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Building Capacity for Innovation: Evidence From Vietnam

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This study investigates the effect of capacity building for innovation through research and development (R&D) investment and training on innovation performance. The results show that training positively affects product/service and process innovation, while R&D investment positively affects only product/service innovation. Besides, service firms gain more benefits through training than manufacturing firms. Employee training plays an important role in enhancing innovation performance.

I. Introduction

Innovation has been known as a key source of competitive advantage (Prajogo & Ahmed, 2006). Innovation processes require firms to possess capabilities to detect technological changes in the environment, and apply new knowledge to create or develop new or improved products/services (Smith et al., 2011). Thus, building capacity for innovation is crucial for firms to capture values from innovation processes.

This paper investigates the role of capacity building activities in facilitating innovation. Prior research expressed the importance of investments in research and development (R&D) to building capacity for innovation (Smith et al., 2011) but overlooked the influence of investments in human resources on organizational innovation (Sartori et al., 2018). In addition, the simultaneous examination of the role of investments in both R&D and human resources in enhancing innovation output is still rare. Moreover, research into innovation has focused more on product innovation than on process innovation, although both innovation strategies are equally important for long-term technological advancement and growth (Goel & Nelson, 2018). In the context of a developing country like Vietnam, where a majority of firms are small- and medium-sized with limited resources, firms may prioritize process innovation, aiming to change processes of manufacturing, management, or distribution to reduce related production costs (Phung et al., 2021). This study attempts to fill this gap by using secondary data from Vietnam to shed light on which capacity building activities contribute to firms' product/service and process innovation performance.

II. Theoretical background and hypotheses

Innovation involves the creative application of entirely new knowledge as well as the diffusion of existing knowledge to increase the set of techniques and products commercially available in the economy (Rogers & Rogers, 1998; Smith et al., 2011). It may be displayed in the forms of new or improved products or services, new production techniques, packaging, marketing, or distribution (Rogers & Rogers, 1998). Thus, innovation capacity refers to a continuous improvement of the overall capability of firms to generate innovation for developing new products to meet market needs. The capacity can be incrementally or radically increased through activities that trigger the supply of innovation resources and conversion of the resources as the firm's knowledge base in an interactive environment (Szeto, 2000).

Although innovation plays an important role in a firm's success, not every firm can truly excel at it (Michaelis & Markham, 2017). Innovative firms require the ability of firms to identify trends and new technologies, acquire and exploit this knowledge and information (Tidd & Bessant, 2009). This innovation capacity can be subject to technical skills for developing successful in-house R&D outcomes, the ability to detect technological changes in the environment, and the development of core competencies from which innovation can develop (Smith et al., 2011). Accordingly, firms need to continue building capacity for innovation to adapt to technological and knowledge changes.

Capacity building is ''the process by which individuals, groups, organizations, institutions and societies increase their abilities to (1) perform core functions, solve problems, and define and achieve objectives; (2) understand and deal with their development needs in a broader context and in a sustainable manner'' (UNDP, quoted in Fukuda-Parr &

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Lopes, 2013, p. 68). Innovation research has expressed the linkages between technological and human elements and innovation capacity. Research focused on technological factors for innovation (Smith et al., 2011) and showed that R&D investment is a key internal input for generating innovation (De Martino & Magnotti, 2018). In modern industries, investments in human capital have become essential in fostering innovation (González et al., 2016), and investments in human resources occur in the form of training (Acemoglu, 1997). Dostie (2018) indicated that more training can lead to more product and process innovation. Investments in specialized training improve individual performance and encourage employees to keep up with the technology frontier, knowledge and skills needed for innovation (van Uden et al., 2017). Training activities facilitate employees to engage in a learning environment to empower their personal and professional characteristics, making them more and more creative to generate and develop ideas for innovation (Sartori et al., 2018). Accordingly, R&D investments and employee training are the stimulus factors that develop innovation capacity (Smith et al., 2011).

Research has also expressed the crucial role of R&D investments and employee training to develop absorptive capacity for innovation (Zahra & George, 2002). Absorptive capacity can foster innovation's speed, frequency, and magnitude and generate innovation capabilities and performance (Kostopoulos et al., 2011). Extant literature has provided evidence on the positive effect of absorptive capacity on innovation performance (Aliasghar et al., 2019; Kostopoulos et al., 2011). Thus, hypotheses are proposed as follows:

> *Hypothesis 1a: R&D investment is positively related to innovation output*
>
> *Hypothesis 1b: Training is positively related to innovation output*

Research literature has focused mostly on innovation in the manufacturing industry and has not paid much attention to innovation in the service industry even though services play a key role in developed countries (Sheehan, 2006). Both R&D investment and training are important to manufacturing and service firms, particularly in the technological era today (Sheehan, 2006). However, innovation in the manufacturing sector relies more on R&D investment than in the service sector, while service firms appreciate worker training against R&D expenditures since human capital is relatively more important in the service sector (Pires et al., 2008). Thus, hypotheses are proposed as follows:

> Hypothesis 2a. The positive impact of innovation capacity on innovation output in service firms is smaller than in manufacturing firms in terms of R&D investment.
>
> Hypothesis 2b. The positive impact of innovation capacity on innovation output in service firms is greater than that in manufacturing firms in terms of training.

Internal R&D is very risky and costly (Atuahene-Gima, 1992). While small firms may be at risk of failure due to uncertain outcomes of R&D activities if they invest in R&D with a high proportion, larger firms can maintain a diversified portfolio of innovation projects to reduce the overall risks of failure (Pires et al., 2008). On the other hand, investments in specific training will be less costly than in R&D and help small firms reduce the knowledge gaps due to lower educational-level employees as compared to larger firms. The same number of investments in training in small firms will have a higher impact on innovation output than in larger firms.

> Hypothesis 3a. The positive impact of innovation capacity on innovation output in small firms is smaller than that in larger firms in terms of R&D investment.
>
> Hypothesis 3b. The positive impact of innovation capacity on innovation output in small firms is greater than that in larger firms in terms of training.

III. Methodology

A. Data

We obtained secondary data from the World Bank for our analysis. The STEP Vietnam is among the Employer Surveys on Skills Measurement carried out in many countries worldwide. The survey was conducted by the World Bank, covering 11 cities in both the coastal and inland Vietnam regions. The final sample used for our analysis consisted of 330 firms.

B. Variables

The two dependent variables used in the study were product/service innovation (*Product*) and process innovation (*Process*). The variable *Product (Process)* was an ordinal variable measured by responses to survey questions relating to how many of the new products/services (processes), etc. were commercialized during the last three years. It took values of 0, 1, 2, 3, 4 if the number of introduced product/service (process) innovations was 0, 1, 2-5, 5-10, or >10, respectively.

The innovation capacity was measured by two variables: 1) *R&D expenditure*, taking values ranging from 0 to 5 if the expenditure for R&D of the firm (in million Vietnam Dong) was 0, <50, 51-200, 200-500, 500-1000, or >1000, respectively; 2) *Training*, taking values ranging from 0 to 5, representing the number of different training activities the firm implemented for employees: the firm 1) organized its own training; 2) sent its employees to training courses organized by other partners; 3) hired technical assistance to work with its employees; 4) provided its employees with updated working and learning materials and tools; and 5) organized other activities.

Control variables included: 1) *Industry*, taking the value of 1 if the firm was manufacturing, and 0 if otherwise; 2) *Firm size*, coded as 1 if the firm was small-sized, and 0 otherwise; 3) *Firm age*, a continuous variable representing the number of years since establishment; 4) *Foreign owner*, coded as 1 if the largest shareholders in the firm were for-

Table 1. Descriptive statistics

Variable	Category	Observation	Percent (%)
All sample		330	100
Industry	Service	143	43.33
	Manufacturing	187	56.67
Firm size	Small firms	201	60.91
	Larger firms	129	39.09
Ownership	Foreign owner	52	15.76
	Government owner	14	4.24
	Other	264	80.00
R&D expenditure	0 VND	297	90.00
	<50 million VND	4	1.21
	51-200 million VND	15	4.55
	200-500 million VND	9	2.73
	500-1000 million VND	1	0.30
	>1000 million VND	4	1.21
Training	Yes	86	26.06
	No	244	73.94

Note: This table reports basic descriptive statistics of the independent variables, including their categories, number of observations, and percentages.

eigners, and 0 otherwise; and 5) *Government owner*, coded as 1 if the largest shareholders in the firm were the government, and 0 otherwise.

C. Analytical methods

Because of the dependent variables' ordinal nature, ordered logistic regression models were used to analyze the data. First, all control variables were included in Models 1-2, and then independent variables were added to Models 3-4 to test hypotheses 1a and 1b. In order to test hypotheses 2a-b and 3a-b, interactive variables were generated and included in Models 5-8. The data analysis was conducted using the statistical software Stata version 15.1. All tables in the paper are the authors' calculations based on the data.

IV. Results

Table 1 presents the descriptive statistics of the sample of 330 observations. The proportions of manufacturing and service firms are 56.67% and 43.33%, respectively. Small firms account for a larger proportion which is 60.91% compared with 39.09% for larger firms. Firms providing training for employees account for 26.06%, while only 10% of firms invest in R&D.

The results of hypothesis testing are shown in Table 2. As shown in Models 3-4, the R&D expenditure significantly and positively affect product innovation ($\beta = 0.276$, $p < 0.05$) but does not show a significant effect on process innovation ($\beta = 0.192$, $p > 0.1$). Thus, hypothesis 1a is partly supported. The coefficients of *Training* are positive and significant for both product and process innovation models (the coefficients are 0.672 and 0.684, respectively, $p < 0.01$), indicating the positive effect of *Training* on innovation output. Therefore, hypothesis 1b is supported.

Models 5-6 show the regression results of interaction terms between innovation capacity variables and industry and firm size to test hypotheses 2a-b. The coefficients of interaction term *R&D expenditure*Industry* are statistically insignificant ($\beta = 0.104$, $p > 0.1$, and $\beta = -0.063$, $p > 0.1$ for product and process innovation, respectively), indicating that building innovation capacity through R&D expenditure shows no difference in its impact on innovation outputs between manufacturing and service firms. Thus, hypothesis 2a is not supported. Meanwhile, the coefficients of the interaction term *Training*Industry* are negative and statistically significant ($\beta = 0.189$, $p < 0.05$ and $\beta = 0.253$, $p < 0.05$ for product and process innovation, respectively), indicating that innovation capacity through training in services firms has a greater impact on both product and process innovation output than in manufacturing firms. Hypothesis 2b is supported. The coefficients of the interaction between innovation capacity variables and *Firm size* are all statistically insignificant in Models 7-8, showing no difference in the impact of innovation capacity on innovation outputs between small firms and larger firms. Thus, hypotheses 3a and 3b are not supported.

V. Discussion

Based on data from Vietnam, this study shows that building innovation capacity contributes significantly to innovation performance. More specifically, capacity building through training plays a significant role in both product/service and process innovation, while R&D investment is significant only for product/service innovation, confirming the importance of human capital in enhancing capacity for innovation. As Michaelis and Markham (2017) stated, "insufficient training [...] can lock a company in incrementalism, leading to missed opportunities and lost growth" (p.

Table 2. Ordered logistic regression results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Dependent variables	Product	Process	Product	Process	Product	Process	Product	Process
Independent variables								
Industry	1.562***	0.719	1.594***	0.570	1.125***	0.978**	1.866***	2.421**
	(0.250)	(0.567)	(0.259)	(0.578)	(0.174)	(0.441)	(0.308)	(1.107)
Firm size	0.323	-0.848	0.219	0.615	0.115	-0.412	-0.497	0.809
	(0.259)	(0.529)	(0.273)	(0.530)	(0.161)	(0.282)	(0.318)	(0.768)
Firm age	-0.012	0.08***	-0.0387*	0.0653**	-0.018	0.039**	-0.0309	0.0820***
	(0.018)	(0.026)	(0.0207)	(0.0282)	(0.013)	(0.017)	(0.0206)	(0.0312)
Foreign owner	0.448	2.365***	0.229	2.042***	0.165	1.00***	0.163	2.180***
	(0.322)	(0.538)	(0.334)	(0.544)	(0.200)	(0.288)	(0.337)	(0.603)
Government owner	0.784	0.406	0.688	-0.449	0.346	-0.446	0.615	-0.391
	(0.550)	(1.17)	(0.593)	(1.304)	(0.371)	(0.746)	(0.589)	(1.301)
R&D expenditure			0.276**	0.192	0.083	0.167	0.0243	0.0865
			(0.136)	(0.189)	(0.164)	(0.221)	(0.309)	(0.533)
Training			0.672***	0.684***	0.661***	0.716***	0.950***	1.645***
			(0.152)	(0.199)	(0.160)	(0.209)	(0.314)	(0.520)
R&D expenditure*Industry					0.104	-0.063	0.199	-0.190
					(0.189)	(0.253)	(0.326)	(0.507)
Training*Industry					-0.379**	-0.553**	-0.677**	-1.225**
					(0.192)	(0.252)	(0.331)	(0.487)
R&D expenditure*Firm size							0.341	0.375
							(0.320)	(0.457)
Training* Firm size							0.366	-0.0721
							(0.297)	(0.425)
Observations	318	318	318	318	318	318	318	318
Pseudo R^2	0.078	0.134	0.122	0.193	0.131	0.207	0.133	0.234

Note: This table reports the ordered logistic regression results, including coefficients, standard errors in parentheses, p-values (*** p<0.01, ** p<0.05, * p<0.1), observations and Pseudo R^2.

41). Building innovation capacity through training enables firms to fill the gap between the general human capital supplied by the education system within a country and the specific human capital required by the firm (van Uden et al., 2017).

In addition, service firms report greater benefits of investing in human capital through training than manufacturing firms, which is in line with prior studies (Sheehan, 2006). Service innovation focuses on new service concepts, improvements in service quality, customer management, service management, and organizational or technological service delivery system; it is less tangible and more interwoven with the capabilities embedded in the processes and routines throughout an organization (Den Hertog et al., 2010), therefore more human-oriented.

The research shows that there is no difference in the effect of innovation capacity building on innovation between small and larger firms. This means that training is beneficial to both small firms with a lack of resources and larger firms with resource abundance. Indeed, even in firms which possess a highly skilled workforce, they still need to keep up with the latest technologies and skills, which can be achieved by training activities.

Firms' managers should consider investing in either R&D or employee training or both to build capacity for creating and capturing values of innovation processes. For firms with limited financial resources, they resort to choosing either of them, depending on the innovation type. This study suggests that R&D investment is more important for product innovation than process innovation, and training leads to enhancing both product and process innovation.

The study results may be useful for policymakers in designing policies that promote innovation among firms. Public policy should not only support innovative firms by financial incentives to invest in R&D but also facilitate and assist firms in providing different forms of training to employees. The Vietnamese government has implemented a number of financial support programs for R&D organizations, yet government programs and incentives for firms to invest in employee training are still limited, even though training contributes to both product/service and process innovation performance, as evidently shown in this study. Policymakers should have policies to promote employee training in R&D, for example, financial incentives and human support for the collaboration between industry, research institutes and universities to enhance innovation capacity.

VI. Conclusion

In an increasingly global market characterized by uncertainty and shortened product life cycle today, firms need to possess innovation capacity to successfully generate superior innovation outcomes. This study shows that investments in R&D and employee training are crucial to enhancing innovation outcomes. While R&D investment is beneficial to product/service innovation, training is critical for both product/service and process innovation by offering opportunities for firms to create an innovation-oriented culture and a pool of employees with specific skills for R&D. The research provides evidence on the impact of building innovation capacity on innovation outcomes in a developing country like Vietnam and has implications for managers and policymakers. Future research may examine the impact of different types of training, such as online and face-to-face training, or the impact of training approaches, such as internal and external training, on innovation performance.

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