CRITICAL SUCCESS FACTORS IN KNOWLEDGE MANAGEMENT AN ANALYSIS OF THE CONSTRUCTION INDUSTRY IN VIETNAM

LÊ VĂN*
Dr. CAO HÀO THI**

Abstract

This paper aims to determine the factors affecting the success in knowledge management (KM) by carrying out the survey of the construction industry in HCMC. While Vietnamese construction firms have recently been facing many crises, the efficient management and operations of foreign construction firms provide some useful experience for local companies. The result of 150 respondents surveyed in the construction industry reconfirmed that the criteria of effectiveness in KM can be measured by quality of service/product delivered, customer satisfaction level and profit performance which are the three of the most widely agreed criteria in most previous studies. Also it is found that KM effectiveness can be considered as the uni-dimensional construct, because results of the factor analysis have showed that only one factor was extracted and specified as KM effectiveness. A new finding from this paper is that the success factors on the KM effectiveness developed by Khalifa and Liu (2003) including KM strategy, culture, people, leadership, technology and can be merged into three new critical success factors, named as KM Social Capability, KM Process and KM strategy.

Keywords: Knowledge management, knowledge management effectiveness, knowledge management components, social capability, process, strategy, construction industry.

1. Introduction

Knowledge management, defined by Nancy Shaw (2009) as a "process of capturing, storage, sharing, nurturing and maintaining of knowledge," is very significant for an organization, especially in the construction industry because it has enormous and various characteristics. In construction practice, one of the most effective means of improving construction management is to share experience among engineers, which helps prevent mistakes that have already been encountered in the past construction works. Besides, there are some key drivers that help identify factors affecting KM success in construction industry in Vietnam: (1) There were many crises on construction projects in Vietnam recently but they were not translated into lessons for others to benefit from, so many mistakes were often repeated, (2) New knowledge, know-how, experience were not regularly updated or shared by the construction-related firms, (3) People waste their time and effort in collecting information/data/knowledge which already exist elsewhere in the organization.

In Vietnam, while Vietnamese construction firms have been facing those difficulties, the efficient management and operations of foreign construction firms provide some useful experience for local companies. The completion of skyscrapers in HCMC like Saigon Center, Metropolitan, and Ocean Palace since the 90s of the previous century has shown some marvelous successes. The stakeholders of those big projects are foreign companies with so much experience with the same works, all having good construction methods based on a well-prepared design procedures including: survey, design, construction, quality control, quality assurance, testing and inspection.

Beside their sound professional construction management, foreign construction firms also pay

much attention to management and operation process.

Clearly the lesson on "problems that have already been solved" by foreign companies have not been taken into account by local construction companies. Also, Yu and Lee (2005) emphasized the significant role of KM in construction industry, when indicating that "this know-how and experience of construction engineers and experts are most valuable because their accumulation depends not only on manpower but also on the spending of much money and time. How to apply the experience of the past finished projects for future similar projects is the main issue of KM." Therefore it is very important to identify critical success factors for KM in an organization.

2. Literature reviews

a. Measuring of knowledge management effectiveness

Chen and Chen (2006) divided KM performance into qualitative and quantitative measures from a variety of perspectives. While the American Productivity and Quality Center (2009) measured the KM effectiveness based on Return on Investment (ROI), Khalifa and Liu (2003) viewed KM effectiveness as KM's impact on achieving a firm's goals. This paper applies Khalifa's & Liu's qualitative-based view (2003) to identify criteria of KM effectiveness including: (1) Quality of Service/Product delivered, (2) Level of Customer Satisfaction, and (3) Profit Performance.

b. Identification of factors affecting KME

Initially, there were five factors (independent variables) possibly affecting KM effectiveness, including KM strategy, culture, technology, leadership and people. The following part deals with developing measures of these factors:

KM Strategy: The authors agree with Bruce and Fiona (2009) findings that KM strategy includes the following elements: (1) having a clear mission and business strategy; (2) having a clear and consistent success measures; (3) having an organization knowledge strategy and (4) having an organization commitment to evaluate and review.

Culture: Smith (2006) suggested that "an organizational culture can be measured through its components including (1) top managers aware of the importance of knowledge to corporate success; (2) staff participating in capturing and sharing knowledge; (3) training and learning creating true value; and (4) employees aware of the importance of knowledge to corporate success".

Technology: Measuring this variable is based on Smith's (2006) conclusion, after identifying major aspects of technology, that part of KM effectiveness comprises (1) the collaboration between members; (2) the learning as a group from multi-locations; and (3) the ability to document practices and experience for future use.

Leadership: Only strong leadership could provide the necessary direction, where an enterprise will need to implement and effectively deploy a KM strategy. This paper measures leadership through its components including (1) ability to integrate knowledge for decision making; (2) ability to request staff to share knowledge; (3) ability to tolerate risk and mistake; and (4) ability to support KM strategy.

People: Core elements of people that could affect KM effectiveness as identified by Bruce and Fiona (2009) include (1) efficient communication with other members; (2) effectively performance even in a change; (3) self-developing ability linked with the organizational business planning and (4) ability to capture and maintaining knowledge.

c. Organizational characteristic

Davenport et al (1999) identified organizational characteristic as one of the very important factors to the KM effectiveness. In the Vietnamese context in particular, through scanning the secondary data, there are some aspects of the organization, including (1) business category of the organization; (2) structure type of the organization and (3) average turnover per year of the organization, that could be used for measuring the impact of the organization characteristic on the relationship between KM components and the KM effectiveness.

d. Initial conceptual framework

Based on findings on the literature review and empirical studies, an initial conceptual framework between KM success factors and KM effectiveness is now proposed in Figure 1

3. Research methodology

Participants in the construction industry were selected for the questionnaire survey. The respondents were requested to tick on general information about their organizational characteristics. And then they were requested to rate all KM suc-

Figure 1: Initial Conceptual Framework
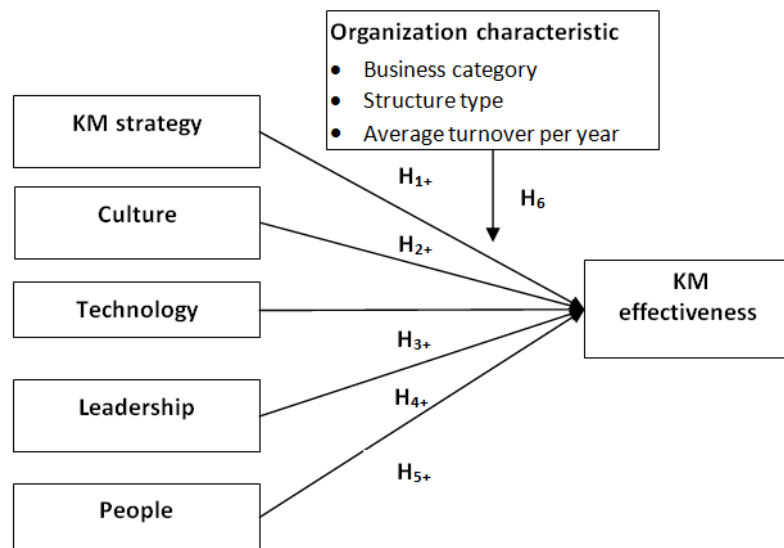
cess factors and personal perception of KM effectiveness according to a seven-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neither agree nor disagree, 5 = slightly agree, 6 = agree, and 7 = strongly agree), based on their actual perception regarding to what KM effectiveness should be. In this paper, statistical analysis such as reliability analysis, factor analysis and regression analysis will be used to test this relationship between critical success factors and KM effectiveness.

4. Data analysis results

The official survey was conducted by sending 245 sets of questionnaires to experienced people in construction industry in HCMC via email and face-to-face interviews. As a result, there were 110 (73.33% of response) replies in a total of 200 sets of questionnaires sent out by email and there were 40 (26.67% of total response) receipts per 45 sets of questionnaires by face to face interviews.

a. Descriptive analysis

Frequency analysis is used for setting out general information about an organization. The biggest business category in the survey is Investor with 48%. Samples also include 38.7% of matrix structured organizations in the survey followed by a 30% of functional structured organizations. In terms of average turnover per year, organization with an average turnover per year from VND10-

25 billion is the most common with 46% of the survey. There are 25.3% of organizations whose labor force comprises around 50 to 100 employees. The range from 5 to 10 years applying KM applications was the highest level in this survey with 47.3%. The most common type of application of KM system in the survey is the data warehouse, with 38.7% of surveyed samples.

b. Correlation analysis

The correlation analysis result shows the significant positive correlation between all KM components, namely KM strategy, culture, technology, leadership and people. Regarding analysis of correlation between KM components and KM effectiveness, all correlation values are positive and statistically significant. This proves that all factors have positive relationship with KM effectiveness. The result of correlation analysis is shown in Table 1.

c. Reliability analysis results

The KM effectiveness is measured by three variables. Cronbach's alpha reliability of this scale is 0.776. Factor KM strategy is measured by four variables, and has a Cronbach's alpha of 0.760. The reliability analysis shows the Cronbach's alpha of Culture is 0.781 which is relatively high, and it proves that the measuring scale applied to this factor is appropriate. The Technology is measured by three variables, and its Cronbach's alpha

RESEARCHES & DISCUSSIONS

Table 1: Correlation analysis between KM components and KM effectiveness

	Mean	SD	Correlation Coefficients		
			Deliverables of service	Customer satisfaction	Profit performance
Dependent variables					
Deliverables of service	4.200	1.617	1		
Customer satisfaction	4.653	1.399	.538**	1	
Profit performance	5.080	1.090	.557*	.520**	1
KMS1: Clear vision and business	4.973	1.022	.344**	.257**	.405**
KMS2: Success measures	4.760	1.091	.317**	.184*	.307**
KMS3: Knowledge strategy	5.153	.994	.337**	.364**	.342**
KMS4: Org. commitment	5.006	1.026	.318**	.361**	.296**
KMC1: Top manager awareness	5.046	.929	.330**	.366**	.311**
KMC2: Employee awareness	5.006	1.032	.288**	.277**	.362**
KMC3: Staff participants	5.113	1.190	.394**	.324**	.444**
KMC4: Training & Learning	5.133	1.133	.417**	.321**	.406**
KMT1: Staff collaboration	5.200	1.003	.448**	.356**	.456**
KMT2: Learning organization	4.840	1.248	.359**	.285**	.274**
KMT3: Documentary system	5.073	.934	.347**	.298**	.445**
KML1:Ability to integrate knowledge	5.266	1.070	.464**	.320**	.430**
KML2:Ability to request staff to share knowledge	5.300	.988	.362**	.311**	.330**
KML3:Ability to tolerates risk and mistake	4.980	.923	.373**	.313**	.391**
KML4: Ability to support KM strategy	5.366	.985	.397**	.371**	.490**
KMP1:Communication well	5.346	.996	.189*	.251**	.342**
KMP2:Effective performance	5.300	1.224	.397**	.341**	.480**
KMP3:Self-development	5.180	1.274	.450**	.435**	.447**
KMP4:Ability to capture and share knowledge	5.226	1.361	.369**	.427**	.411**

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

is 0.538. Leadership has the reliability coefficient of 0.746 while the factor People has the Cronbach's alpha of 0.806. The reliability analysis shows that all five factors have a relatively high Cronbach's alpha reliability and it proves that the measuring scale is appropriate and all correlation coefficients between independent variables and dependent variable are acceptable (higher than 0.3).

d. Factor analysis results

A total of three factors - KM strategy, KM so-cial capability, and KM process - were requested, with the culture and people factors merged into KM social capability, and technology and leadership factors merged into KM Process. The first factor accounted for 44.27% of the variance, the second factor 11.25% of the variance, the third factor 6.947% of the variance. The cumulative variance was 62.47% indicating that these above KM factors can explain 62.47% the variance of the observed variables. By conducting three rotations, the factor analysis result of independent variables

is appropriate for the reasons as follows: (1) Kaiser-Meyer-Olkin Measure of Sampling Adequacy is very high, KMO = .907; (2) the Varimax rotation of indicator of samples is also appropriate. The result of the EFA is depicted in Table 2.

Table 2: Factor analysis result of KM Factors

Independent variables before conducting EFA	Factor 1	Factor 2	Factor 3	Modified variable	Name of modified variable
KMC3	.804				
KMC4	.799				
KMP2	.725			X1	KM Social capability
KMP4	.723				
KMC2	.684				
KMP3	.652				
KMT3		.739			
KML4		.724		X2	KM Process
KML3		.698			
KMT1		.507			
KMS2			.818		
KMS4			.713	X3	KM Strategy
KMS1			.681		
KMS3			.620		
Eigenvalues	6.641	1.688	1.042		
Variance explained (%)	44.274	11.253	6.947		
Cumulative variance explained (%)	44.274	55.527	62.474		

e. Model modification to improve the research model appropriateness:

The initial conceptual framework can be modified because of various reasons, such as (1) The large sample size of this survey (n = 150) has confirmed the reliability of the factor analysis results; (2) Recently trends have extended the traditional notion of KM enablers to KM Capabilities; (3) Results of the exploratory factor analysis indicated clearly the strong relationship between indicators which can be merged into new variables and strongly suggested by new theory of KM researchers and (4) Importantly, the modifications also lend a theoretical sense to this research.

The adjusted research model is now presented in Figure 2 below:

Figure 2: Adjusted conceptual framework
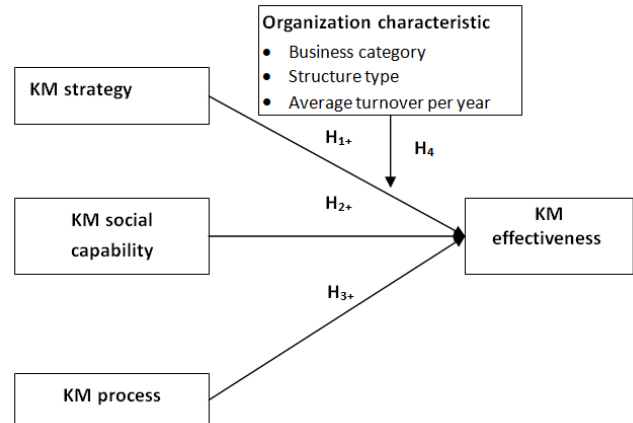
Based on the adjusted conceptual framework, hypotheses are suggested as follow:

H1: In an organization, KM strategy affects positively the KM effectiveness.

H2: In an organization, KM social capability affects positively the KM effectiveness.

H3: In an organization, KM process affects positively the KM effectiveness.

H4: In the KM context the strength of relationship between KM components and KM effectiveness is significantly impacted by the organization characteristic.

f. Regression analysis results

In this paper, three models have been developed. Model 1 was developed by analyzing the three independent and dependent factors. Model 2 was developed by adding variables of organization characteristics (ownership type of the organization, organizational structure type, and average turnover per year) into the Model 1 as dummy variables. Value 1 was assigned to "foreign-owned company" and value 0 was assigned to other ownership type; Value 1 was assigned to "functional structure" and value 0 was assigned to other types of organizational structure. Value 1 was assigned to firms having average turnover per year greater than VND50 billion and value 0 was assigned to firms having other average turnover per year. Model 3 was developed by adding three interactive variables into the Model 2. These three interactive variables were established by the three factors

above and "ownership type of the organization" variable. Results of regression analysis are described in the Table 3.

Model 1 in Table 3 indicates that three groups of factors including KM Social capability, KM Process and KM Strategy have significantly positive relationships with the KM effectiveness criteria.

When the three organization characteristics

cates that three independents variables including KM social capability, t = 3.049, p < 0.05; KM process, t = 3.871, p < 0.05; KM strategy, t = 2.203, p < 0.05 were found to affect positively and significantly the KM effectiveness. The ownership type of the organization with t = -2.569, p < 0.05 was also found to have a negative and significant effect on the relationship between KM components and KM effectiveness.

Table 3: Results of multi-variables linear regression analysis

Variables	Model 1	Model 2	Model 3	Collinearity Stat
	(beta coefficient)	(beta coefficient)	(beta coefficient)	
Factors:				
KM social capability	.413*	.406*	.243*	1.000
KM process	.439*	.394*	.316*	1.000
KM strategy	.311*	.329*	.171*	1.000
Dummy variables (organization characteristics)				
Ownership type of the organization		-.175*	-.171*	1.472
Organizational structure type		.014		1.200
Average turnover per year of the organization		.107		1.132
Interaction with Intervening Variables				
Factor related to KM strategy*Ownership type of the organization			.152	2.368
Factor related to KM social capability*Ownership type of the organization			.203	2.401
Factor related to KM process *Ownership type of the organization			.020	2.099
Constant/Intercept term	0.000	0.047	0.086	1.302
F-value	41.406*	22.573*	21.717*	2.368
R²-value	.460	.486	.517	2.401
Adjusted R²-value	.449	.465	.493	2.099

*Correlation is significant at the 0.05 level (2-tailed).

treated as dummy variables are entered in Model 2, Ownership type of organization continue to be significant p-value = 0.018 < 5%.

The overall model explains the data reasonably well, with 49.3% of the total variance in KM Effectiveness criteria being explained by Model 3. At each stage in transition from one model to the next, the increment of the adjusted R^2 is also significant, $F_{(7,142)} = 21.717$, p < 0.05 at sig F = 0.000. Moreover, the result in the Table 3 indi-

Multicollinearity statistics

Multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly correlated, and it is used for testing variables that have not been rotated with the Varimax rotation. According to the linear regression analysis, the variance inflation factor (VIF) value in the Collinearity status showed that no existence of multicollinearity of variables as the tolerance values are close to 1.0.

Researches & Discussions

ANOVA

Result of the analysis of Variance (ANOVA) is depicted in Table 4

Table 4: Result of Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	68.494	3	22.831	41.406	.000
	Residual	80.506	146	.551		
	Total	149.000	149			
2	Regression	72.477	6	12.079	22.573	.000
	Residual	76.523	143	.535		
	Total	149.000	149			
3	Regression	77.039	7	11.006	21.717	.000
	Residual	71.961	142	.507		
	Total	149.000	149			

As shown in Table 4, the result indicated that F values for three models are F1 = 41.406, F2 = 22.573, F3 = 21.717 and sig. = .000. These demonstrate that the linear multiple regressions between factors and KM effectiveness are appropriate to data and can be used.

5. Conclusion and recommendations

a. Conclusion:

This paper developed and tested a research model (as shown in Figure 2) of critical success factors in the interaction with organization characteristics on the KM effectiveness. The results of this paper supported the KM critical success factors on the KM effectiveness based on the literature review. From the results, good pre-requisite for the future use of KM in Vietnam can be applied. Especially, in the construction industry, a KM system is crucial where knowledge can be captured, shared, nurtured, exchanged and maintained for completed and future projects. It is where the questions of business performance, client satisfaction and enhanced business process can be addressed to achieve a sustainable competitive advantage for local construction companies and foreign construction entities in the context that Vietnam has become a full WTO member.

Secondly, this paper clarified that factors related to KM social capability affect KM effectiveness criteria. It is suggested that the more emphasis on the creation of a knowledge-friendly culture where the collaboration between staff members are to bring confidence and trust as they are required to encourage the application and development of knowledge within an organization. It is agreed with Que et al. (2009) that "The Vietnamese–specific cultural attributes are extremely important to entrepreneurial culture which, in turn, positively influences the KM capability of an organization and the KM effectiveness." This result highlights the necessity to consider KM social capability as a critical factor affecting the KM effectiveness.

Thirdly, the paper also demonstrated that factors related to KM process affect KM effectiveness criteria. The researchers agreed with Savary (1999) that an effective information infrastructure is necessary for the organization to implement the KM process. Dan (2008) confirmed that a rapid development of the ICT sector in Vietnam and its application will create a good precondition for the future use of KM in Vietnam. This explains why KM process could affect the KM effectiveness as "the Vietnamese-specific industrial characteristics, plus emerging private sector and the fast growing economic boom have created a more intensive and dynamic competition landscape, requiring firms to upgrade their technological equipment and information system to acquire and maintain a competitive advantage" (Que et al., 2009).

Finally, the paper results also support the literature review that the organizational characteristics have a moderating effect on the relationship between the KM components and KM effectiveness. The ownership type of the organization has affected the relationship between the KM components and the KM effectiveness (beta coefficient is .175* significant at level 0.05). It is also supported by Dan (2008) that "KM is a very new concept in Vietnam in general and in the stated-owned firms and organizations in particu-

lar"; and to large foreign companies "it is already applied the KM in their organization as it used in their parent companies aboard."

b. Recommendation

In terms of managerial implication, the hypothesis that "KM process has a positive effect on the KM effectiveness" is supported by the statistical result (p-value < 0.05), with KM process as defined by Khalifa and Liu (2003) including leadership, technology, it is important that the awareness of Vietnamese leaders on the role of KM should be increased so that KM application can be widely facilitated through the government's policies (Asian Productivity Organization, 2008) as without "the support of top-level managers, the success of KM activities is cumbersome" (Civi, 2000).

Secondly, KM social capability has a strong effect on KM effectiveness (supported by the hypothesis testing with p-value < 0.05), it is strongly suggested that the corporate managers should create a friendly working environment and have a strong commitment to the KM strategy so that knowledge can flow thoroughly within the organization, create the collaboration between the departments and integrate into the leader decision making process. In addition, a culture of confidence and trust is required to encourage the application and development of knowledge within an organization. Only by so doing could the local companies possibly achieve a competitive advantage to foreign companies.

Thirdly, the ownership type of the organization has a moderating effect on the implementation of KM (with beta coefficient is -.175 and p-value < 0.05 also supported through the statistical analysis result), given that SME plays an important role in the Vietnamese economy (Asian Productivity Organization, 2008), the application of KM in the SME sector can and should be promoted to ensure the rapid and sustainable development of this sector∎

References

1. Asian Productivity Organization (2008), *Knowledge Management in Asia – Experience and Lessons*, ISBN: 92-833-7065 -1

2. Bruce and Fiona (2009). "Best Practice in Managing Knowledge – Benchmarking Knowledge Management Within and Between Organizations", Fianian Pty Ltd.

3. B. Choi, H. Lee (2003). "An Empirical Investigation of Knowledge Management Styles and Their Effects on Corporate Performance", *Information and management*, 40, pp.403-417.

4. Dan Vu Hong (2009). "Some Discussions about Knowledge Management of Vietnamese Entrepreneurs". *Vietnam Productivity Center*.

5. Que NTN, Philip A. Neck, Thanh NT. (2009), "The Critical Role of Knowledge Management in Achieving and Sustaining Organizational Competitive Advantage", *International Business Research*, 2(3).

6. Yu C. Lin, Lee K. Lin. (2006). "Critical Success Factors For Knowledge Management Study In Construction". ISARC 2006.