buildings owned or leased by the government significantly differ in shape, type, usage, size and complexity. For example, a ministry can own both ordinary and special structures such as office buildings, police stations, border centres, coastguard ports and state prisons. Another ministry can have care buildings to host individuals with special needs. That is in addition to ministries and organizations that own hospitals, schools, airports, seaports and even luxurious royal buildings. The requirements for such diverse categories of buildings make the process of maintenance complex.

To sustain their services, maintenance departments responsible for maintaining public buildings in Kuwait can range from small sections working within larger facilities departments to distinguished large departments with headquarters and branches located in different parts of the country. Teams working within the departments comprise in-house personnel and out-sourced contractors. The Measured Term Contract (MTC) is employed by several Kuwaiti public maintenance departments to fulfil their maintenance duties. The lead author has previously worked for three of the departments. This form of contract is applied separately for the civil, electrical and mechanical works of building maintenance. In other words, each of the three sections of maintenance procures a separate specialized contractor. The contractors' classifications of size and speciality are organized by the Central Tendering Committee (CTC) which also controls the tendering process for the whole State of Kuwait's public projects (CTC 2010). The MTC form of contract used by public departments is derived from maintenance contracts employed by the Ministry of Public Works (MPW). The MTC contract includes different sections such as: earth works, concrete works, wood works and masonry works. The same form of contract is used in ministries with some differences in subsections, specifications, included items and pricings.

Figure 1 illustrates an outline of a typical building maintenance process for a department with regional branches. Upon receiving requests and reports for maintenance works from units or by maintenance teams, employees of public departments visit sites to assess works needed and then issue estimated job description to the management for approval. The approximation of quantities, items, types of works and project total cost included in the job description are based on the contract signed between the ministry and the winning contractor. When the proposed project is approved, detailed lists of items with its quantities are then issued to the contractors or to in-house teams. The designated employees will then observe and supervise the works being carried out. When there is more than one specialized contractor working in a project, the public maintenance employees manage the contractors and their activities. Upon finishing the project, the contractor/in-house teams and the supervising group issue a re-measured and modified total cost with detailed list of quantities for items and works that were carried out in the project. The regional manager checks the quantities then sends the project documents with its payment approvals to headquarter. Another verification of the documents is then made to ensure accurate summation of prices. Lastly, a payment approval is then issued to be included within the agreed contractors' periodic payments.

This outline will help identifying the role of the proposed KM system to improve BM process which will be discussed later in this paper. But first, an overview of applications of KM in BM will be presented.

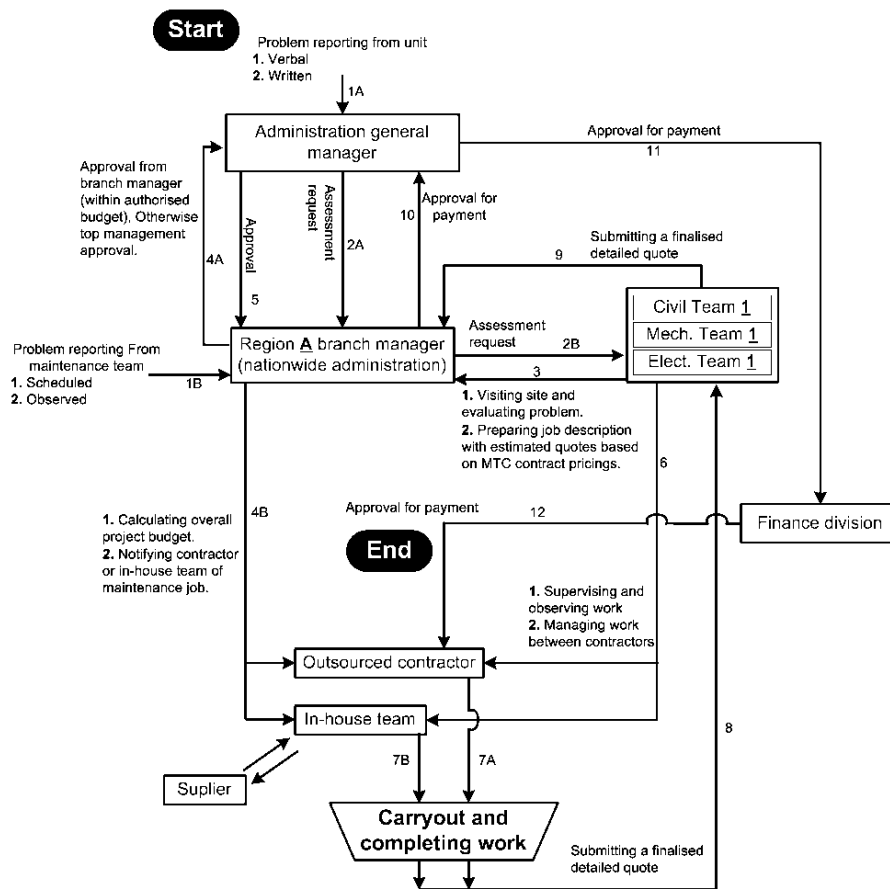


Figure 1: Outline of a typical public building maintenance process in Kuwait

## KNOWLEDGE MANAGEMENT (KM) APPLICATIONS IN BUILDING MAINTENANCE

Building maintenance activity is extended to buildings' life span and involves multiple stakeholders that are replaced over time. As the concept of knowledge management can be used to improve performance in property management and FM organizations (Fong and Lee 2009; Olomolaiye *et al.* 2004), Knowledge and experience gained from one maintenance project can be used to benefit another project. Furthermore, Egbu (2000) argued that people issues represent 90 percent of KM while technology represents merely 10 percent. Fong and Wong (2009) provided examples of knowledge and experience in building maintenance including project location and proximity, type of repair work, reaction time, functioning of materials and products, details of contractors and suppliers and health and safety issues.

As mentioned earlier, building maintenance is considered as an activity within facilities management and based on that, applications are advertised for use in FM and have utilities for building maintenance. Sun and Howard (2003) reported that there are several "of the shelf" software applications commercially distributed which include: Archibus/FM, CAFM Explorer, QFM, FacilityOne and Planet FM. Their advertised functions are: assisting in helpdesk call centers, planning, managing, tracking and

controlling of organizations' projects, assets, spaces and budgets and costs. However, KM benefits were not advertised as part of the gained advantages within the commercial FM applications.

With more focus on KM, Lepkova and Bigelis (2007) proposed a web-based Consulting Knowledge System (CKS) to be used in facilities management. CKS provides three methods of consulting: 1) searching the website using the domain ontology, 2) webmail and 3) using a decision support system. Lepkova and Bigelis (2007) asserted that the search results will be accurate and short since information is mainly entered as snippets. Another KM application has been developed by Fong and Wong (2009). They investigated whether forming a Community of Practice (CoP) among building maintenance organizations could increase the efficiency of knowledge and experience sharing and reuse. They examined the feasibility of proposed web-based experience management system in sharing, capturing and reusing knowledge and experience. Based on their study results, online Building Maintenance Community of Practice (BMCoP) prototype application was developed to be used by stakeholders. Both applications, however, are advertised to be used by several parties with no particular organization in charge of the system. Lack of ownership can be a major issue in such cases as accountability of running costs, management and systems improvements are required for continuity.

Ali *et al.* (2004) developed a web-based knowledge management system named "MoPMIT" (More Productive Minor Construction Project through Information Technology). The main aim of MoPMIT system is to improve the performance of parties involved in Reactive Maintenance (RM) projects by having a common interface as a mean of communication for sharing information and knowledge. MoPMIT was designed to assist non-expert users in identifying problems and in describing the work required leading to reduction in time wastage since the appropriate contractors are then allocated with the correct tools. The participants in the system development, testing and evaluation comprised a group of building owners, facilities management teams, contractors and suppliers. The architecture of MoPMIT bespoke design is based on a process model developed by Ali *et al.* (2002). The main function of MoPMIT application is to mimic the process of a call centre including accelerating the communication between parties, identifying problems, selecting the appropriate contractor and allowing feedback on completed work. However, the system has more focus on communication between different parties rather than communicating the workforce of one party for knowledge use before, during and after repair projects. For example, it addresses links between the client and the helpdesk in reporting and describing the problem also between the FM manager and the contractor in quotes estimation, price negotiations and payment processes. Furthermore, contractor selection is based on location and type of work needed. Such function may not be applicable in cases such as public organizations and ministries that have annual contracts with specific contractors for the civil, electrical and mechanical works of building maintenance, as the case of Kuwait.

In the Kuwaiti context, a small number of publications have explored KM. A study by Al-Athari and Zairi (2001) examined the current situation of the availability of KM systems in the Kuwaiti private and public sectors. Their study revealed that knowledge management was perceived as very important to organizations in both sectors, and that employees and organizations' existing knowledge are the most important sources of ideas. Also, it was found that internal journals are the common method for knowledge sharing between employees. In another study by Alazmi

(2003), the actual implementation of IT-based KM systems was investigated. It also compared between the use of KM systems in both UK and Kuwait public sectors with the specific aim of building a best practice model for KM implementation model in conjunction with IT. However, the BM sector in Kuwait was not the target in both studies.

Another attempt was aimed to investigate the application of web-based information technology in the Special projects Administration (SPA) in Ministry of Public Works (MPW) in Kuwait. The former study by Al-Reshaid and Kartam (2000) investigated the communication between parties involved in the SPA projects. The study concluded that the existing type of communications failed to provide a reliable rapid mean of information delivery and exchange. Therefore, it was suggested to implement the web technology as a supporting tool to enhance and increase the efficiency of information exchange and delivery. The later study by Al-Reshaid and Kartam (2003) described the implementation of a web page to be used by stockholders involved in SPA projects. They promoted that the web page allows stakeholders to directly communicate with each other. Moreover, the website was promoted to be used as electronic record of all discussions, decisions, and project notes. However, such revolutionary attempt was custom designed for the SPA department and its projects and stakeholders. The SPA involved in new large construction projects for the state.

What is required is a KM system to be used by public employees working in BM. The system should be designed with simple search and navigate tools to allow employees of different teams located in diverse locations to communicate and share knowledge when needed. The applications discussed above fall short of meeting such requirements.

## **OPPORTUNITIES OF KM IN BUILDING MAINTENANCE**

Based on the outline in Figure 1, several issues can be derived regarding knowledge management and communication between employees. Four opportunities for knowledge capture, reuse and sharing were identified in the process of BM in Kuwait. The first opportunity exists in process 3 where public employees visit the site for evaluating and submitting needed repairs, estimating quotes and quantities. The second opportunity is found in process 6 when public employees supervising and managing the work of projects. The third opportunity exists in processes 8 and 9 where finalized paperwork is submitted. Lessons learnt are to be documented in these processes. The fourth opportunity can take place in the process 1B where public employees conduct routine visits to sites; as their comments are to be recorded in this stage. Furthermore, the outline shows that communication lines of teams are limited to the branches managers, contractors and in-house workforce. This leads to maintenance teams to be isolated within repair projects located in their jurisdiction. It is expected that no clear communication links are present between teams located in different locations. Therefore, a proposed KM system that connects employees, their thoughts, experiences, decisions and knowledge can have a significant impact on performance improvement. Next section will explain the adopted fieldwork stages of the research methodology to develop the proposed KM system.

## **RESEARCH METHOD**

The field data collection of the research method is designed to address KM attitudes and awareness issues, identify a verified BM working process then develop a KM

system to be used by employees working in the sector. The fieldwork is divided into five stages as shown in Figure 2:

The first stage will be in the form of semi-structured exploratory interviews aiming to: refine and validate the outlined process shown in Figure 1, identify current knowledge sharing methods and tools used by departments, and to assist in designing the questionnaire. The lack of literature of BM process in Kuwait necessitated the addition of this stage. This stage will also help identifying the main differences in KM application between Kuwait and other countries.

The second stage will focus on exploring the current status of KM in the public sector in Kuwait. This includes employing the questionnaire to investigate the type of building maintenance contracts are currently used by the majority of public departments, the maturity levels of KM, perceptions towards KM in organizations, computer literacy and usage level, and types and sources of knowledge. The task is to investigate the attitudes towards KM and the readiness and the scale of its use in the sector. Also to identify a common contract form to be the basis in designing the knowledge management system. This will result in identifying the main specifications of the proposed KM system. The surveys will generalize building maintenance process refined in the first stage. It is worth noting that the process model presented to the participants in the questionnaire will be in a form of stages and sub-stages. Mapping links and loops of processes between the sub-stages will be investigated further through interviews in the third stage.

Questionnaires will be designed for self completing with the majority of questions being short close-ended. Oppenheim (1992) advocated that open ended questions should be kept to the minimum, since they require more thoughts, writing and time from respondents. Research hypotheses will be tested in this stage as a method of generalization. Organizations will be classified into small, medium and large in size. A Null hypothesis will show no significant difference of perceptions from large departments to medium departments to small departments. This will lead to generalizing the results of the questionnaire and therefore the output can be applied to any department regardless of size. Nonetheless, if the hypotheses results showed opposite results, the study will focus on one particular department size.

The third stage comprises series of interviews and will focus on endorsing the results of the questionnaires, identifying the needs and wants for designing the Knowledge capturing/retrieving system, and adjusting the process model of BM. The interviews will be in a form of informal semi-structured face to face recorded meeting with professionals working in the sector. The method for identifying the interviewees will be based on the participants' relationship and nature of their work in the sector and their familiarity to the concept of KM. Also, selecting the interviewees will be based on the distribution average of participants in the questionnaire results.

The fourth stage will focus on developing the KM system. This includes designing the system and identifying related issues such as selecting the servers, database software, script language, connection, data utilization, knowledge classification, security and compatibility.

The fifth stage will cover validating and testing the application. Participants of previous two stages will be asked to validate and test the system.

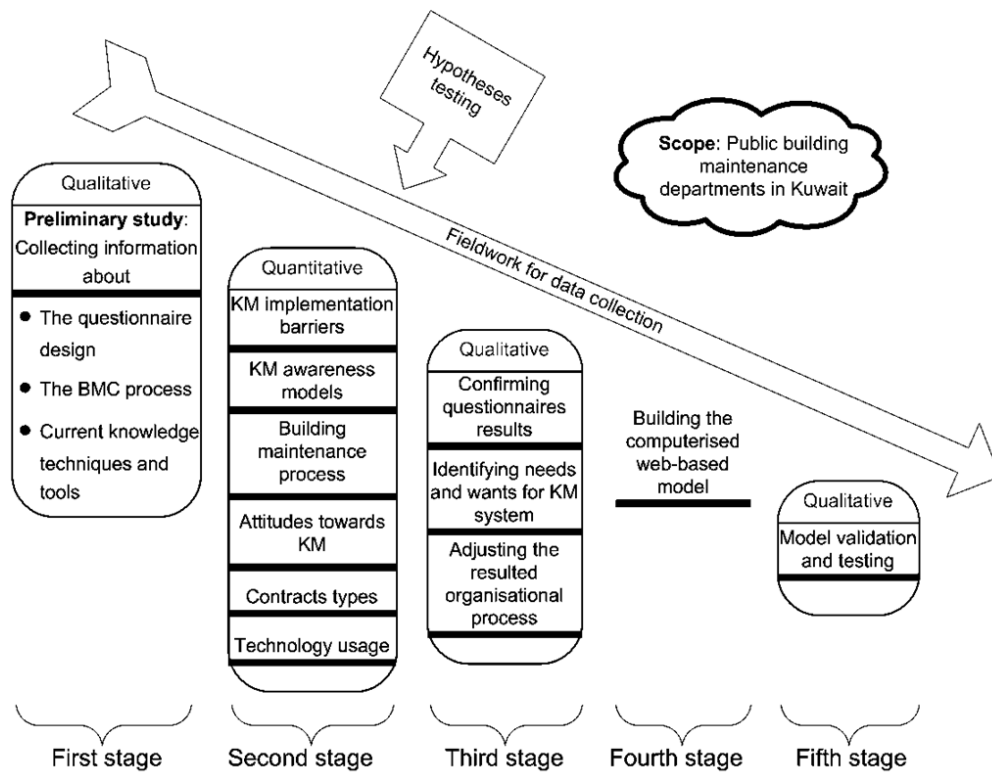


Figure 2: Stages of fieldwork research method

The scope of the research is extended to building maintenance departments working within public organizations listed in the State’s budget dedicated to maintain, refurbish and construct buildings owned by the state. The organizations include ministries, dependent and independent organizations; the distinction is based on the administrative type of the top management. Even though the targeted departments are located in different regions of the country, the built up area of Kuwait is small and the administering team is expected to cover all organizations listed for participation with minimal difficulties. There are 40 public organizations listed in the state budget each of which is expected to have its own building construction and maintenance department. The categorization of department size will be based on number of employees and allocated budgets for maintenance works.

The uniqueness and novelty of the proposed research reside within the area that investigates the application of KM in the field of building maintenance departments within the Kuwaiti public sector. The main finding of this study is KM application that will assist in increasing the effectiveness of the BM process. The proposed KM system will take advantage of opportunities in the organizational process to capture, reuse and share knowledge of employees. In addition, the structure of the KM system will be based on the form of contract used by the majority of public organizations. This approach will simplify knowledge sharing and retrieval.

## CONCLUSIONS

Several issues were witnessed in the public BM sector in Kuwait that reduce efficiency in performance. By applying the concept and tools of KM and developing a KM system, the value for money spent by the public departments can improve. The lack of literature in this area has created a novel and unique research opportunity for



investigation. Therefore, the research objectives were set to investigate awareness and attitudes towards KM, map the main BM processes and develop KM system. The fieldwork of the designed research method comprises five stages that include quantitative and qualitative techniques for data collection. Furthermore, some research impediments are anticipated to arise during the fieldwork phase of the research and more during the development of the KM system such as participation level. Nevertheless, adequate considerations will be given at due time to minimize their effects. The findings will be limited to public building maintenance departments in Kuwait as the design of KM system will be based on their process and form of contract used by the majority of the departments.

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