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Study of the Relationship between Knowledge Management and Project Quality Management Considering the Key Knowledge Factors in Construction Industry

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Abstract: The purpose of this study is to analyze the relationship between knowledge management and project quality management and the effect of knowledge management on project quality management. This study determines the component of knowledge management and its highest effect on project quality management. Result show that the project quality management is affected by knowledge management. The conceptual model of this study for analyzing the relationship among these variables was designed and the model was used to analyze the relationship among these variables in construction industries of Kurdistan province. The statistical population of this study is 176 managers and experts from 444 companies and contractors. To test the conceptual model, structural equations and path analysis of LISREL were used. The result of the study indicated that knowledge management has positive and significant effects on key knowledge factors. And key knowledge factors has a significantly positive effect on project quality management. However, the influence of knowledge management on project quality management is not directly significant, the indirect influence of it through key knowledge factors in construction industry is positive and significant.

Key words: Project quality management, knowledge management, key knowledge factors in construction industry

INTRODUCTION

The organizations can stay at the top point in competitions with knowledge utilization. They confess that by employing quality management system in their projects, they will achieve reduction or omission of shortcomings with a continuous improvement (Salojarvi *et al.*, 2005; Bennett and Gabriel, 1999). In fact using this system alone does not improve the operation of the organization (Ndlela and du Toit, 2001). Therefore, the employment of the new concepts to achieve the objectives of project management is considered. This new concept among management experts and a great attempt has been done on utilizing the capability of the potential knowledge of people in organizational productivity (Botha and Fouche, 2002). Many researchers have played a role in the development and distribution of knowledge management (Jennex, 2005), but few researchers have proved and develop analysis of knowledge management in construction. Lubit (2001) have defined knowledge management as a strategy to make innovation and improvement in the stages of construction and they were able to define the key benefits of utilizing knowledge management in construction industry. Kruger and Snyman (2005) suggested that a knowledge management system managed the value engineering. This system collects the creativity tools that can be utilized in

the domain of value engineering creativity, thus the domain becomes more systematic and more coherent. Chan and Tam (2000) identified the effective factors in construction projects in Hong Kong. Their finding show that the knowledge management is most important factor influencing customer satisfaction of the quality. There are other factors influencing customer satisfaction including the effectiveness of construction leader and the customers' focus on quality and time. Teerajetgul *et al.* (2009) identified key knowledge factors in construction industry in Thailand by using a combination of quantitative and qualitative methods. Tupenaite *et al.* (2008) suggested that the importance of knowledge management in improving industrial organizations and construction projects. They have also developed the knowledge management model for construction projects. Tupenaite *et al.* (2008) believe that the implicit knowledge causes a better performance and the accomplishment of the competitive advantage for active organizations in construction industry. According to their model, an effective strategy is require to achieve and manage the implicit and explicit knowledge. Therefore, we believe that incoherence and imbalance among different construction industry careers is considered as an important factor for poor performance of projects (Kruger and Snyman, 2005; Au and Winnie, 1999). Maqsood and Finegan (2009) indicated that knowledge management is related to

learning and innovation. They concluded that the innovations caused by the implementation of knowledge management in an organization helps to transform this organization into a learning. Moreover, such an organization works more creatively than a non-learning. Kanapeckiene *et al.* (2010) have discussed the importance of implicit knowledge and the benefits of knowledge management in organizations and construction industry projects. They have provided a comprehensive analysis of knowledge management in the construction and emphasis on explicit knowledge, which claim that the implicit knowledge of all beneficiaries and those who should be satisfied is to be considered (Teece, 2000; Hasanali, 2002). Ansari-Ranani and Qasemi-Nameqi (2009) in their study evaluated the influence of knowledge management in creating a competitive strategy out of the value chain of organizational activities. They demonstrated that organizations are able to achieve competitive advantage that is used in the competition, in case of using knowledge management in a disciplined way. Maroofi (2012) in his findings provide the managers some guidelines to design their policies or adjust their systems to better adopt different TQM practices. Quality management is considered as a method to improve the activities and performances of an organization and project quality management involves all the processes followed to certify the fulfillment of all the needs to which the project is intended to respond, so that the multiple TQM practices can be effectively implemented in the organization (p. 340). Maroofi (2012) suggest that minor industrial and service companies pay a special attention to quality management. Quality management is defined as 'a management approach that enables the organizations to achieve the competitive advantage' (p. 341). Therefore, many quality management initiatives, directly or indirectly include improvement of the initiation of the project, programming, performance and control. Attalla *et al.* (2003) by using a questionnaire, tried to provide checklists for construction operations depending on quality and security and by collecting information about the security and quality of construction projects to assure the inspectors that construction operations will be done without any damage or delay. Chantarasombat (2009) modeled knowledge management to assure the quality of education in educational planning college in MahaSarakham University (Thailand). The findings of this study developed the knowledge management model in quality assurance. So, knowledge transfer is located between quality management and organization performance as a bridge. Thus by delving into the elements of quality management, knowledge transfer is affected and in this way the organization performance is

improved. The purpose of this study is to investigate the relationship of knowledge management and project quality management and the effect of knowledge management on project quality management. And to determine which one of the components of knowledge management has the most effect on project quality management as well as to identify the stages of project quality management, is more influenced by knowledge management.

CONCEPTUAL MODEL OF THE STUDY AND THE HYPOTHESES

Since knowledge, especially in the age of the internet, is a criterion of power, organizations make an attempt to discover the needs of their customers previous to their rivals. Therefore, the knowledge management of an organization in the age of knowledge becomes increasingly important. Since, the main objective of the study is to determine the relationship between knowledge management and project quality management, first the model of knowledge management and quality management was designed based on the literature. It also became clear from the literature that the key knowledge factors in construction industry are an effective intermediate variable to be considered in the study. Therefore, the model of key knowledge factors of construction was also designed and from their combination, the conceptual model of the study was designed (Fig. 1).

Hypotheses: According to the conceptual model of the study the following hypothesis are considered:

- **H1:** There is a significant relationship between knowledge harvesting and project quality management
- **H2:** There is a significant relationship between knowledge documentation and project quality management
- **H3:** There is a significant relationship between knowledge transfer and project quality management
- **H4:** There is a significant relationship between knowledge utilization and project quality management

RESEARCH METHODOLOGY

Sample and data aggregation: A total of 444 managers and experts counseling companies and contractors, includes 642 people in the financial services industry were selected from the Kurdistan province. Respondents were given the option of mailing the questionnaire back or

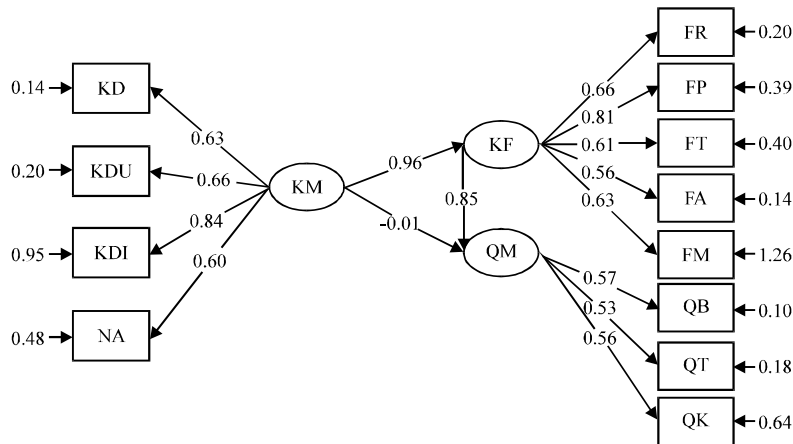


Fig. 1: Conceptual model of the study

Table 1: Demographic profile of respondents

Parameters	Mean
Sales (%)	
Contractors sales	47.8
Counseling sales	37.2
Retail sales	55.6
Online sales	17.3
External sales	24.6
Sales/assets under management (%)	
>50 million	15.5
51-250 million	12.2
250.1 million ⁻¹ billion	23.2
1.1-5 billion	26.9
>5 billion	18.2
Respondent age (%)	
0-32	12.5
32-40	24.5
41-50	39.1
51	23.9

Table 2: Results of the items validity test

Variables	Items	Cronbach's alpha
Knowledge management	KD1...NA6	0.774
Knowledge in construction industry	FR1...FM4	0.707
Project quality management	QB1...QK5	0.807

Source: Investigated calculations

completing the questionnaire online via., the attached URL. A second mailing was later sent to non-respondents one month after the mailing was delivered. The samples were chosen by the use of stratified random sampling in which the categories were determined through the domain of construction organizations performance. First the questionnaire was distributed among 40 people, then by considering the initial sample variance and through Kocran formula, the number of the sample with the error rate of 5% was determined as 176 people. Obviously, the description of filling the questionnaire was provided for the expert respondents. Table 1 contains the profile of respondents. Approximately 48% of the companies are experts counseling and about 37% are contractors. The

majority of the respondents (63%) were 38 years or older. Online experts counseling was a little over 13% of their work consistent with the industry average. Most of the firms (71.5%) reported at least Rials 1250 million in sales/assets under management. Possible biases of informer were controlled for by requiring informer to be; (1) Knowledgeable in their field; (2) Have a business experience and (3) Have a significant amount of background in their industry. Moreover, a Harmon's one-factor test shown that common method bias was not an issue in the data.

According to the conceptual model, based on the purpose of this study, it can be regarded as applied-developmental researches. Based on the methodology, it is a correlation research and based on the method of data collection, it is of survey researches. To test the hypotheses of the study and to practice its conceptual model a questionnaire consisted of 52 questions was designed and its validity and reliability were found. Table 2 shows the results of the questionnaire validity test.

According to the data in Table 2, the Cronbach's alpha is more than 0.7 for all three structures that indicates the desirability of data collection tools for the study. The questionnaire consists of two parts: The first part includes the respondent's specifications including the construction company, the interviewee's major, the degree, expertise and experience. In the second part, the rate of knowledge management utilization, key knowledge factors operation and the utilization of project quality management indicators in the organization are asked in three separate parts.

Criterion of the model test and measurement: As it was mentioned to determine the reliability of the measuring

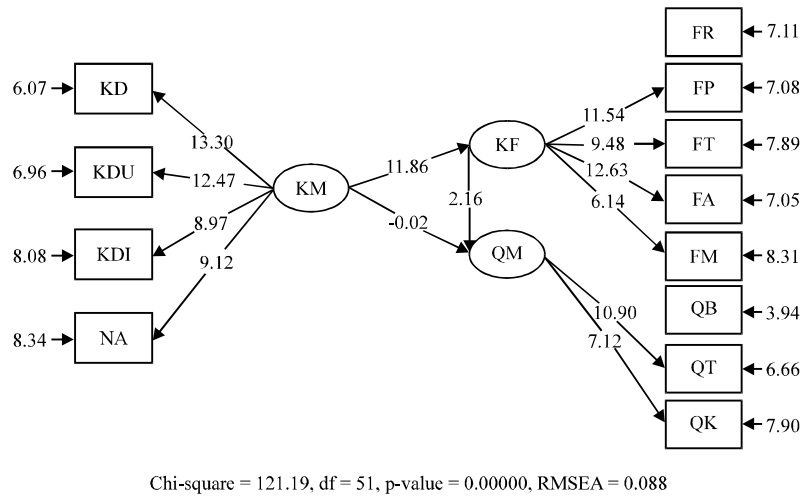


Fig. 2: Coefficients of the variables in the model along with t-values (the standard model)

Table 3: Range of fitness desirability indicators

Fitness indicator	Desirable fitness	Acceptable fitness
χ^2	$0 \leq \chi^2 \leq 2df$	$2df \leq \chi^2 \leq 3df$
χ^2/df	$0 \leq \chi^2/df \leq 2$	$2 \leq \chi^2/df \leq 3$
p-value	$0.05 \leq p \leq 1.00$	$0.01 \leq p \leq 0.05$
RMSEA	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.08$
GFI	$0.95 \leq GFI \leq 1.00$	$0.90 \leq GFI \leq 0.95$
AGFI	$0.90 \leq AGFI \leq 1.00$	$0.85 \leq AGFI \leq 0.90$

Table 4: Results of path analysis (the conceptual model)

Total effect 1+2	Indirect path 2	Direct path 1	PathFrom-To
0.96 (11/86)	-	0.96 (11/86)	KM-KF
0/81 (9/72)	0/82 (2/12)	-0/1 (-0/02)	KM-QM
0/85 (2/16)	-	0/85 (2/16)	KF-QM

Numbers in the top row are path coefficients and those at the bottom indicate corresponding t-values

tool the Cronbach's alpha was used. Coming to an amount more than 0.7 for all three structures confirms the desirability of data collection tools in this study. To test the conceptual model, structural equations and path analysis in LESREL were used. By structural model, we mean the causal relationship between latent variables. The objective of this model is to find the effect of exogenous latent variables on endogenous latent variables, in other words it tries to present a path analysis of the study. In this stage, the main model of the study which indicates the relationship of the primary variables including knowledge management, knowledge in construction industry and project quality management is to be estimated. It is therefore, necessary to calculate factor scores in order to introduce factor values. Factor scores are determined by developing a formula in LESREL that is presented by Anderson-Rubin. These factor scores without their covariance matrix are exactly equal to the estimated covariance matrix of the references. The rest of the

methods of estimating factor scores lack this characteristic. Figure 1 indicates the conceptual model of the study.

Before analyzing the results of the conceptual model, the model should be appropriate and the fitness desirability tests should confirm the suitability of the estimate. In such circumstances the results of the model can be trusted. The indicators of fitness desirability are included in Table 3.

Referring to Fig. 2, the first four indicators can be easily viewed. The χ^2 equals 121/19 while the freedom degree equals 51 and $2df \leq \chi^2 \leq 3df$ is established and it is in the acceptable fitness range. Moreover, χ^2/df is also in the acceptable fitness range. The indicators AGFI, GFI, RMSEA and p-value are in the desirable or acceptable fitness range. So, it can say that the model is a good one regarding the fitness, thus can be trusted.

CONCLUSION

The remarkable point is that in the model of this study, KM has indirect effect on QM along with the direct effect, shown in Fig. 2. For the correct interpretation of the effect of KM on QM the total effect, which is the result of direct and indirect effects, is to be considered. The results of direct and indirect effects and the entire variables of the study are shown in Table 4.

According to the figure, the results of the effects among the variables indicate that the total effect of KM on KF and QM is statistically significant. In addition, statistically, KF has a significant effect on QM. As, it is shown in Fig. 2 and Table 1, the direct effect of knowledge management on quality management is not significant but

the total effect becomes significant through intermediate variable. It means that knowledge management provides the background of the project quality improvement in different aspects through the improvement of key knowledge factors. This means that the knowledge management implementation in these organizations can cause the improvement in quality management. Among key knowledge factors: Trust, incentive or reward, information technology and individual competency or skills, respectively have the greatest effects. In the domain of knowledge management: Knowledge harvesting, knowledge documentation, knowledge utilization and finally knowledge transfer have respectively the greatest effects. And about the quality: Quality assurance and quality control have the greatest effects. Therefore, we can summarize the conclusion in the following way:

- Knowledge management affects project quality management through key knowledge factors
- The influence of knowledge management on two of key knowledge factors, trust and visionary leadership is more than other factors and it influences project quality management through these two and other factors. Therefore, according to the point that knowledge management is not directly affecting project quality management, the aspects of knowledge management including “knowledge harvesting”, “knowledge documentation”, “knowledge transfer” and “knowledge utilization” can make the way to improve quality management through the key aspects of knowledge

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