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## Critical Factors Affecting the Innovation Activities of Businesses: Evidence from Binh Dinh Province, Vietnam\*

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### Abstract

The study investigates the factors influencing the innovation activities in the enterprises in the Binh Dinh Province, Vietnam. By employing the dataset from a survey in 200 typical enterprises in Binh Dinh and using the Exploratory Factor Analysis and regression analysis, we found that there are eight factor groups affecting the innovation activities of enterprises. They include management of innovation promotion; market research capacity; leadership inspiring innovation; culture of innovation; human resources for implementing innovation; network connection; disseminating/sharing knowledge; and impact of producing/serving technology. All these factors strongly affect the innovation activities, which plays an important role in promoting the sustainable development of the Vietnamese enterprises, with the statistical significance level at 1%. Moreover, findings also show that, among these factors, the market research capacity is the strongest determinant of the innovation activity in the enterprise. An increase of 1 point of capacity of market research will increase the innovation activities in the enterprise by 0.114 point. It is followed by the management of promoting innovation, leadership inspiring innovation, and disseminating and sharing knowledge, with 0.104, 0.103 and 0.102 score, respectively. On the other hand, network connection is the weakest factor, with the score of 0.07 point.

**Keywords:** Innovation, Critical Factor, Enterprise, Vietnam.

**JEL Classification Code:** O30, O32, M10, O20

## 1. Introduction

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This study is an empirical research funded by the People's Committee of Binh Dinh Province which aims to identify the influencing factors of innovation activities in enterprises in Binh Dinh Province, Vietnam. This is the basis for proposing policies and directions for improving the environment for innovation. The authors conducted a convenient sampling and survey of 200 enterprises in Binh Dinh Province. A total of 200 questionnaires were delivered and 200 valid questionnaires collected, the corresponding rate of valid votes is 100%.

When conducting innovation at the enterprise level, businesses often have to answer a series of questions such as how to innovate and which aspects should benefit from innovation, such as product innovation, innovation in management organization, innovation in production process, innovation in marketing, and innovation in production technology. According to the Organisation for Economic Cooperation and Development (OECD, 2005), innovation is the implementation of a product, commodity, service, a new or significantly-updated production process, a new

marketing strategy, new organization structure in operation and external relation.

In Vietnam, according to the Vietnam Chamber of Commerce and Industry (VCCI, 2011), innovation is new thing that is used in commerce. In innovation process, creativity and implementation are often combined together in term of product, production process and organization. At the same time, the innovation of businesses is influenced by many factors including within the enterprise such as business leaders view of innovation (Erdil et al., 2004; Fell et al., 2003) or the creative capacity of employees in the enterprise (Hu et al., 2009; Kheng & Mahmood, 2013), or external factors such as association, legal framework and industry characteristics (Tran, 2016). Therefore, this study aims to identify innovation activities of enterprises including five aspects of innovation, such as product innovation, manufacturing process innovation, management, organization innovation, marketing innovation, and technological innovation. The factors that affect the innovation activities of enterprises including both internal and external factors.

The structure of this paper consists of six parts; the next section is an overview of the study; the third part presents research methods including research hypotheses, description of research variables and methods of data collection, and data processing; the fourth part presents research results; the fifth part discusses the results; and the final part presents conclusions and policy implications of the research.

## 2. Literature Review

In terms of innovation, studies often focus on five aspects.

First, product innovation is the invention of a new product or significant improvement of an existing product in term of operating features or the intended usage related to the technical standards, components and the materials, the environmental friendliness, etc. (Schumpeter, 1949; Romijn & Albaladejo, 2002; Hage, 1999; Dibrell et al., 2008).

Second, innovation in production processes includes the fundamental changes in the way of production, machinery or software. Process innovations can be conducted to cut production cost, distribution, quality improvement, creating a new or improved products. Specifically, it is innovating in the implementation of a new design, a new analytical method or a new developments that change the way products are created (Acs & Audretsch, 1988; Singh & Singh, 2009; Amara et al, 2009; Jensen & Webster, 2009).

Third, the marketing innovation is the application of the new marketing methods that create changes in the design, the distribution, the promotion and pricing in order to better identify customer needs and seek the new market or position for the new product to increase sales, revenue, etc (Singh & Singh, 2009; Jensen & Webster, 2009).

Fourth, the innovation in management organization is the application of the new management methods to increase the business efficiency basis of cutting transaction costs and administrative costs, improve the outside relationships to improve knowledge, increase labor productivity, improve work efficiency, etc (Hage, 1999; Jensen & Webster, 2009; McMillan, 2010).

Fifth, technological innovation includes the small improvements that are small changes in the existing technology platforms that bring small benefits to customers. Or it is technological breakthroughs that apply new technologies that are completely different from existing products (Chandy & Tellis, 1998; Herrmann et al, 2006; McMillan, 2010).

Depending on the perspective of researchers, there is currently a large body of literature about the influencing factors of innovation activities in enterprises. However, we found that most studies focused on two main research directions: internal factors and external factors.

Regarding internal factors, the research suggests that the innovation process depends on many factors such as: size of the business, the strategy and the business culture, knowledge and experience of the leaders, diverse requirements of customers, human resources of organization, etc. Bhattacharya et al. (2004) argues that firm size and business performance such as revenue and profit growth have a positive impact on the process of innovation in enterprises. Romijn and Albaladejo (2002) posits that the innovation capacity of companies is mainly based on the ability of product innovation. So, it is greatly influenced by the training and experience of managers, the skills of staff, and budgets for research and development activities and training. Prajogo and Sohal (2003) argues that focusing on serving customers is one of the important factors of innovation. The improvement in customer service, which aims to detect and satisfy customer needs through improving the quality of products and services, and creating new product features, is the core of innovation.

Regarding external factors, the research suggests that the innovation activities depend on factors such as operating area, networks connection, government policies, etc. Becheikh et al. (2006) categorized the external influences on the innovation activities, including: areas of activity, geographical area, collaboration and network interaction, the absorption of knowledge and technology, government policy, and cultural environment. Fagerberg and Godinho (2004) suggest that the intensity and quality of interactive relationships in the network have a positive impact on the innovation. With the same perspective, there are studies by Cavusgil et al (2003), Love & Roper (1999), and Bigliardi & Dormio (2009). Romijn and Albaladejo (2002) argued that the degree of coherence between firms in the value chain or the geographical distance between firms in the value

chain, institutional support, etc. has a major influence on the innovation activities of business.

The above studies showed that, depending on the operating characteristics of the units, there are a varieties of determinants of innovation. This is the reason why we conducted the research focusing on the enterprises in Binh Dinh. From the overview of the studies, the innovation in enterprises is basically carried out on the following aspects: product innovation, innovation in production process, innovation in organization/management, marketing innovation and technology innovation. At the same time, the innovation process depends greatly on both internal and external factors to enterprise. This is an important rationale for conducting this study about the factors affecting the innovation activities of enterprises.

### 3. Research Methods

#### 3.1. Research Process

To carry out this study, the author has designed the following steps:

#### 3.2. Hypothesis

##### Leaders inspire the innovation (LD)

Avlonitis et al (1994), Erdil (2004), Fell et al (2003) suggest that administrative factors of the organization contribute to the overall innovation of enterprises. The leaders inspire innovation and play a significant role in the innovation activities of enterprises.

Hypothesis H1: Leaders who inspire innovation have a positive relationship with the innovation activities in enterprises.

##### Capable human resources contribute to implementing innovation (NL)

Hu et al (2009) suggested that the individual creative capacity is the source of creating and implementing the creative ideas in an organization. From this perspective, the

foundation of enterprise innovation is ideas from individuals in the enterprise (Neely & Hii, 1998; Kheng & Mahmood, 2013).

Hypothesis H2: the capable human resources positively relate to the innovation activities in enterprise.

##### Management promotings innovation (QL)

Wan et al (2005) argued that elements of management and promoting innovation such as the degree of empowerment in decision-making, the degree of risk-taking, etc., influence innovation. In addition, Nguyen (2015) also said that good management and suitable policies supporting innovation will have a positive and strong impact on innovation.

Hypothesis H3: Management promoting innovation has a positive relationship with the innovation activities in enterprises.

##### Market research capacity (TT)

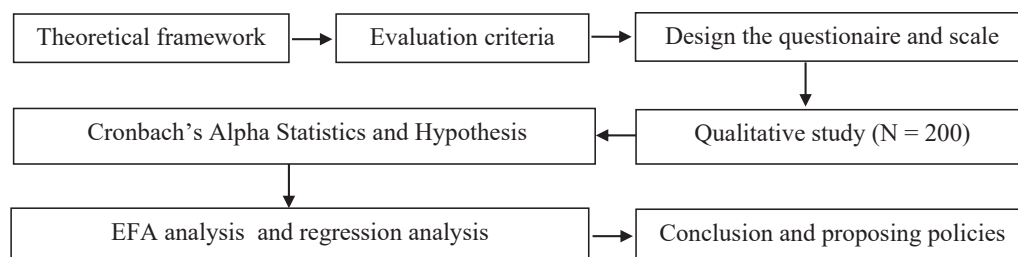
Chuang et al. (2010) measures the enterprise innovation through enterprise capability, the organizational capability and research and development capability. Findings suggested that the marketing department will identify the demand and issues of the consumer, which are then passed to the research and development (R&D) team and used as the inputs for research promoting innovation for businesses. This result is consistent with Artz et al. (2003).

Hypothesis H4: Market research capacity is positively associated with innovation activities of enterprises.

##### Culture of innovation (VH)

Schulze & Hoegl (2008), Tran (2016) showed that good practice of innovation culture will contribute to knowledge creation and knowledge personalization plays an important role in creating new product ideas. Therefore, the organization's culture of innovation is reflected in the organizational structure of the management apparatus, human resources, cultural environment, remuneration policies, etc.

Hypothesis H5: Creative innovation culture has a positive relationship with the innovation activities in enterprises.



**Figure 1:** Research process

### Disseminating/ sharing knowledge (CS)

Darroch (2005) examined the relationship of knowledge management, innovation and business results. It is showed that a enterprise with a good knowledge management will use resources more effectively than other businesses. Therefore, the innovation capacity of the business is also better and the business results are also improved.

Hypothesis H6: Disseminating/sharing knowledge has a positive relationship with the innovation activities in enterprises.

### Network Connection (QH)

Prajogo and Sohal (2003) said that focusing on developing customer relationship networks to detect and meet customer needs allows enterprises to continuously improve the quality of products and services with the new features is an important factors of innovation. At the same time, Phung and Le (2013) also said that in order to enhance innovation, countries need to pay attention to the network of businesses through the development of the national innovation system. Nguyen (2015), and Le and Nguyen (2017) also agree with this point of view.

Hypothesis H7: Network connection has a positive relationship with the innovation activities in enterprises.

### Impact of manufacturing/ serving technology(CN)

Herrmann et al (2006), Assink (2006), and O'Connor and Ayers (2005) suggested that the use of differentiated production/service technologies can create a fundamental change in production at a low cost that results in a low price, which can cause a complete change in the existing market.

Hypothesis H8: The impact of production/service technology has a positive relationship with the innovation activities in enterprises.

### 3.3. Research Model

Based on the research hypotheses, we use the multivariate regression model with the dependent variable as innovation in Vietnamese enterprises and eight independent variables mentioned in each hypothesis of the study. The detail regression is as follow:

From the above model, the author proposed the specific regression

$$DMST = \alpha + \beta_1 * LD + \beta_2 * NL + \beta_3 * QL + \beta_4 * TT + \beta_5 * VH + \beta_6 * CS + \beta_7 * QH + \beta_8 * CN + \varepsilon$$

Where:  $\alpha$ ,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$ ,  $\beta_6$ ,  $\beta_7$  and  $\beta_8$  are coefficients  
 $\varepsilon$ : is error

### 3.4. Variables

In order to serve the process of asking and answering the survey, the author uses the Likert scale (5 options), the ratings are as follows: 1 = “very low”, 2 = “low”, 3 = “average”, 4 = “high”, 5 = “very high”. The variables and scales of the research model are determined as follows (see Table 1):

### 3.5. Data Collection

In order to collect data for this study, the authors used a predefined survey questionnaire based on the defined variables and scales. The final questionnaire was built in three stages.

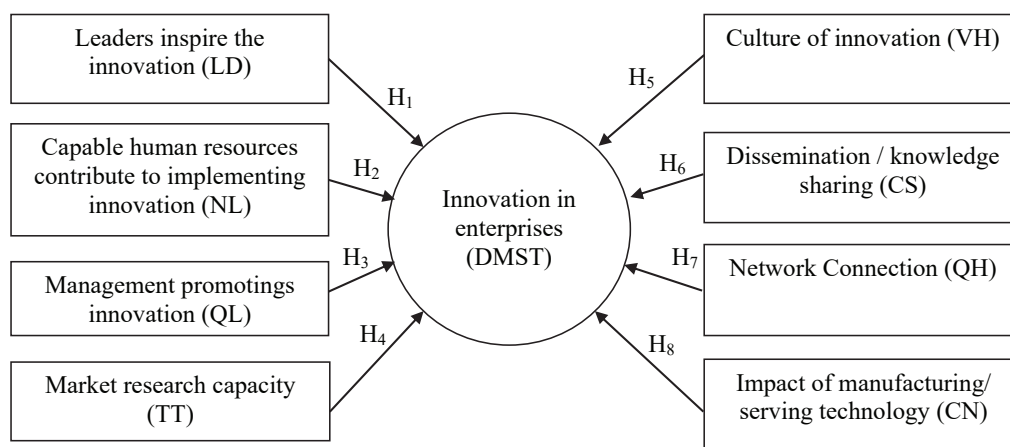


Figure 2: Overview of the research model

**Table 1:** Variables and scales

TT	Factors	Observed variables	Encryption	Source
<b>Dependent variable</b>				
1	Product innovation (DMSP)	The company introduces completely new products to competitors.	DMSP1	OECD (2005); Schumpeter (1949); Romijn & Albaladejo (2002); Hage (1999); Assink (2006); Dibrell et al (2008); Lee & Xuan (2019) and experts interview
		The company offers new products that have not been previously produced.	DMSP2	
		The company usually adds new products to the existing product categories.	DMSP3	
		The company often improves product design.	DMSP4	
		The company often enhances the quality of manufactured products.	DMSP5	
		The company often improves the usability of manufactured products.	DMSP6	
		The company improved its products based on changing input materials.	DMSP7	
		The company innovates products based on the application of new knowledge and technology.	DMSP8	
		The company usually creates products that are suitable for consumers' tastes.	DMSP9	
		The company often updates the quality standards for its products.	DMSP10	
2	Innovation in production processes (DMQT)	The company often improves its manufacturing methods to manufacture products.	DMQT1	OECD (2005); Acs & Audretsch (1988); Singh & Singh (2009); Amara et al (2009); Jensen & Webster (2009) and experts interview
		The company often makes significant improvements or new methods in supplying, transporting, providing input for manufacturing products.	DMQT2	
		The company often improves the delivery method.	DMQT3	
		The company often updates production management methods to the production process.	DMQT4	
		The company has applied software technology in its manufacturing process.	DMQT5	
		The company periodically renews production equipment.	DMQT6	
		The company often modernize the production process.	DMQT7	
3	Management innovation (DMQL)	The company is always improving and adjusting its organizational structure to improve management effectiveness.	DMQL1	OECD (2005); Singh & Singh (2009); Jensen & Webster (2009) and experts interview
		The company always applies new management methods (for example, supply chain management, operational model design, knowledge management, etc.).	DMQL2	
		The company always implements new methods in personnel organization, human resource management and decision making.	DMQL3	
		The company always applies new methods to promote external relations with other organizations or companies.	DMQL4	
		The company often applies quality management systems, innovations in the operation process.	DMQL5	
		The company often shares knowledge internally.	DMQL6	
		The company applies a decentralized management decision-making approach.	DMQL7	
		The company is interested in developing the affiliate network in the value chain of the active industry.	DMQL8	
		The company always focuses on improving the qualifications and skills of managers.	DMQL9	



4	Marketing innovation (DMMAR)	The company always applies new techniques to promote the sale of products, goods and services.	DMMAR1	OECD (2005); Hage (1999); Jensen & Webster (2009); McMillan (2010) and experts interview
		The company always utilizes new media to promote products, goods and services.	DMMAR2	
		The company always has a new way of selling or distributing products, goods and services.	DMMAR3	
		The company always applies new methods of pricing products, goods and services.	DMMAR4	
		The company is always updated with new tastes and market trends.	DMMAR5	
		The company always changes effective sales methods based on customer suggestions.	DMMAR6	
		The company always pays attention to the price of its products, goods and services with competitors.	DMMAR7	
5	Technology innovation (DMCN)	The company is interested in investing in technology research and development.	DMCN1	Afuah (2003);Chandy &Tellis (1998); Herrmann et al (2006); McMillan (2010); Lee & Xuan (2019) and experts interview
		The company often upgrades its production technology and service methods.	DMCN2	
		The company is interested in setting up science and technology development fund.	DMCN3	
		The company is interested in investing in new and modern technologies.	DMCN4	
		The company applies modern technology in accordance with the staff performance.	DMCN5	
		The company exploits well the equipment productivity.	DMCN6	
		The company focuses on the application of technology to the manufacturing process.	DMCN7	
		The company always focuses on using environmentally-friendly technology.	DMCN8	
Independent variables				
1	Leaders inspire innovation (LD)	Company leaders give a clear vision of the future development of the business.	LD1	Avlonitis et al (1994); Erdil (2004); Fell et al (2003) and experts interview
		Company leaders attract people to care and implement plans for the future of the business.	LD2	
		Company leaders often listen and encourage new ideas of employees.	LD3	
		Company leaders always care and support individuals with innovative ideas.	LD4	
		Company leaders always show enthusiasm for innovation and completed work.	LD5	
2	Human resources are capable of realizing innovation (NL)	Workers have the ability to critically analyze current practices to find better ways.	NL1	Hu et al (2009); Neely & Hii, (1998); Kheng & Mahmood (2013) and experts interview
		Employees in the company often contribute valuable information and initiatives.	NL2	
		Employees have the capacity to identify and acquire relevant new knowledge from the outside.	NL3	
		Workers have the ability to exploit new knowledge for innovation.	NL4	

3	Management promotes innovation (QL)	The company has a clear, relevant and effective way to bring new ideas and new solutions.	QL1	Wan et al (2005); Nguyen (2015); Hoang & Ngoc (2019) and experts interview
		The company has an appropriate process and criteria for choosing product innovation ideas.	QL2	
		The company always provides feedback to employees about their ideas.	QL3	
		Everyone has the opportunity to be empowered to perform the assigned work in the most creative and effective manner.	QL4	
		The coordination between the various departments and divisions in the company is very effective to turn new ideas into practical results.	QL5	
		The company pays attention to the policies of rewarding and encouraging employees to innovate.	QL6	
		The company has implemented many training programs to improve the innovation capacity for employees.	QL7	
4	Market research capacity (TT)	The company performs well market research to understand the needs of its customers.	TT1	Chuang et al (2010); Artz et al (2003); Basuki et al. (2020) and experts interview
		The company does well in market research to shape a clear new product.	TT2	
		The company does well in market research to identify market opportunities.	TT3	
		The company usually collects information about customers.	TT4	
		The company usually collects information about competitors.	TT5	
		The company usually collects market information from the relational network (from customers, suppliers, partners, ...).	TT6	
		The company establishes good relationships with customers to obtain timely feedback.	TT7	
5	Innovative culture (VH)	The company cares about creating an environment to encourage individuals to do things in a different way.	VH1	Schulze và Hoegl (2008); Tran (2016) and experts interview
		The company encourages people to try new ways of working.	VH2	
		When experimenting with a new way of working, mistakes are sympathetic / shared within the company.	VH3	
		In the company, employees are very proactive in making suggestions/ suggestions for finishing work.	VH4	
6	Disseminate knowledge sharing (CS)	The company has forms of documents and regulations that workers can easily access when they need it.	CS1	Darroch (2005); Chiu & Lin (2019) and experts interview
		The company periodically sends relevant reports and information to employees.	CS2	
		The company has databases, meeting rooms to display and disseminate knowledge.	CS3	
		The company often holds seminars and workshops to share and disseminate new knowledge to all members.	CS4	
7	Relationship network (QH)	The company established good relationships with partners.	QH1	Prajogo và Sohal (2003); Phung & Le (2013); Nguyen (2015); Le & Nguyen (2017) and experts interview
		The company develops strong partnerships with universities or research organizations, design consultants, technology transfer.	QH2	
		The company has the ability to create new partnerships.	QH3	
		The company is able to exploit business networks.	QH4	
8	Impact of production technology / service (CN)	Technology has a significant influence on the innovation process in the company.	CS1	Herrmann et al (2006); Assink (2006); O'Connor & Ayers (2005); Lee & Xuan (2019) and experts interview
		The company often invests and researches to innovate production/ service technology.	CS2	
		The degree of innovation and success of the company depends on the advance of applied technology.	CS3	

### **Phase 1: Developing a draft survey.**

We conducted an overview of domestic and foreign studies on innovation in enterprises to identify gaps to be studied. Next, based on the theory of innovation and preliminarily practical data collection from the enterprises in Binh Dinh, we came up with a draft questionnaire with two main information: (i) general information about the business, (ii) survey information.

### **Phase 2: Consulting with experts and conducting the pre-test survey to complete plans and targets needed to be surveyed.**

For this stage, the authors conducted direct interviews with experts who are university lecturers, researchers in institutes, members of the Board of Directors, and heads or deputy heads of enterprises. A total of 20 people and 20 enterprises pre-tested the survey. At this stage, the research team conducted a direct interview on the questionnaire designed in Phase 1 and exchanged ideas about research with experts and businesses to assess whether the questionnaire is appropriate or necessitates additions or adjustments

### **Phase 3: Designing the official questionnaire.**

Based on the results of the interviews in Phase 2, we designed a complete questionnaire with a view to increase the effectiveness, accuracy and feasibility of questions. The authors have organized the first workshop to publish the results of expert interviews, pre-test survey results and official questionnaire. We have received valuable comments and feedbacks from the experts, consumers, businesses that allows us to finalized the questionnaire.

At the same time, the survey was sent directly to the selected 200 enterprises together with a recommendation letter of the host agency introducing this project. To ensure a representative sample, businesses surveyed had to satisfied the following criteria: (1) enterprises operate in three different sectors: (i) industry and construction; (ii) trade and service; (iii) agriculture, forestry and fishery under the Government Decree No. 32/2018/ND-CP; (2) they have the legal structure of a joint-stock company, limited-liability company, and private company; (3) they are located in different areas from the delta, mountainous and city; (4) the sample includes enterprises inside the industrial parks, industrial zones and outside these regions.

## **3.6. Methods of Data Analysis**

From the valid questionnaires collected, the authors turned to Excel and coded each part of the survey questionnaire. Next, all data were processed through the SPSS 22.0 software. The author conducted a number of analyses and testing as follows:

Descriptive Statistics and hypothesis of mean testing: Descriptive statistics allows to calculate the average for the factors affecting innovation while the average value test is used to compare the average value of the factors with the average value of 3 that allows to evaluate the level of influence of the factors.

Cronbach's Alpha Analysis: The purpose of Cronbach's Alpha analysis is to test the reliability of scales and survey data to assess the correlation among the observed variables. Most of researchers accept that Cronbach's Alpha levels of 0.8 or higher is good; from 0.7 to 0.8 it is usable. If the concepts in question are new, this coefficient is only required to reach above 0.6. With Cronbach's Alpha level greater than or equal to 0.8, the scale is considered a good measurement, the questions are designed closely, and the scales are actually correlated with each other to achieve high reliability (Hoang & Chu, 2011).

EFA exploratory factor analysis: When analyzing discovery factors, researchers often care about some standards. First, KMO coefficient (Kaiser-Meyer-Olkin)  $\geq 0.5$ , the significance level of Bartlett  $\leq 0.05$  test. KMO is a criterion used to consider the appropriateness of EFA,  $0.5 \leq \text{KMO} \leq 1$ , then factor analysis is appropriate. Bartlett's Test examined the hypothesis of the correlation between observed variables in the overall. If this test is statistically significant ( $\text{Sig} \leq 0.05$ ), the observed variables are correlated in the overall. Second, factor loading coefficient  $> 0.45$ . If any observed variable has factor loading coefficient  $\leq 0.45$ , it will be disqualified. Third, the scale is accepted when the total variance extracted  $\geq 50\%$  and eigenvalue is greater than 1. The fourth criterion is the difference in factor loading coefficient of an observed variable among factors  $\geq 0.3$  to ensure the distinguishing value among factors is protected (Hoang & Chu, 2011). According to Dinh et al. (2018), Factor loading is the norm to ensure the practical meaning of EFA, Factor loading  $> 0.3$  is considered to be the minimum, Factor loading  $> 0.4$  is considered Important,  $\geq 0.5$  is considered to have practical significance.

## **4. Research Results**

### **4.1. Cronbach's Alpha**

In this study, the observed variables of the independent and dependent variables were selected when the Cronbach's Alpha coefficient was 0.6 or higher and the total correlation coefficient was greater than 0.3. The results in Table 2 show that the variables in the research model are reliable. The test results also show that Cronbach's Alpha of the dependent and independent variables are larger than 0.7. Thus, both the dependent and independent variables satisfy the reliability, thus, no variables are excluded. Because the results of testing the scales show that all scales are suitable and reliable, they are statistically significant to use the EFA discovery factor analysis for innovation activities of businesses in Binh Dinh Province.



**Table 2:** The Cronbach's Alpha coefficients

Reliability Statistics	N of Items	Cronbach's Alpha
<b>1. For dependent variables</b>		
Product innovation	10	0.953
Innovating the manufacturing process	07	0.937
Innovation in management organization	09	0.956
Innovation in marketing	07	0.902
Technological innovation	08	0.949
<b>2. For independent variables</b>		
Leaders inspire innovation	05	0.912
Human resources are capable of implementing innovation	04	0.853
Management promoting innovation	07	0.915
Market research capacity	07	0.911
Creative innovation culture	04	0.860
Knowledge disseminating/ sharing	04	0.740
Network connection	04	0.852
Impact of producing/ serving technology	03	0.841

**Table 3:** Results of the total variance of the data are explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.271	16.502	16.502	6.271	16.502	16.502	4.806	12.647	12.647
2	4.961	13.057	29.558	4.961	13.057	29.558	4.680	12.316	24.963
3	4.323	11.376	40.934	4.323	11.376	40.934	3.864	10.169	35.131
4	2.857	7.518	48.452	2.857	7.518	48.452	2.883	7.586	42.717
5	2.601	6.845	55.298	2.601	6.845	55.298	2.863	7.535	50.253
6	2.456	6.463	61.761	2.456	6.463	61.761	2.836	7.462	57.715
7	1.822	4.796	66.557	1.822	4.796	66.557	2.605	6.854	64.569
8	1.660	4.370	70.926	1.660	4.370	70.926	2.416	6.357	70.926
9	.975	2.565	73.492						

Extraction Method: Principal Component Analysis.

## 4.2. Exploratory Factor Analysis (EFA)

On the basis of testing the reliability and correlation with Cronbach's Alpha, we conducted an EFA discovery factor analysis, the results were as follows:

### For independent variables:

According to KMO and Bartlett's Test,, we have a KMO coefficient = 0.677 > 0.5 (greater than the minimum to ensure

the appropriate EFA analysis) and Sig level of Bartlett's test is 0.000 < 0.05 means that the variables correlated in overall. Thus, the EFA analysis for the independent variables is really meaningful. At the same time, the analysis results in Table 3 show that, based on criterion of Eigenvalue > 1, there are eight groups of factors drawn. The total variance extracted is 70.926% (greater than the standard level > 50%), which means 70.926% of the data variation is explained by eight factor groups.

In addition, for Factor Loading in groups, according to Hair et al. (2010), in order to ensure the practical significance level of EFA, Factor Loading > 0.3 is considered to be a minimum, Factor Loading > 0.4 is considered important, Factor Loading  $\geq 0.5$  is considered to be of practical significance. As a result, when using the Varimax rotation to obtain the best load coefficient, we obtained eight groups of influence factors, including: (1) Management of innovation promotion

(with seven variables); (2) Market research capacity (with seven variables); (3) Leaders inspire innovation (with five variables); (4) Innovative culture (with four variables); (5) Capable human resources for implementing innovation (with four variables); (6) Network connection (with four variables); (7) Dissemination of knowledge sharing (with four variables) and (8) Impact of producing /serving technology (with three variables) (see Table 4).

**Table 4:** Factor rotation matrix

	Component							
	1	2	3	4	5	6	7	8
QL1	.862							
QL5	.858							
QL4	.839							
QL6	.787							
QL3	.772							
QL2	.759							
QL7	.723							
TT7		.876						
TT5		.866						
TT2		.856						
TT3		.822						
TT1		.786						
TT4		.758						
TT6		.703						
LD3			.971					
LD1			.928					
LD2			.871					
LD5			.757					
LD4			.722					
VH3				.900				
VH2				.879				
VH1				.835				
VH4				.646				
NL2					.879			
NL1					.872			
NL3					.775			
NL4					.764			
QH1						.880		
QH4						.824		
QH3						.755		
QH2						.632	.568	
CS4							.788	
CS2							.740	
CS1							.733	
CS3							.690	
CN2								.877
CN1								.851
CN3								.796

#### For dependent variables:

According to KMO and Bartlett's Test tables, we have a KMO coefficient = 0.743 > 0.5 (greater than the minimum to ensure appropriate EFA analysis) and Sig level of Bartlett's test is 0.000 < 0.05 means that the variables correlated in overall. Therefore, the EFA analysis for the dependent variables is meaningful. From the above variance table, according to criterion of Eigenvalue > 1, there are five factors drawn. The total variance extracted is 73.387% (greater than the standard level > 50%), that is 73.387% of the data variation is explained by these factors.

Moreover, the results from using Varimax rotation to obtain the best load coefficient, we obtained five groups of factors of innovation, including: (1) Product innovation (with 10 variables); (2) Innovation of management organization (there are nine variables); (3) Technological innovation (with

eight variables); (4) Innovation in manufacturing process (there are seven variables); and (5) Innovation in marketing (with seven variables). Therefore, the results of the factor analysis show that the research has drawn eight groups of factors affecting the innovation factors in enterprises. All of which are reliable and statistically significant (see Table 5).

#### 4.3. Regression Analysis

In order to perform regression analysis, we calculated the mean to represent the dependent and independent variables. The results of regression analysis assessing the impact of factors on innovation are as follows (see Table 6):

The regression results table shows that all independent variables are really affecting innovation dependent variables (this is concluded through t-test with Sig level of the test are all less than 1%, 5% or 10%). The result also shows that

**Table 5:** Results of the total variance of the data are explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.415	22.964	22.964	9.415	22.964	22.964	7.279	17.754	17.754
2	7.126	17.380	40.344	7.126	17.380	40.344	6.839	16.681	34.436
3	5.644	13.767	54.111	5.644	13.767	54.111	6.029	14.705	49.141
4	4.612	11.248	65.359	4.612	11.248	65.359	5.306	12.942	62.082
5	3.292	8.028	73.387	3.292	8.028	73.387	4.635	11.305	73.387
6	.963	2.350	75.737						

Extraction Method: Principal Component Analysis.

**Table 6:** Results of regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.708	.148		4.781	.000		
	LD	.103	.013	.365	7.849	.000	.860	1.162
	NL	.073	.013	.255	5.608	.000	.897	1.115
	QL	.104	.016	.308	6.370	.000	.795	1.258
	TT	.114	.023	.221	5.061	.000	.973	1.028
	VH	.092	.015	.274	5.985	.000	.887	1.128
	CS	.102	.026	.176	3.920	.000	.920	1.087
	QH	.070	.017	.200	4.015	.000	.752	1.330
	CN	.076	.011	.325	7.085	.000	.884	1.131

a. Dependent Variable: DMST

due to the magnification coefficients of VIF are less than 10, the level indicates the serious multi-collinearity, there is no symptom of multicollinearity in this model.

Moreover, the value of  $R^2$  of the model is 64.5%, showing that the independent variables explain the high fluctuation of dependent variables. In addition, the results of testing the suitability of the regression function through F statistics from ANOVA table also show that the model is really suitable (Sig level of the test is very small 0.000). Therefore, based on the regression results table, we have a regression equation for the factors that influence innovation activities of enterprises as follows:

$$\text{DMST} = 0.708 + 0.103 \cdot \text{LD} + 0.073 \cdot \text{NL} + 0.104 \cdot \text{QL} + 0.114 \cdot \text{TT} + 0.092 \cdot \text{VH} + 0.102 \cdot \text{CS} + 0.070 \cdot \text{QH} + 0.076 \cdot \text{CN}$$

On the other hand, through the standardized beta coefficient column, we can see that the labor factor has the strongest impact on the innovation, with the standardized beta of 0.365, followed by industry and management, with the standardized beta is 0.325 and 0.308, respectively. The lowest effect on the dependent variable is CS factor with standardized beta of only 0.176. Other factors such as NL, TT, VH and QH have similar levels of influence.

## 5. Discussion and Policy Implications

The regression results show that there are eight factors influencing the innovation activities and all have positive effects with the strongly statistical significance. However, there are only four factors that have a strong impact on innovation with a beta greater than 1. Therefore, with the limited resources, to promote innovation, the businesses need to focus on resources allocation with the order of priority of market research capacity, management promoting innovation, leadership inspiring innovation and disseminating/ sharing knowledge.

### Firstly, improving market research capacity

In order to improve market research capacity, businesses need to focus on improving the criterion of their weakness to create efficiency. The enterprises can set the priority: (i) improving relationships with their customers, suppliers, and partners to quickly and timely facilitate the market information; (ii) focus on capturing the needs of customers, especially the target customers. Capturing customers' tastes will help businesses have a reasonable product innovation strategies to best meet those needs; (iii) it is necessary to be sensitive in identifying market opportunities and creating a customer data system to develop a customer care system,

increase accessibility, and promote product information to customers. In particular, it is necessary to develop an information system on the competitors in order to implement plans and strategies when the competitors change their tactics to dominate the market.

### Secondly, management promoting innovation

Management promoting innovation has a great impact on the efficiency of innovation. An effective management method that creates motivation for employees to promote their ability to work, foster and develop creative ideas is a premise to create a big step in the innovation process. In particular: (i) it is necessary to focus on decentralization and empowerment so that everyone has the opportunity to perform the assigned work in the most creative and effective way; (ii) there is a need to improve the innovation capacity of employees through organizing training courses, training programs, seminars; (iii) it is crucial to create an appropriate process and set criteria in order to select the innovation ideas; because the selection and nurturing of innovative ideas will contribute to enriching the innovative solutions of enterprises; (iv) there is a need to develop a clear, appropriate and effective implementation plan for developing new ideas and new solutions; (v) focusing on providing feedback on creative ideas of employees is required to help them perfect their ideas or reject the implementation of ideas that are not feasible and applicable.

### Thirdly, leadership inspiring innovation

The leadership significantly affects the innovation capacity of enterprises. Encouraging and inspiring employees to actively innovate would create many breakthroughs that contribute to improving the innovation in enterprises. An inspirational leader plays an important role in creating an open working environment, an open corridor that promotes a culture of innovation in business development. It is one of the important prerequisites that contribute to the improvement and high efficiency of innovation of businesses. Specifically, (i) business leaders should show their enthusiasm for innovation and perfect working conditions of subordinates; (ii) business leaders should constantly listen to and encourage new ideas from employees. Listening and having plans to encourage new ideas will create the motivation for employees to express innovative and creative ideas. In addition, regularly listening to employees also helps leaders to capture information and current status, so that they can make timely plans to promote good creative ideas and abandon fruitless alternatives; (iii) business leaders need to implement many measures to attract people to work on plans for future development. When the employees are clear about the future plans of the company, they would have a better

orientation and plans for their current jobs as they relates to the long-term development of enterprises.

#### Fourthly, disseminating/ sharing knowledge in enterprises

Increasing the dissemination and sharing of knowledge within the enterprises will contribute to improving the capacity of employees in terms of knowledge, skills, and will increase the cohesion among employees. Therefore, in order to promote innovation, the businesses need to enhance the dissemination and knowledge-sharing internally. Particularly, (i) there is a need to build databases, meeting rooms to display and disseminate knowledge, so that all employees can regularly access knowledge. This, in turn, can help employees broaden their knowledge in term of applying technological advances, improving working methods, promoting business innovation; (ii) enterprises also need to hold seminars and workshops to share and disseminate new knowledge to all members; (iii) enterprises also need to have forms of documents and regulations that are easily accessible for workers when they need them. At the same time, the businesses should periodically send appropriate reports and information to employees which could help them timely grasp the necessary information, adjust the processes and reasonable working methods to increase their working efficiency.

## 6. Conclusion

The results of this study show that there are eight factors affecting the innovation activities of enterprises in Binh Dinh, Vietnam, including: (i) Management promoting innovation; (ii) Market research capacity; (iii) Leaders inspiring innovation; (iv) Culture of innovation; (v) Capable human resources for innovation; (vi) Network connection; (vii) Disseminating and sharing knowledge and (viii) Impact of producing/serving technology. Among the above eight factors, there are four factors that have a strong influence on the innovation activities of enterprises, including: (i) Market research capacity; (ii) Management promoting innovation; (iii) Leaders inspiring innovation and (iv) Disseminating/ sharing knowledge. This shows that most factors that strongly influence innovation are internal to the enterprise. Therefore, businesses need to strengthen their internal resources to improve the efficiency of innovation.

The authors are aware that this investigation of the factors influencing the innovation of the enterprises through a survey of 200 samples companies in Binh Dinh is not strong enough to reach final conclusions. Therefore, it is necessary to extend the sample size to cover businesses in all provinces and cities across the country in future research. Despite this limitation, we still believe that this research is a significant

contribution to the empirical literature on the innovation of Vietnamese enterprises.

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