The Relationship between Innovation Capability and Firm's Performance in Electronic Companies, Vietnam

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Abstract

The study aims to investigate the determinant factors in the organisation of a firm's innovative activities, and the impact of innovation capability on firm's performance of electronic firms in Ho Chi Minh city, Vietnam. How is the performance of electronic companies after delivering an innovation project? How will innovation capability affect firm's performance in electronic companies? This study aims to seek the answer of these questions. We employ a Structural Equation Model and the PLS technique in order to validate the theoretical model proposed in this study. With observation of 374 valid firms, based on Cronbach's Alpha analysis, EFA analysis, CFA analysis and SEM analysis, this study discovers 5 groups of factors including: (i) Institution factors; (ii) Attitude of leadership factors; (iii) Marketing factors; (iv) Technological resources factors; (v) Combination factors, which have direct impact on innovation capability of firms. There are 4 groups of factors that have positive impacts on financial performance of electronic firms, with descending order of importance as follows: (1) Attitude of leadership factors; (2) Quality of human resources factors; (3) Innovation capability; (4) Marketing activities factors. Research results are important implications for Government administrative agencies for business to consult and introduce effective support policies.

Keywords: Innovation Capability, Firm Performance, Electronic Companies, Vietnam.

JEL Classification Code: O31, O32, C25, L20.

1. Introduction

It is now the beginning of the 21th century, an era of knowledge economy, whose pinnacle is creative economy. This is the era of scientific thinking, when science and technology become dominant productive forces of the society. In underdeveloped and developing countries, innovation is becoming a pressing issue, to not only the whole country, but also each firm and even each individual. Successful experiences of Korea, Taiwan, Singapore, etc.. reveal that innovation capability is the key to success, the competitive aspect of each firm, the motivation for developing and the tool for changing the world.

Firstly, the meaning of innovation needs to be clarified. "*Innovation*" derives from "*nova*", a Latin root meaning "*new*". It depicts the beginning of a matter or a new solution. Early concepts about innovation in firms usually focused on production firms with particular products, thus "innovation" was understood as invention along with exploitation. Though Schumpeter (1934) does not provide a definition of innovation, he is highly influential in theories about innovation in firms. Schumpeter claims that economic development is a process of motivational mutation, incessantly replacing the old technology with a new one, which he calls "*creative destruction*". Schumpeter divides innovation into 2 categories: (i) "*basic*" innovations that create breakthrough changes, (ii) "*incremental*" innovations that impact continuously and lead to gradual improvements.

Rogers (2003) defines innovativeness as "*the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than any other member of the system*". Dalia et al. (2011) propose a definition of

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innovation, which is "*the introduction of a new product, service, or process through a certain business model into the marketplace*" by commercialization or utilization of existing activities and products, and all contribute to the competitiveness of a firm.

In Vietnam, according to Clause 16 Article 3 of Law on Science and Technology in 2013, "*Innovation refers to the creation, application of achievements, technical, technological and management solutions to enhance the efficiency of socio-economic development, increase productivity, quality and added value of products and goods".* Nowadays, the innovation in reality has five basic manifestations: product innovation, process innovations, innovation in business model, organizational structure, brand, marketing, management systems, customer service, and experience.

Vietnam, a country transforming from an agricultural economy, is characterised with relatively low capital, low labour productivity. However, the rapid growth of technology, environment change, the instability of the market are factors that require enterprises to evaluate their innovation capabilities special in the field of electronics. What are the factors could have had an impact on the innovation capability of electronic companies in Ho Chi Minh city, Vietnam? How is the performance of electronic companies after delivering an innovation project? How will innovation capability affect firm's performance in electronic companies? This study aims to seek the answer of these questions.

2. Theoretical Background and Literature Review

Innovation capability is a broad and controversial concept. Romijin and Albaladejo (2002) define innovation capability as the skills and knowledge needed to effectively absorb, master and improve existing technologies and to create new ones. According to Chen (2009), innovation capability of a firm originates from processes, systems and organization that can be utilized in innovation of products and processes. Thus, innovation capability relates to factors of resources and abilities to create innovative results. These factors are also called impact factors of innovation capability.

This research detects impact factors of innovation capability of firms or impacts of innovation on business effectiveness, which have been published in studies of many national and international researchers. The first research to apply econometrics in Research and Development (R&D) activities of firms is the study of Griliches in 1979. Griliches (1979) studies production firms and emphasizes the importance of investments on R&D

activities of a firm. He believes that innovation capability of a firm depends on "technological capital", which is not formed by chance but is the result of 3 main groups of activities including: (*i*) Firms' R&D expenditure; (*ii*) R&D in universities/research facilities; (*iii*) Technological consultation and transfer in technological centers. Griliches (1979)'s research is supported by subsequent studies of Hagedoom and Cloodt (2003); Tsai, Chuang, and Hsieh (2008). Despite not denying the role of expenditure for R&D, Calvo (2000) argues that R&D expenditure is only a portion of innovation expenditure, as innovation is a process from the formulation of ideas to their presentation in products/services that are appreciated by customers.

Meanwhile, numerous studies on the relationship between innovation capability and business effectiveness of firms are conducted. Many new factors are found: Avlonitis et al. (1994) discover organizational management factor, Erdil (2004) finds marketing factor, Fell, Hansen, and Becker (2003) emphasize the factor of present manufacturing and the interactions between these units, all contribute to a firm's overall innovation capability. It is discovered by Romijin and Albaladejo (2002) that innovation capability of firms is mainly measured by the production innovation capability. Interior impact factors include: Qualification and experiences of managers; Skills of staff; Expenditure on R&D activities. Exterior impact factors include: Strength of connections between members of value chain; geographic distance between members; Institutional supports of administrative agencies.

In Vietnam, Duy (2015) summarizes theories about innovation and impact factors and concludes that groups of factors that influence innovation capability of a firm include interior factors; the firm's general properties; firm-level strategies and administration; organization, culture and management; resources and functional strategy; exterior impact factors. Analyzing impact factors of innovation and its influence on business effectiveness of software firms in Vietnam, Duy (2015) also discovers factors with positive and significant impacts on innovation, which are idea innovation; connection and relations, R&D, technological enhance; relationships with professional associations; innovation support policies.

Wang, Lu, and Chen (2008) uses an integrated measure which examines both input components (impact factors) and output components (results of innovation) to evaluate the innovation capability of firms. The results are as follows: The level of empowerment in decision making, resources for innovation activities, level of risk acceptance, the willingness to exchange knowledge and new ideas are all hugely influential to innovation capability of firms.

Chuang, Liu, Tsai, and Huang (2010) measures innovativeness of firms using market, organizational, and

R&D capabilities. These authors argue that the marketing division of a firm is responsible for identifying the requirements and problems of the consumers, which are finally transferred to the R&D team as input data. The R&D division uses these input data to invent products that are capable of satisfying the demands of consumers. Thus, the R&D and the marketing division are directly linked to a firm's development of ideas/new products (Artz, Norman, &

Hatfield, & Cardinal, 2010; Erdil, 2004). Similarly, a marketing unit can also help the R&D division develop products that are revolutionary, such as a new technology with huge commercial prospects.

In summary of empirical research results, this study outlines the indicators of innovativeness by capabilities of firms in Table 1.

Table 1: The indicators of innovation capability

Indicators	Metrics	Citation
1) R&D intensity	(i) % of researchers to overall employees	Wang et al. (2008)
	(ii) S&T Personnel, technical intensity, university graduate	Hollenstein (1996), Wang et al. (2008)
	(iii) Technology trends in the patents filed	Abraham and Moitra (2001)
	(iv) Individual innovativeness	Hollenstein (1996), Wang et al. (2008)
	(v) Efficiency of development/activities	Hollenstein (1996),
2) R&D expenditure	(i) R&D & education expenditure	Blomqvist et al. (2004); Hagedoom and Cloodt (2003).
	(ii) R&D activity	Damanpour et al. (1989)
3) Role of leadership innovation & supports	(i) Equipment, facilities, innovation leadership	Avlonitis et al. (1994), Damanpour et al. (1989)
	(ii) R&D commitment	Basberg (1987)
4) Contribution of skills & expertise	(i) People in terms of propensity to innovate and skills, experience and education.	Blomqvist et al (2004)
	(ii) R&D efforts & closeness to basic research	Jacques and Mohnen (2001)
5) Project management (control & monitoring)	(i) Process (design of innovation management, idea evaluation, concept test, profitability analysis, innovation strategy, construction/development, ex- post analysis, project management & controlling & project management employed and project controlling employed	Carayannis and Provance (2008), Haner (2002)
	(ii) High level of management support for the project	Heidi et al. (2008)
6) Market characteristics	(i) Market share (shares in sales of innovative products & innovative sales), export %, market penetration	Wang et al. (2008), Blomqvist et al. (2004)
	(ii) Economic demand	Blomqvist et al. (2004)
	(iii) Customer intimacy	Haner (2002)
7) Product promotion & pricing strategy	(i) Changes in product design or packaging, product placement, product promotion or pricing, marketing & publicity	Damanpour et al. (1989)
	(ii) Market focused strategy, well planned product & service development process, length of time between the conception of a new product & its introduction into the market place	Blomqvist et al. (2004), Damanpour et al. (1989)
8) Product cycle time	(i) Product cycle time	Wang et al. (2008)
9) Product quality level	(i) Product quality level	Wang et al. (2008)
10) Production staff quality level	(i) Production staff quality level, staffing level effectiveness in product development	Wang et al. (2008), Haner (2002).
11) Advanced manufacturing technology	(i) Advanced manufacturing technology, manufacturing technology & technical competency, new functional solution based on existing product, technical features of product innovations, technical features of process innovations such as new production technique, automation	Wang et al. (2008), Hall et al. (1986), Hollenstein (1996).
	(ii) Efficiency & productivity improvement	Haner (2002)
12) Rate of adoption of new technology to support innovation	(i) Use of new materials or intermediate products, fundamentally new production system.	Hollenstein (1996)
	(ii) Components & equipments & effective use of outside technology	Haner (2002)

| 13) Return on investment	(i) Return on investment, Profit share of innovation, Return on investment & project net present value	Wang et al. (2008), Haner (2002) Carayannis and Provance (2008)
14) Capital intensity & allocation	(i) Capital intensity & allocation, Follow-up investment	Wang et al. (2008), Hollenstein (1996)
	(ii) Technological incorporated into the capital & not incorporated into the capital	Haner (2002)
	(iii) Investment for commercialization of new innovations	Hall et al. (1986)
15) Fundraising ability	(i) Innovation cooperation funding	Hall et al. (1986)
16) Payback period	(i) Payback period	Wang et al. (2008), Haner (2002), Carayannis and Provance (2008).
17) Role of institution	(i) Rate of tax and fee	Duy (2015) Siddquee et al. (2015) Viet (2016)
	(ii) Support of Government administration agency	
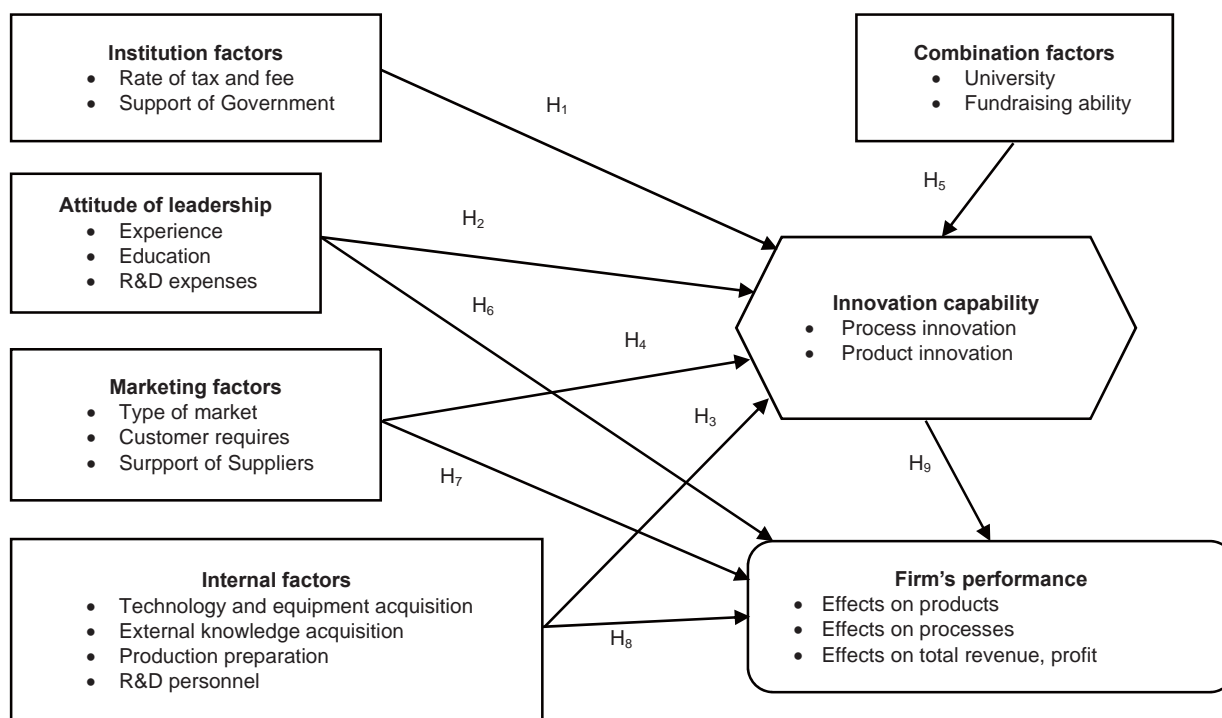
Figure 1: Proposed Research Model

3. Research Model and Hypothesis

3.1. Model

Studying factors that impact innovation capability and the relationship between innovation capability and business effectiveness of firms in Spain, Galende and Fuente (2003); Hernández and De la Calle (2006) use these variables: Firm's size; firm's age; executive's age; enterprising courage; cooperation with institution as representatives of organizational characteristics. The firm's economic performance is measured by indicators of finance and introduction of new products and services.

In Vietnam, studying impact factors of innovation and its influence on business effectiveness of software firms, Duy (2015) points out factors with positive and significant impacts, which are: (*i*) idea innovation; (*ii*) connection and relations; (*iii*) research & development and technological enhance; (*iv*) relationships with professional associations; (*v*) innovation support policies. This conclusion is in agreement with research of Viet (2016) on factors that influence innovation capability of 60 footwear & leather firms in Hanoi.

Based on empirical results in Table 1 and research of Vieites and Calvo (2011); Siddiquee et al. (2015); Hernández and De la Calle (2006); Duy (2015); Viet (2016), this study proposes research model as in Figure 1.

3.2. Hypothesis

Cooper (2011) explains that companies should be able to extend the life cycle of their products on the market or to create a new product with innovation. Companies need to maintain innovation capabilities in order to survive and grow (Crossan & Apaydin, 2010). Madanmohan (2003) defines innovation capacity as the company's ability to form and develop their resources as well as the ability to organize for innovation. Based on Madanmohan (2000) and Antonio (2012) there are four dimensions of innovation capacity: Sensing capability, combination capability, networking capability, and learning capability. About innovation capability, Aryanto et al. (2015) proved that strategic human resource management significantly affects innovation capability, and furthermore, the innovation capability also significantly affects innovation performance. Research conducted by Duy (2015) and Viet (2016) on firms in Viet Nam discovered evidences of the relationship between innovation capability and internal factors (employee satisfaction, characteristics of the firm, attitude of leadership, technological & human resource, etc.); and external factors (rate of tax, support of policy-maker, fundraising ability, relationships with universities, etc.) Therefore:

H1: Institution factors affect to innovation capability.
H2: Attitude of leadership affect to innovation capability.
H3: Internal resources affect to innovation capability.

The study conducted by Erdil (2004), Maletic, Maletic, Dahlgaard, Dahlgaard-Park, and Gomiscek (2015) and explained that there is connection between social performance (including customer's positive feedback, information of company, etc.), patent management and innovation capability. The evidence of the existence of the relationship between innovation capability and commercial performance (the ability to develop high-quality, the launch speed of new products, just-in-time, etc.) is shown through researches of Duy (2015), Atieh, Siamak, and Mostafa (2013), Tseng and Lee (2014). Therefore:

H4: Marketing factors affect to innovation capability.
H5: Combination factors affect to innovation capability.

OSLO Manual (2018) described some aspects that can be used to measure the innovation performance in the form of the output of innovation (e.g. number of new products produced, improve quality of the work) and impact of innovation (e.g. changes in competition, market expansion, increased productivity, profit, and environmental impact). Firm's performance can be measured by approaches range from technical, financial and non-financial (Herba & Gamal, 2011). The firm's performance achievement or success of innovation is done by a company with a suitable target (Wang et al., 2008). Dimitrios and Evangelos (2012) concludes that there is a positively relationship between a firm's overall performance and innovation capability. Avlonitis, Kouremenos, and Tzokas (1994) and Damanpour, Szabat, and Evan (1989) recognize that managers should manage the innovation in order to boost their operational performance. Improving firm performance is central to every manager in every business. To be successful in improving firm performance, it is important for an company to set up a comprehensive measure to provide managers and employees with clear guidelines and objectives for the organization. Haner (2002) and Wang et al. (2008) suggested profitability, rate of return on investment, customer retention, and sales growth rate as the firm performance measurement indexes, while Lee and Choi (2003) suggested market share rate, comparisons of success with other companies, growth rate, profitability, and ability to innovate as the firm performance measurement indexes. Therefore:

H6: Attitude of leadership has a positive relationship with firm's performance.
H7: Marketing activities has a positive relationship with firm's performance.
H8: Quality of human resource has a positive relationship with firm's performance.
H9: Innovation capability has a positive relationship with firm's performance.

4. Empirical Results and Discussion

4.1. Descriptive Statistics

Since 1986, the socio-economic development of Vietnam has experienced positive changes, income per capita has been enhanced, and since 2012, the World Bank has recognized Vietnam as a developing country. There has been considerable effort of the government to improve the investment environment for all foreign and domestic firms. According to the report of the Ministry of Planning and Investment, there are 110,000 domestic firms established in 2017, attracting foreign direct investments of USD 15.8 billion. Ho Chi Minh City is one of the two largest and most

active socio-economic centers in Vietnam, the concentration of big firms and the leader in application of science and technology in business production and administration.

The Statistical Office of Ho Chi Minh City reports that by the end of 2016, there are approximately 135,865 operating firms in the city. With this formula to determine sample size: n = N/(1 + N(e^2)) (N = 135,865 and e = 5%), this paper finds out that the typical sample size to survey is n = 398 (firms). The survey questionnaire is designed based on previous research, using the five-level Likert scale. The authors conduct the survey in 500 active firms in Ho Chi Minh City, Vietnam from December 1st, 2018 to March 15th, 2019 and obtain 374 valid firms to analyze. As our survey responses are collected from active firms in 23 urban/rural districts in Ho Chi Minh city, the data obtained are random and relatively diverse in types of size, sector and owners' equity. Hence, the data satisfy objectivity to be further analyzed. Descriptive statistics of the research sample are demonstrated in Table 2.

Table 2: Descriptive statistics

Details		Number of firm	Percentage
Type of firm	Private firms	20	5,3 %
	Limitted Company	264	70,6 %
	Joint-stock Company	75	20,1 %
	Household business	15	4,0 %
Type of owner's equity	Private capital	299	79,9 %
	Joint venture capital	28	7,5 %
	Foreign-owned capital	22	5,9 %
	100% government-owned capital	10	2,7 %
	Government-share capital	15	4,0 %
Business size	Micro firm	49	13,1 %
	Small firm	175	46,8 %
	Medium firm	112	29,9 %
	Big firm	38	10,2 %
Gender of the Leader	Female	85	22,7 %
	Male	289	77,3 %

4.2. Results of Regression Analysis

With 54 initial observations using 8 scales for the group of independent variables and 1 scale for the group of dependent variables, this study examine the reliability of these scales by Cronbach's Alpha test, Varimax's rotation and Exploratory Factor Analysis (EFA), and lastly conduct regression analysis using the OLS method. Empirical results show that all independent variables in analysis are statistically significant at 1%. Results of regression analysis are illustrated in Table 3 and results of model validation test are shown in Table 4.

Table 4 reveals that ANOVA test produces F = 130,180 with significant level of 1%, which means the model proposed in this study is valid. The adjusted R-squared is 0.639, implicating that independent variables in the model explain 63,9% of the variation in dependent variables. The Durbin-Watson statistic = 1,809, between 1 and 3, which means autocorrelation does not exist between independent variables. The variance inflation factor VIF coefficients of all independent variables are under 3, thus there is no perfect multicollinearity between independent variables (Hair, Anderson, Babin, & Black, 2010). The model satisfies conditions of ordinary least squares OLS method and the results are reliable.

Table 3: Empirical results by OLS method

Variables	Unstandardized coefficients		Standardized Coefficients	t statistics	Sig	Collinearity Statistics	
	β	Std. Error	Beta			Tolerance	VIF
Intercept	0,068	0,163		0,420	0,675		
Institution factors	0,126	0,044	0,118	2,868	0,004	0,579	1,727
Attitude of leadership	0,509	0,046	0,464	11,145	0,000	0,567	1,764
Technological factors	0,331	0,053	0,291	6,296	0,000	0,460	2,175
Combination factors	-0,115	0,034	-0,128	-3,397	0,001	0,691	1,446
Marketing factors	0,193	0,044	0,162	4,438	0,000	0,738	1,355

Table 4: Test of model validation

Model	R	R square	Adj. R square	Std.Error	Durbin-Watson
1	0,799	0,639	0,634	0,52438	1,809
Result of ANOVA analysis					
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	178,977	5	35,795	130,180	0,000
	Residual	101,189	368	0,275		
	Total	280,166	373			

All variables are statistically significant at 1%, 5 variables are positive (expected), only variable combination factors is negative (unexpected). The explanation of these variables in the reality will be provided in the last part, after the model validation using Structural Equations Modeling (SEM) method.

4.3. Hypothesis Testing by PLS Technique

In order to analyze the impacts of factors on innovation capability of electronic companies and test research hypothesis, this paper applies PLS technique to the structural equations modeling (SEM). The strength of SEM is that it enables multiple regression of both endogenous

and exogenous variables in a model. Therefore, in a SEM we consider two types of models:

A model of measure applying factorial analysis. With this model we can observe the consistency and strength of theoretical constructs. Those constructs can be composed by reflective or formative indicators. In our model all of them, with the exception of firm's performance, are generated from formative variables.

A structural model to analyze the causality interactions between independent constructs (exogenous) and dependent ones (endogenous).

PLS technique is applied multiple times to determine optimal SEM by eliminating least valid observations to improve statistics of the model. Testing results of statistics in the first SEM and final SEM are shown in Table 5.

Table 5: Test of SEM's model validation

Model	Chiquare/df	df	RMSEA	CFI	GFI	TLI
SEM first	2,855	329	0,071	0,893	0,846	0,877
SEM final	1,979	147	0,051	0,960	0,927	0,948

Regression results of final SEM are demonstrated in Figure 2. Testing results of statistics in the final SEM are all satisfactory. Chiquare/df = 1,979 (<3); RMSEA = 0,051 (<0,08); CFI = 0,960 (>0,95); GFI = 0,927 (>0,9); TLI = 0,948 (>0,9), which prove that the model is valid and regression results are reliable (Hair et al., 2010). In order to evaluate the consistency of the model of measure we employ the following tests:

Composite reliability. It is use to test internal consistency. The criterion implies that:

$$\rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum_i var(\varepsilon_i)}$$

is bigger than 0,7, where λ_i is the standardized load of i indicator, ε_i is measurement error and $var(\varepsilon_i) = 1 - \lambda_i^2$. In our case the value obtained are shown in Table 7.

Convergent validity. We use Average variance extracted (AVE) proposed by Fornell and Larcker (1981). The value of the expression:

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_i var(\varepsilon_i)}$$

should be bigger than 0,5, since more of 50% of construct variance should be explained by its variables. In our study it researches the values 0,839.

Multicolineality. First we should avoid a multicolineality problem. Therefore we calculate an Variance Inflation Factor (VIF) demanding a value smaller than 3 for all indicators. The results are included in Table 3.
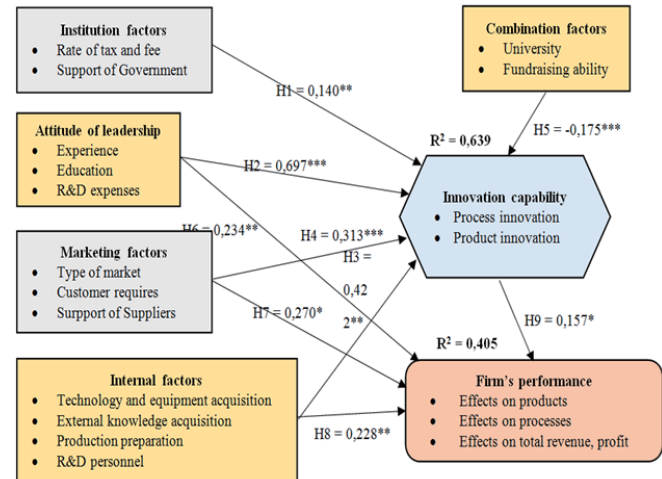
*Note: * p < 0,1; ** p < 0,05; *** p < 0,01*

Figure 2: Empirical results of SEM by PLS technique

Lastly, unstandardized regression results, standardized regression results and model's hypothesis testing results are shown in Table 6. Empirical results in Table 6 reveal that all variable are statistically significant, 8 hypothesis are accepted, including H_1, H_2, H_3, H_4, H_6, H_7, H_8, H_9 and new finding H_5 hypothesis. 8 hypothesis tested are positive, indicating that institution factors, attitude of leadership factors, technological factors and marketing factors have positive impacts on innovation capability of electronic firms in Ho Chi Minh city, Vietnam. Besides, attitude of leadership factors, quality of human resource factors, marketing activities factors and innovation capability are positively influential to business performance of firms.

This conclusion is in agreement with research of Mansfield (1981), Crespell, Knowles, and Hansen (2006) for firms in the United States, Vieites and Calvo (2011) for 200 large firms in Spain, Siddquee et al. (2015) for firms in India, Duy (2015) and Viet (2016) for firms in Vietnam. This implies that in whichever countries, if R&D activities are properly invested, new technologies are continuously explored and feedbacks from customers on the quality of products/services are welcomed and collected, the innovation capability of each firm is bound to be enhanced. Only with good innovation capability firms can increase business effectiveness and stabilize its position in the market.

Table 6: Regression results and hypothesis testing results

Causal Paths			β	Beta	P_value	Hypothesis supported
Inno.capability	←	Institution factors	0,140	0,126	0,015	Yes
Inno.capability	←	Attitude of leader	0,697	0,522	0,000	Yes
Inno.capability	←	Internal factors	0,313	0,237	0,019	Yes
Inno.capability	←	Combination factor	-0,175	-0,199	0,000	New finding
Inno.capability	←	Marketing factors	0,422	0,209	0,005	Yes
Performance	←	Quality of human	0,228	0,238	0,031	Yes
Performance	←	Marketing activities	0,270	0,184	0,061	Yes
Performance	←	Attitude of leader	0,234	0,241	0,043	Yes
Performance	←	Inno. capability	0,157	0,215	0,072	Yes

5. Conclusions and Policy Implications

Using the five-level Likert scale with 374 valid observations collected from our survey in active firms in Ho Chi Minh City from December 2018 to March 2019, this study reaches these following conclusions:

- There are 5 groups of factors that impact the innovation capability of electronic firms in Ho Chi Minh city, Vietnam with descending order of importance as follows: *(1) Attitude of leadership factors; (2) Technological factors; (3) Marketing factors; (4) Combination factors; (5) Institution factors.* Notably, combination factors have a negative effect on innovation capability.
- There are 4 groups of factors that have positive impacts on financial performance of electronic firms, with descending order of importance as follows: *(1) Attitude of leadership factors; (2) Quality of human resources factors; (3) Innovation capability; (4) Marketing activities factors.*

From the research empirical results, the author propose a number of implications for administrative agencies as follows:

First, Establishment of a National Innovation System.

According to the 2017 Global Innovation Index report published by the World Intellectual Property Organization, Vietnam ranks 47th among 128 countries, which is Vietnam's highest rank to date. However, when comparing to countries with high innovation index such as Switzerland, Japan, Korea, Singapore or Germany, there is still a significant gap

for Vietnam to cover. A National Innovation System is a long-term result of the socio-economic development. Originating from the national tradition, it is enhanced by institution systems to become particular support policies of innovation, which are applied continuously and consistently over generations due to the educational system that aims at ability development. Successful experiences of developed countries reveal that a consistent national innovation system is essential to encourage innovation.

Second, Development of Incubation Models and Technology Consultancy - Procurement Centers

Investments in research activities, especially basic science research always require large budget, while firms only focus on gaining profit, as a result, they tend to invest on only applied technology and technologies with particular results. The models of "technology incubation" or "talent incubation" have been tested in various countries, the most successful among which are the United States with Silicon Valley, India and Israel with its startup model. These are valuable suggestions for developing countries like Vietnam to learn from.

Moreover, the role of consulting and orienting national technologies of the government should be furthered. If competition in technology acquisition and assignment is left to the firms to handle, the price of technology transfer may be overly pushed up. The experience of Japan in the 1970s implies that basic technologies, which can be applied in a wide range of sectors and fields, should be bid by the government, and then assigned to a number of domestic firms to exploit. This is to the majority's advantage, considering that if the technology is purchased by a particular firm, it will be monopolized, leading to difficulties in the development of other firms.

Third, Enhancement in Vocational Education

Education in general and vocational education in particular will improve qualifications of workers and intellectual standards of the society in the long run. Practical solutions are to increase the autonomy of educational institutions, to develop the quality of teachers/educators, to relate theoretical education to the reality and to link the educational approach to economic development. The encouragement of students learning Science, Technology, Engineering and Math should also be considered, as thanks to this solution, Taiwan, Korea and China have seen tremendous progress in technology application and innovation.

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