EXPLORING AND RECONCEPTUALIZING KNOWLEDGE ACQUISITION IN CONSTRUCTION CONTRACTORS

Jane Sekarsari Tamtana

Trisakti International Business School,
Trisakti University, Jakarta, Indonesia
tamtana@cbn.net.id

Session L-4

Abstract

This paper presents a brief review of the exploration of the author's study in analyzing a model in learning mechanisms in contruction contractors. To address improvement companies use learning mechanisms that help acquire knowledge for generating new and effective ways of working. Learning mechanisms based on networks such as Networks based on construction industry institution, professionally based networks (Instutute of civil Engineers); Inter company networks based on the value chain also employee based networks has a direct relationship with firm's performance. The performance of the companies in the study of learning mechanisms are as simple as the attributes of the firms, which are financial turnover range, size, number of employees and number of years in business. The exploration of the other study based on concept of technology strategy as knowledge strategy shows significant relationship between the total value of knowledge strategy and competitive performance for internationally linked companies supports. This study provides a reconceptualization for future investigation and understanding knowledge acquisition in construction contractors.

Keywords: knowledge acquisition, learning mechanisms, performance, technology strategy.

Exploring and reconceptualizing knowledge acquisition in construction contractors

Jane SekarsariTamtana [a],

[a] Trisakti International Business School
(Trisakti University)
Jakarta, Indonesia
tamtana@cbn.net.id

Abstract

This paper presents a brief review of the exploration of the author's study in analyzing a model in learning mechanisms in contruction contractors. To address improvement companies use learning mechanisms that help acquire knowledge for generating new and effective ways of working. Learning mechanisms based on networks such as Networks based on construction industry institution, professionally based networks (Instutute of civil Engineers); Inter company networks based on the value chain also employee based networks has a direct relationship with firm's performance. The performance of the companies in the study of learning mechanisms are as simple as the attributes of the firms, which are financial turnover range, size, number of employees and number of years in business. The exploration of the other study based on concept of technology strategy as knowledge strategy shows significant relationship between the total value of knowledge strategy and competitive performance for internationally linked companies supports. This study provides a reconceptualization for future investigation and understanding knowledge acquisition in construction contractors.

Keywords: knowledge acquisition, learning mechanisms, performance, technology strategy

1 Introduction

In the construction contractors building learning mechanism systems is generally seen as a technical process. Various problems arise from time to time during this process, because of the perception of the entire process as technical, the literature reflects a continuing search for solutions to such problems that are also technical in nature. During the recent years as the property development start to rise and due to the competitive environment, there was a need of the construction industry particularly the construction contractors, to manage organizational knowledge in terms of how to gain access to new knowledge (renew) in construction technologies, to use, to store, to transmit and to share within the organization. Kululanga et al (1999) introduces concepts of organizational learning and how they relate to UK construction contractors. In their study relating technology strategy and competitive performance, Hampson K. and Tatum, C.B.(1997) developed five grouping or dimensions of technology strategy

framework related to improving performance. Davenport (1998) reported that Ernst and Young (E&Y) knowledge managers believed that knowledge primarily resided in people, not technology. However, the scope and geographical distribution of the E & Y knowledge base and its users meant that technology had to be used as an enabler wherever possible. A good application of learning mechanisms employed is a need toward the tight competition. The Indonesian construction contractors had also established integrating learning through collaborative work arrangements which provide forums for knowledge acquisition. Such companies have established joint-ventures with local partner. This paper analyze the results of two study using a combined framework based on the reviewed literature and a reconceptualization for future investigation knowledge acquisition in construction contractors

2 Knowledge Acquisition

In their paper, Kululanga et al (1999) quoted Federle and Chase (1993) that continuous improvement has become an ever- present reality to construction contractors. The need to explore the learning mechanisms of construction contractors in such vacillating business circumtances become eminent to understand the dynamics that govern their appropriation and acquisition of knowledge that influence innovation and continuous improvement. The main motivation for such continuous learning as part of an organization's culture is of course to continuously improve thereby ensuring superior performance and competitive advantage. In construction the products are unique there is little room for change and experimentation in a given project. Processes change slowly and the choice of technology is not the exclusively decision of the user (Carillo,1993).But, the construction process should evolve to increase productivity and efficiency in coping with an evermore competitive era. Construction firms managers need to recognize the competitive need to invest in and apply more appropriate technology that will benefit their operation. Thee (1990) in his study of technology transfer through transnational corporations in selected manufacturing industries in Indonesia found that local technological effort, that is the use of technological knowledge to adapt technology which may lead to a higher level of technological mastery, is greater in national companies without transnational corporations equity involvement than in joint ventures. Conversely, Ofori's (1994b) case study in Singapore found that a joint venture is the most widely preferred vehicle for construction technological knowledge transfer.

2.1 Technological knowledge strategy

The research Hampson and Tatum (1997) extended Burgelman and Rosenbloom's study (1989), which proposed an evolutionary process framework for the formation of technology strategy. The researchers' idea is that technology strategy emerges from organizational capabilities, shaped by the generative forces of the firm's strategic behavior and the evolution of the technological environment, and by the integrative mechanism of the firm's organizational context and the environment of the industry in which it operates. The results of the study of Hampson (1993) provide a series of quantitatively-based dimensional measures for analyzing a firm's technology strategy. In the study of Sekarsari J., 2002) the framework of Hampson and Tatum (1997) was used to serve as the basis for analyzing technological knowledge strategy (technology strategy) in construction. They described *five dimensions of technology strategy* portion of their research in studying the relationship with competitive performance as follows: *competitive positioning, sourcing of technology, scope of technology strategy, depth of technology strategy and organizational fit*. Competitive positioning includes: relative emphasis of technology in business strategy and relative command of key technologies in the market; the dimension of sourcing of technology consists the degree of the firm structures its approach to the acquisition of explicit (hardware) and implicit (knowledge) value-creating technologies; the scope of technology strategy consists of the core and peripheral technologies in the firm and sources of information concerning these technologies; while the dimension of depth of technology strategy includes: relative emphasis on research and development, depth of technical capabilities, and emphasis on breaking construction operations down into task performed by specialists. The last dimension, organizational fit includes the matching of the reward systems in the firm with the technological objectives and the structuring of information flows throughout the organization.

2.1 Learning Concepts

A learning mechanisms is a tool, that in many cases, is applied deliberately to achieve a desired outcome. To address improvement, companies use learning mechanisms that help acquire knowledge for generating new and effective ways of working (Kululanga et al (1999). They identified the main learning mechanisms as five categories : *Category A : Learning mechanisms based on collaborative arrngements; Category B: Learning mechanisms based on noncollaborative arrngements; Category C : Learning mechanisms based on networks; Category D: Learning mechanisms based on in-house research schemes, team learning, reviews, benchmarking, shows*

and exhibitions and Category E: Learning mechanisms based on individual employees.

2.1 Competitive Performance

Competitive performance is a difficult concept to define and measure. Thompson (1967) stated that regardless of the basis for organizational assessment (efficiency, instrumental or social tests), the important issue for organizations is preparedness for future action. Very often the determinants of industry, firm and business performance is described in models which link to various indicators such as some combination of elements of environment, firm strategy and organizational characteristics. In their framework for diagnosing competitive superiority, Day and Wensley (1988) input elements of competitive advantage is superior skills and superior resources which could also be achieved by technology development. The output elements influenced as performance outcomes are market share and profitability, satisfaction and loyalty. Hampson and Tatum (1997) incorporates organizational policies, size and contract volume to moderate the influence in the relationship of technology strategy and competitive performance. As developed by Hampson (1993):*a series of competitive performance indicators* used by the first study (i.e.: trends in value of contract awards both in value of contract awards and proportional growth in contract awards) have been used and these indicators applied consistently to all firms. Three attributes of the construction contractors involved in the study of Kululanga et al (1999) which were used in the survey of Komala A. & Sekarsari J. (2001) are as follows: number of years in busness, average number of employees and financial turnover.

3 Methodology

The aim of this study is to analyze qualitatively the relationship between the findings of the two study of (Sekarsari, J., 2002) and (Komala A. & Sekarsari J. 2001). To achieve the objectives of the two study, the nonparametric technique Spearman Rank Correlation had been employed. The first study (Sekarsari, J., 2002) and the second study (Komala A. & Sekarsari J. 2001) of the construction industry assessed the degree of association between the independent variable and dependent variable using Spearman Rank Correlation. Therefore this survey will examine the findings based on Rank score and average score *(R)* of the previous study.

The first group of sample of this study (Sekarsari, J., 2002) were five Indonesian joint venture multi-story buildings construction firms as the “internationally linked domestic firms” include joint ventures (Group L) and five “domestic firms”(Group D) Both group are members of the Indonesian Contractors Association for the year 2000. The second group of sample of this study (Komala A. & Sekarsari J. 2001) were ten Indonesian multi-story buildings construction firms with different collaborative arrangements. (Group M)

Measures of technological knowledge strategy/ technology strategy (TS) of the first study consisted of 29 items scale, grouped in five dimensions i.e.: *competitive positioning*: relative emphasis of technology in business strategy, and relative command of key technologies in the market; *sourcing of technology*: how the firm structures its approach to the acquisition of explicit (hardware) and implicit (knowledge) value-creating technologies; *scope of technology strategy*: core and peripheral technologies in the firm and sources of information concerning these technologies; *depth of technology strategy*: relative emphasis on research and development, depth of technical capabilities, and emphasis on breaking construction operations down into task performed by specialists and o*rganizational fit*: match of the reward systems in the firm with the technological objectives and the structuring of information flows throughout the organization. The technology strategy measures utilizing a five point Likert response format.As developed by Hampson (1993):*a series of competitive performance indicators* (i.e.: trends in value of contract awards both in value of contract awards and proportional growth in contract awards) have been used and these indicators applied consistently to all firms. Also included a productivity measure i.e.: contract award value per technical management employee as an objective indicator of competitive performance.

Measures of learning mechanism of the second study consisted of 39 items scale, group also in five category. *Category A **:** Learning mechanisms based on collaborative arrngements* (12 items scale) *; Category B: Learning mechanisms based on noncollaborative arrngements* (4 items scale)***;*** *Category C **:** Learning mechanisms based on networks*(8 items scale)***;*** *Category D: Learning mechanisms based on in-house research schemes, team learning, reviews, benchmarking, shows and exhibitions* (9 items scale)***,*** *and Category E: Learning mechanisms based on individual employees* (6 items scale).

4 Discussions

The objective of the study (Sekarsari, J., 2002) is to examine how technology strategy affects the competitive performance of multi-story buildings contractors owned by the internationally linked domestic firms (Group L) and the domestic firms (Group D).*Table 1* indicated that there was a perfect direct relationship ($r_{s=}$ 1.000) between technology strategy (all five group dimension) applied by Firm L1- Firm L5) and their average objective competitive performance.

Table 1. Spearman Coefficients for Technology Strategy Values and Competitive Performance indicators of Firms for Group L (source : Sekarsari, J. 2002)

Competitive Performance Indicators	Technology Strategy Values					
	Compe-titive Positi oning	Sourcing of Techno-logy	Scope of Techno-logy Strategy	Depth of Techno-logy Strategy	Organi-zational Fit	Total Techno-logy Strategy Values
Contract Award Growth ($M/Year) Annual Data 1992-1997	-0.053	-0.410	0.132	0.632	0.564	0.308
Contract Award Growth ($M/Year) Annual Data 1992-1995	0.667	0.500	0.872*	0.616	0.5	0.900*
Av Annual Contract Award Per Tech Mgt Employee ($M/Year) - 1992-1995	0.821*	0.600	0.872*	0.526	0.3	0.8
% Growth in Annual Contract Awards 1992-1997	-0.053	-0.410	0.132	0.632	0.564	0.308
% Growth in Annual Contract Awards 1992-1995	0.872*	-0.100	0.872	0.667	0.7	0.8
Average Competitive Performance Indicators	0.821*	0.900*	0.975**	0.872*	0.8	1.00 **

* correlation is significant at 0.05 level (1-tailed);

** correlation is significant at 0.01 level (1-tailed)

Sourcing of technology was negatively correlated with three competitive performance indicators. Competitive positioning was negatively correlated with two competitive performance indicators: contract award growth from 1992 through 1997 and growth rates in annual contract award from 1992 through 1997. The rest of other dimensions of technology strategy and all competitive performance indicators were directly correlated varying from 0.132 to 0.900. *Table 2* indicated that there was a significant direct relationship ($r_{s=}$ 0.667) between technology strategy (all five group dimension)

applied by Firm D1- Firm D5) and their average objective competitive performance. Also Spearman coefficient for the correlation in the *Table 2* indicated that there was a perfect direct relationship ($r_{s=}$ 1.000) between scope of technology strategy applied by Firm D1- Firm D5) with contract award growth annual data from 1992-1997. Depth of technology and organizational fit were significantly correlated with three competitive performance indicators: contract award growth from 1992 through 1997, contract award growth from 1992 through 1995, and average annual contract award per technical management employee from 1992 through 1995.

Table 2. Spearman Coefficients for Technology Strategy Values and Competitive Performance indicators of Firms for Group D (source : Sekarsari, J. 2002)

Competitive Performance Indicators	Technology Strategy Values					
	Compe-titive Positi oning	Sourcing of Techno-logy	Scope of Techno-logy Strategy	Depth of Techno-logy Strategy	Organi-zational Fit	Total Techno-logy Strategy Values
Contract Award Growth ($M/Year) Annual Data 1992-1997	0.700*	0.900*	1.00**	0.975**	0.975**	0.975**
Contract Award Growth ($M/Year) Annual Data 1992-1995	0.308	0.564	0.667*	0.684*	0.684*	0.684*
Av Annual Contract Award Per Tech Mgt Employee ($M/Year) - 1992-1995	0.700*	0.900*	1.00**	0.975**	0.975**	0.975**
% Growth in Annual Contract Awards 1992-1997	-0.500	0.100	0.200	0.051	0.051	0.051
% Growth in Annual Contract Awards 1992-1995	-0.600	-0.300	-0.100	-0.205	-0.205	-0.205
Average Competitive Performance Indicators	0.200	0.600*	0.700*	0.667*	0.667*	0.667*

* correlation is significant at 0.05 level (1-tailed);

** correlation is significant at 0.01 level (1-tailed)

The rest of other dimensions of technology strategy and all competitive performance indicators were directly correlated varying from 0.051 to 0.900.

The other study (Komala A. & Sekarsari J. 2001) gives also a similar result. *Table 3* shows that Number of years in business has direct correlation only with Learning mechanism Category C and D, and Number of employees has direct correlation only

with Learning mechanism Category A and C. Financial turnover has direct correlation with Learning mechanism Category A, B and C.

Table 3 Relationship between Firm's Attributes and Learning Mechanism Category A –E For Group M (source Komala, A. & Sekarsari, J. 2001)

Attributes of firms	Range	Category A	Category B	*Category C*	Category D	Category E
AG	30% (21-29 yrs) 40%(11-20yrs) 20%(>30yrs)	NC	NC	*DC*	DC	NC
NE	50%(100-250) 40%(<100) 10%(250-500)	DC	NC	*DC*	NC	NC
TO	80% (>12 mill. US $) 10% (6-12mill.US$) 10% (1-6 mill US $)	DC	DC	*DC*	NC	NC

Attribute of firm sample **:** *AG* (number of years in business), *NE* (number of employees) and *TO* (financial turnover)
NC means no correlation occurred*; DC* : shows there is a direct relationship / correlation

5 Conclusions

The results of the study strongly support the importance of technology strategy and learning mechanism for firm performance (contract award, number of employees and financial turnover). The higher Spearman coefficients for group L ("internationally linked domestic firms") was also supported by the results of the second study that Learning Mechanism Category C based on networks i.e. international networks, research based networks, theme focus networks, professionally based networks, inter company based networks, socially based networks and employee based networks, intercompany networks is the only Learning Mechanism Category that has a direct relationship with all the firms' attributes. The findings of this study have potentially significant implications for technological knowledge strategy as well as for managerial practice. This paper also provides a basis for future investigation and understanding of learning mechanisms and technological knowledge strategy and management. Industry professionals can use these results to better define priorities and move forward into a culture of knowledge management to increase their ability to innovate and ensure continuous improvement demanded in today's dynamic construction business environment

References

Hampson, Keith and Tatum C.B. (1997). Technology Strategy and Competitive Performance in Bridge Construction. *Journal of Construction Engineering and Management*, 123 (2), 153-161.

Komala, Antony and Jane Sekarsari (2001) *Analisis Penerapan Mekanisme Belajar Pada . Industri Konstruksi, Studi Kasus pada 10 Kontraktor*. Unpublised Thesis Civil Engineering Department Tarumanagara University.

Kululanga, McCaffer, Price and Edum-Fotwe (1999) Learning Mechanisms Employed By Construction Contractors. *Journal of Construction Engineering and Management*, July-August, 215-223.

Ofori, G. (1991). Programmes for Improving The Performance of Contracting Firm in Developing Countries : A Review of Approaches and Appropriate Option. *Construction Management and economics***,** 9: 19-38.

Sekarsari, Jane (2002). *Knowledge Management Employed by Firms A Study of The Indonesian Construction Contractors*, OKLC 2002 proceedings, Athena, Greek.

Tatum, C.B. (1988b). A Classification System for Construction Technology. *Journal of Construction Engineering and Management*, 113 (4), 648-663.