Int. J. Nonlinear Anal. Appl.
Volume 12, Special Issue, Winter and Spring 2021, 1299-1309
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/IJNAA.2021.5647

Effects of technology transfer on sustainable competitiveness in Thailand

Natarpha Satchawatee[a,*], Sutana Boonlua[a], Palan Jantarajaturapath[a]

[a]*Mahasarakham Business School, Mahasarakham University, Thailand.*

(Communicated by Madjid Eshaghi Gordji)

Abstract

The research main objective is to investigate the effects of technology transfer capability (which are learning capability, acceptance orientation, innovation focus, exchange competency, and change awareness) on sustainable organizational competitiveness. The key research question is How does technology transfer capability relate to sustainable organizational competitiveness of the ICT companies? About 286 questionnaires were usable for analysing with effective response rate of 76.06 percent. The key informants are top executives of the information and communication technology business around Thailand. The results show that innovation focus and exchange competency positively affect sustainable organizational competitiveness. That means the technology transfer capability is important for firm's competitiveness. The innovation focus is essential components of technology transfer capability that enhances new product development, valuable operational enhancement, remarkable business efficiency, and firm performance.

Keywords: Technology transfer, Sustainable competitiveness, Information and communication technology companies

1. Introduction

In the age of the contemporary business world that has dynamic and continuous change, an enterprise is being competitiveness of introducing new products or services and innovating business processes to have faster than competitors [27]. Most business firms are faced with competition characterized by product and market uncertainties, globalization and rising research and development

*Corresponding author
Email addresses: natarpha.s@acc.msu.ac.th (Natarpha Satchawatee), sutana.t@acc.msu.ac.th (Sutana Boonlua), palan.j@mbs.msu.ac.th (Palan Jantarajaturapath)

Received: June 2021 *Accepted:* September 2021

costs, technology management is important to the business and becomes the main determinant of competitiveness [14]. Business firms with technology management those have ability to connect a firm's technology to customer needs and to other firm resources [15]. Moreover, the firm's strategy is to increase the management of technology transfer activities that plays a significant role in enhancing the firm competitiveness [27]. Consequently, the technology transfer has been accepted as a high utility for increasing competitive advantage s over other firms in the stiff markets [29]. The factor determines the practicality of technology transfer is the firm's advance capacity [14]. A firm's technology strategy affects to the firm performance, which achieves significant advantages for the business firms [31]. Thus, a technology transfer that is strategy to enable business firms to achieve sustainable organizational competitiveness.

The ability of businesses and community can utilize technology in support of growth, competitiveness and development [3]. Thailand's ranking for firm level technology absorption, is in order at 53 from 139 countries and has the score at 4.9 which is greater than 4.7 of average score (The range of scores: [1, 2, 3, 4, 5, 6, 7]). This indicates that business firms realize of new technology into firm's operations. It highlights that Thailand business firms can adopt new technologies and apply into their operations.

Currently, information and communication technology (or ICT) business in Thailand, which is in the digital era so called Thailand 4.0. The Thai government has focused on Thailand 4.0 which is the country's strategy to reposition Thailand's economy to reform economy structure into value-based economy and develop Thailand into a group of high-income countries. Thailand 4.0 is the economic model that has changed from producing commodity products oriented towards innovation. The concept of Thailand 4.0 is to change the traditional work style to the management and use of new technologies to provide entrepreneurs more efficiency. In other words, this change drive Thailand with technology, creativity, and innovation. The potential foreign direct investment (FDI) build up a spillover effect that is one of the most effective channels of technology transfer [27] and help in terms of economic development which will boost the country's successful approaching a Thailand 4.0 economy [44]. Hassan and Jamalludin [20] suggested that government policy, transferor and transferee characteristics, technology spillover environment, and technology knowledge capability factors becoming the important indicators of technology transfer performance to the host information and communication technology industry. Therefore, the support from the government will enable the information and communication technology firms with strategic technology transfer capabilities that are able to succeed competitive situation. Thus, the information and communications technology (ICT) companies in Thailand can be selected as a sample in this research.

The Federation of Thai Industries (FTI) has announced that the information technology industry has increased up to 10 percent in 2018 [11]. This shows that ICT companies play significant role and affect to the Thai economy development. Therefore, the ICT companies has suitability and the potential to examine five dimensions of technology transfer capability simultaneously.

This research's main objective is to investigate the effects of technology transfer capability (five dimensions : learning capability, acceptance orientation, innovation focus, exchange competency, and change awareness) on sustainable organizational competitiveness. This is to find the solutions from research question is, "How does technology transfer capability relate to sustainable organizational competitiveness of the ICT companies?"

2. Literature review

The prior literature and theoretical perspectives used to explain the overall conceptual framework, the effects among each of five dimensions of technology transfer capability (learning capability,

acceptance orientation, innovation focus, exchange competency, and change awareness), and its direct outcome (sustainable organizational competitiveness), are investigated and expected to yield positive effects.

2.1. Technology transfer capability

The technology transfer (or 'transfer of technology') must be realized in three main objectives including the introduction of new techniques by improving existing techniques, investment new plants, and generating new knowledge [21]. Janssen [24] has set clearly defined that the technology transfer is a movement of idle equipment and machinery from one place to another. It also includes the adoption and transfer of know-how, technique, and information. Technology transfer is a process of sharing of knowledge, methods, skills, and technology of manufacturing from a developed to a developing country [33]. Technology transfer is a process of deliberate and systematic acquisition of machinery, skills, information, intellectual rights, operational processes, plans and amenities, for manufactures and applications [9].

There are five dimensions of technology transfer capability have been modified from Zahra, Larrañeta and Galán [47]. The key dimension of absorptive capacity including acquisition, integration, conversion, and utilization. The first dimension of technology transfer capability is a capability of technology learning, which describes as the firm's capability to acquire the knowledge and to understand information received. Acceptance orientation, the second dimension, it is a firm's capability to combine the routines of existing knowledge. Likewise, exchange competency is the third dimension, it illustrates the firm's capability to manage the knowledge. And the last dimension, utilization is adapted from all of the dimensions of absorptive capacity together.

Learning capability

The learning capability is a technological knowledge that has the possibility to approach a firm's competitive advantage [26]. This proposes the firms need technology strategies to encourage continuous learning, which to create a competitive advantage. Moreover, technology learning in firms can take place through interactions at local and international levels of competition as well [46].

Acceptance orientation

The acceptance orientation are defined as production and innovation orientations. It is ability to adapt a substantial technological experience then develop new products [13]. The firm's strategy of aceptance orientation that is expected to create sustainable competitive advantage [48]. The technology orientation can assume as innovation and product. It refers to a firm's tendency to utilize new technologies, new products, and innovation [19]. The firms' long-term and sustainable success can create a new way beyond new technological solutions, products, services, innovations, or production developments. It is to guide the activities and strategies of the technology-oriented firm [48] to overcome the competitors.

Innovation focus

The changing in market environments makes firms developing particular processes and activities to build a differentiate and innovation themselves from their competitors for getting business opportunities and long-term competitiveness [2]. Product innovation refers to developing and deliver new products, technologies and approaches, as improve existing products for better quality and efficiency [41]. The innovation refers to invent and change to the new system, methods, and process management in the firm, as a result, the productivity, production, product design, and service delivery

increase more efficiency [16]. Technological innovations relate to products/non-products and technology in production process [7]. Thus, technology innovation includes product/process innovation and radical/incremental innovation, which this occurs when innovation is based on the use of technology for change. Accordingly, technology innovation will focus of new functionality or improves product specifications, while design innovation boosts appearances and friendliness for users. It found that the innovation capability of the firm which is disciplined in the strategies, systems, and structures and leads to the continuous innovation development to the changing market environment [15].

Exchange competency

The exchange competency is most definitely happening between organizational requirements and the technical abilities to make the exchange possible. The technology exchange shades light on technology oriented, which distinguishes of technology related activity including technological information transfers and technological needs [39]. The technology exchange in terms of commonly advantage in technology flows that can concern current barriers to technology transfer. In this research, exchange competency is as the firm's ability to supervise the knowledge and skills in technological information, requisition, and requirement for two-way sharing which is mutually beneficial into firms [30].

Change awareness

The technology change awareness can be used as a strategy of the firm to establish technology capabilities. It is to consider as a significant change of technology in the firms [4]. Firms have technology alignment that will be taken into consider technological change in the fir. It is to match with technology and standard as set in the strategy [5]. In this research, change awareness in technology is as the firm's perception explicitly which is a technological advance and movement to provide the highest usefulness of the firms [4]. The informational capabilities as activating, potential technicians must transform technology must be invented, adapted, transferred, and kept information with new ways to organize the task. The technology changes fit interactions between organizations, resulting in productive technology transfer, which positively affects the firm's competitive advantage [25].

2.2. Sustainable organizational competitiveness

Peteraf and Barney [36] state that competitive advantage as an ability to establish economic benefit more than margins. Feurer and Chaharbaghi proposed that a competitiveness can take into account of sustainability as shareholder/customer values, financial power, and resource potential. The financial power is ability to act and react within the competitive environment. The implementation of resources and technology potential is strategic necessary to change in the firms [12]. Thus, the sustainable organizational competitiveness is assumed that sustained superior performance arises from superior competitiveness to compete successfully. Firms can produce the right goods and services of the right quality, price, and time to meet the needs of customer more efficiently and effectively than rivals [10]. There must be a balance of these factors to achieve these capabilities in the long. Likewise, Singh also indicates that competitiveness contributing to the increased performance of the firm or firm's quality rivals, led to results of increased benefits for the firm. Prempree, Ussahawanitchakit and Boonlua [38] argue that the competitiveness is positively correlated with firm performance and value. Moreover, there is an impact of firm sustainability on processes and performance, which found that firms with voluntarily adopted sustainability policies become sustainability companies in a high range [8].

To approach a competitive advantage and to be more innovative and successful firm, technology transfer capability is likely to sustain on firm competitiveness. According to the above review on technology transfer capability, the hypotheses can be proposed as:

Hypothesis 1: Learning capability is positively affected to sustainable organizational competitiveness.

Hypothesis 2: Acceptance orientation is positively affected to sustainable organizational competitiveness.

Hypothesis 3: Innovation focus is positively affected to sustainable organizational competitiveness.

Hypothesis 4: Exchange competency is positively affected to sustainable organizational competitiveness.

Hypothesis 5: Change awareness is positively affected to sustainable organizational competitiveness.

The conceptual framework is expected to be positive as shown in Figure 1.

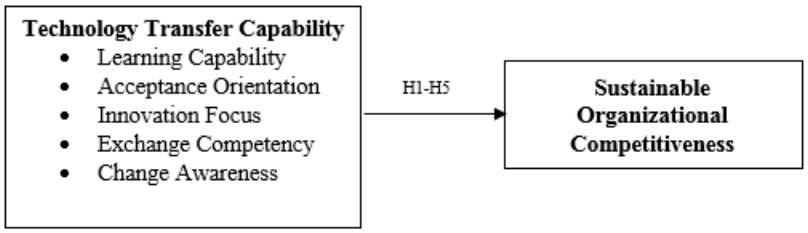

Figure 1: The conceptual framework between technology transfer capability and sustainable organizational competitiveness

3. Research method

A list of 18,466 Thai information and communication technology firms that are provided by the database online of the Department of Business Development, Thailand (www.dbd.go.th). The required sample size to be representative in this research is 376 firms, which is a minimum usable sample size with 95 percent confidentiality [28].

The questionnaires are appropriately used to collect data in this research for large-scale data collection in mailing questionnaire which is an appropriate instrument to gather data from different geographical areas at low cost strategic [37]. The key informants are top executives of the information and communication technology business around Thailand. The organizational strategic decisions and actions are motivated by top executive perceptions [42]. Therefore, the measurement by top executive is likely to be appropriate in this research. The completed questionnaires mailed to respondents and were directly sent back to the researcher about 298 firms but 12 uncompleted questionnaires. Therefore, only 286 questionnaires were usable for analysing. The effective response rate was approximately 76.06 percent.

A framework provides researchers to achieve the objectives of the research. The framework must be well-organized in a systematic process. Figure 2 illustrates the flowchart of the research framework employed in this research.

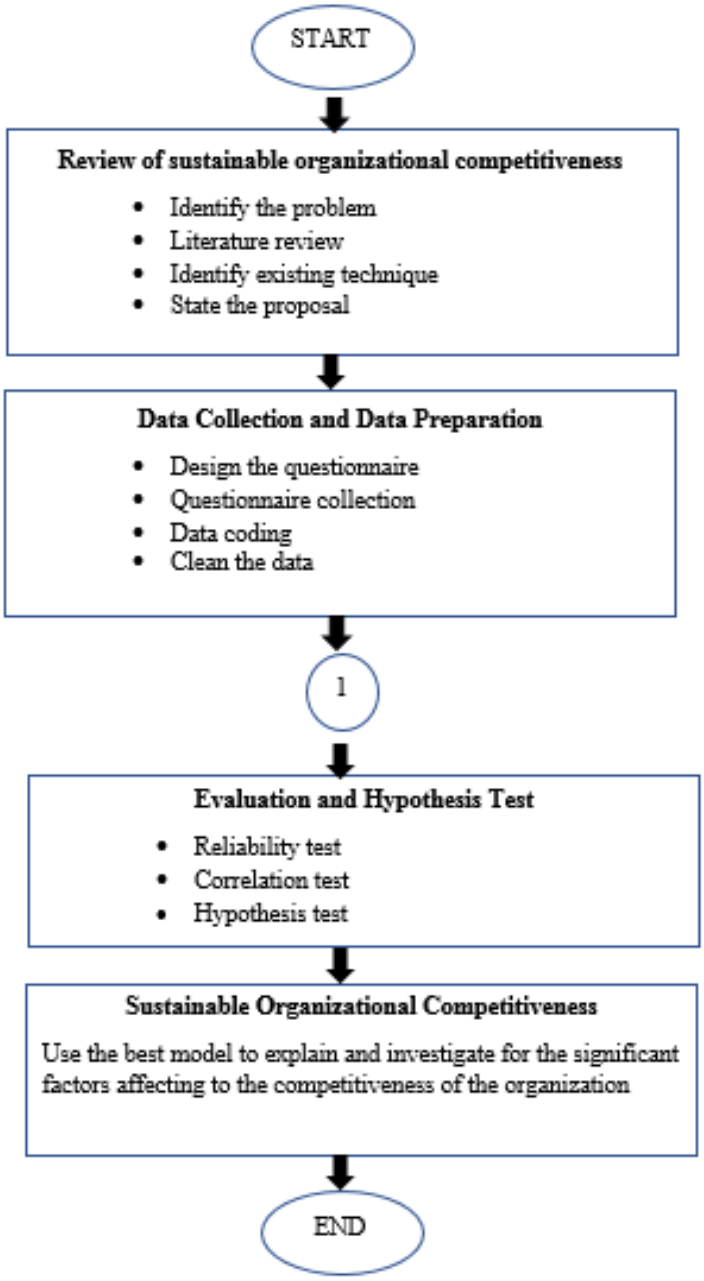

Figure 2: The research framework

The Cronbach's alpha coefficients is generally used as a measurement to test an internal consistency of each constructs. An acceptable Cronbach's alpha coefficient should not be lower than 0.70 [18]. The result of Cronbach's alpha coefficients is a range between 0.709 and 0.884, which exceeds 0.70, to indicate high reliability. Thus, the internal consistency is distinct the entire scale and reliability is acceptable.

The research model has been applied to different types of technology transfer capability such as learning, acceptance orientation, innovation focus, exchange competency, and change awareness. The equation is derived from the technology transfer capability to sustainable organizational com-

petitiveness. Thus, the reduced form of the equation is specified as follows:

$$SOC = f(LC, AO, IF, EC, CA)$$

Where:

SOC is sustainable organizational competitiveness; LC is learning capability; AO is acceptance orientation; IF is innovation focus; EC is exchange competency; and CA is change awareness.

This research model of effects is represented as the equation as.

$$SOC = \alpha + \beta_1 LC + \beta_2 AO + +\beta_3 IF + \beta_4 EC + \beta_5 CA + \epsilon$$

Where: SOC is sustainable organizational competitiveness; LC is learning capability; AO is acceptance orientation; IF is innovation focus; EC is exchange competency; CA is change awareness, α is constant; and ϵ is error.

4. Research results

4.1. Respondent and firm characteristics

The respondent characteristics of 286 samples are : more than half of respondents are male (52.80%), age is more than 50 years old (38.11%), marital status is generally married (67.48%), educational level is bachelor's degree or lower (61.54%), working experiences are more than 15 years (74.12%), an average monthly income is less than 100,000 baht (52.10%), and current position is managing directors (51.75%). The most of firms have registered as company limited (81.47%) and located in Bangkok (47.90%). Majority of business ownership is Thai affairs (94.41%). In addition, the firms have less than 25,000,000 baht of the operational capital (76.92%) as well as the average annual revenue (60.49%). Approximately 79.72% of firms have been operating in the business more than 15 years. The number of full-time employees is between 10 – 50 employees (51.05%).

4.2. Correlation analysis

A bivariate correlation analysis of Pearson Correlation was employed on all variables to explore the relationships among variables and to verify the multicollinearity problem in multiple regression assumption. As suggested by Hair et al. [18], when inter-correlation between independent variables exceeds 0.80, it is likely that a multicollinearity case will be occurred. The results of the correlation analysis of all variables are presented in Table 1.

The correlation of the dimensions of technology transfer capability including that is between 0.406 and 0.631 ($p < 0.01$). All the five dimensions of technology transfer capability is related positively significant to sustainable organizational competitiveness. The value of variance inflation factor (VIF) is between 1.494 and 2.154, which is lower than the cut-off score of 10 as suggested by Hair et al. [18]. Both correlations and the VIF guarantee the non-existence of multicollinearity problems for regression analysis.

The Ordinary Least Squares (OLS) regression analysis is employed to investigate the hypothesized relationships. The regression equation is a linear combination of the independent variables that are considered to best explain and predict the dependent variable. The results of OLS regression analysis for H1, H2, H3, H4, and H5 are presented in Table 2.

Table 1: The Results of the correlations

Variables	SOC	LC	AO	IF	EC	CA	VIF
Mean	4.01	4.29	4.28	4.17	4.22	4.19	
S.D.	0.59	0.42	0.41	0.49	0.46	0.47	
LC	0.425*	1					1.494
AO	0.478*	0.483*	1				1.653
IF	0.422*	0.451*	0.507*	1			1.954
EC	0.435*	0.406*	0.490*	0.613*	1		1.971
CA	0.405*	0.503*	0.542*	0.608*	0.631*	1	2.154

N = 286

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

Table 2: The results of the regression analysis

Independent Variables	coefficient
Constant	1.693*** (0.390)
Learning capability	0.063 (0.090)
Acceptance orientation	-0.159 (0.097)
Innovation focus	0.427*** (0.088)
Exchange competency	0.161* (0.095)
Change awareness	0.062 (0.095)
No. of respondents	286
R^2	0.195
R^2 Adjusted	0.182
F-Statistic	14.420
Durbin-Watson	1.871

***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively

beta coefficients with standard errors in paratheses

Table 2, the value of Durbin-Watson found that 1.871. It confirms that values of all variables are accepted and trustworthy range from 1.20 to 2.50 [17]. The results determine Hypotheses 3 and 4 are supported. The hypothesis proposes that innovation focus ($\beta_3 = 0.427, p < 0.01$) and exchange competency ($\beta_4 = 0.161, p < 0.10$) are positively affected to sustainable organizational competitiveness. The results found that the greater the capability of technology transfer capability effect of the greater the firm competitiveness [43]. This means that innovation and technology awareness are strongly significant which can create competitive advantages for the firms [22]. This result is also consistent with Thomas [45] who investigated the US manufacturing firm that there is a substantial and positive relationship between knowledge exchange address computer-mediated communication channels and the firm competitiveness as both effective and efficient. According to Paulraj, Lado, and Chen [35], found that the exchange of competency in information technology

affects to enhance the operational process of supply chain partner. Likewise, the firm has ultimately the supply chain to remain competitive when it is information gathering and sharing of new knowledge that is the exchange competency (McCarter et al., 2005). Moreover, it also found that the facilitated knowledge exchange has expected firm sustainable growth from new products and services' revenue and sales growth [6].

However, these results do not find the significant effect of technology transfer capability on learning capability ($\beta_1 = 063, p > 0.10$), acceptance orientation ($\beta_2 = -0.159, p > 0.10$), and change awareness ($\beta_5 = 0.062, p > 0.10$) and sustainable organizational competitiveness. This is consistent with the research of Jabar, Soosay, and Santa [23] who found that learning organization which includes training and experience of employees is not significant effect skills in Malaysian firms. Sapienza et al. [40] suggested that the firms as emphasized learning is able to decrease the probability of growth and did not assess the potential threats to survival, for this reason, technology learning capability does not affect to firm competitiveness. Thus, Hypotheses 1, 2 and 5 are not supported.

5. Conclusion and recommendations

Each of the five dimensions of technology transfer capability are expected to have an effect on sustainable organizational competitiveness. The results indicate that innovation focus and exchange competency positively affect sustainable organizational competitiveness. That means the technology transfer capability is important for firm's competitiveness. Especially, technology innovation focus is essential components of technology transfer capability that enhances new product and service development, valuable operational enhancement, remarkable business efficiency, and firm performance.

The results can help practitioners, including managing director, managing partners, or managers, who are responsible for strategic planning in capability development of the firm. In particular, information and communication technology businesses, the practitioners should understand how their firms can enhance firm performance and improve sustainable competitiveness over their competitors in the industry through technology transfer capability development. Especially, technology innovation focus is a major determinant, which manages the knowledge classification and integration to generate the new technological functionality that enables the management of the firm to be more effective. The firm should encourage the creation of new technologies which are relevant to working that helps to increase more operational efficiency. The firm's awareness to allocation of technological budgets, which sufficiently used in the operation that enables to more effectively administer. The firm should provide significance in technology exchange competency, which enables to manage the knowledge and skills in technological information, requisition, and requirement for two-way sharing. A systematic exchange of technology can increase the potential of new product and service development, operational enhancement, and performance to achieve firm's targets.

The suggestions for future research are provided on the conceptual model in this research. The limitation from the cross-sectional study in quantitative approach was selected, therefore, future research that should consider using a longitudinal study in qualitative approach as in-depth interview. This may be conducted in order to develop a more accurate result in the proposed conceptual model.

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