ROLES OF ENTREPRENEURIAL MINDSET AND BUSINESS MODEL INNOVATION TO PRODUCT INNOVATION OF TECH-BASED FIRMS

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ABSTRACT

This study is designed to validate the impact of entrepreneurial mindset on product innovation outcomes in technology-based enterprises while concurrently examining the mediating influence of business model innovation. Anchored in the opportunity innovation theory, the model and research hypotheses underwent empirical testing through a structured questionnaire survey conducted in technology-based businesses across Vietnam. The dataset, derived from 163 valid responses obtained from mid to senior-level managers, facilitated a robust analysis. Employing a partial least squares structural equation modeling approach, the study meticulously investigates the managerial interplay among entrepreneurial mindset, business model innovation, and product innovation outcomes. The results unequivocally demonstrate a positive influence of entrepreneurial mindset on product innovation, with business model innovation playing a partial mediating role in this relationship. This research underscores the pivotal roles played by entrepreneurial mindset and business model innovation in shaping product innovation outcomes within technology-based enterprises in developing nations. Furthermore, these businesses are encouraged to implement the research findings for practical application actively.

VAI TRÒ CỦA TƯ DUY KHỞI NGHIỆP VÀ ĐỔI MỚI MÔ HÌNH KINH DOANH ĐẾN KẾT QUẢ ĐỔI MỚI SẢN PHẨM CỦA DOANH NGHIỆP DỰA TRÊN CÔNG NGHỆ

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TỪ KHÓA

Tư duy khởi nghiệp
Đổi mới sản phẩm
Phát triển sản phẩm
Đổi mới mô hình kinh doanh
Doanh nghiệp dựa trên công nghệ

TÓM TẮT

Nghiên cứu nhằm kiểm chứng vai trò của Tư duy khởi nghiệp tới kết quả đổi mới sản phẩm của doanh nghiệp công nghệ, đồng thời xem xét vai trò trung gian của đổi mới mô hình kinh doanh. Dựa trên lý thuyết đổi mới cơ hội, mô hình và giả thuyết nghiên cứu được kiểm chứng thông qua khảo sát bảng hỏi có cấu trúc tại các doanh nghiệp công nghệ Việt Nam. Tập dữ liệu bao gồm 163 câu trả lời hợp lệ của các nhà quản lý cấp trung và quản lý cấp cao. Nghiên cứu sử dụng phương pháp mô hình cấu trúc bình phương tối thiểu từng phần để kiểm tra mối quan hệ nhân quả giữa tư duy khởi nghiệp, đổi mới mô hình kinh doanh và kết quả đổi mới sản phẩm. Kết quả cho thấy tư duy khởi nghiệp có ảnh hưởng tích cực đến đổi mới sản phẩm và đổi mới mô hình kinh doanh có vai trò trung gian một phần đối với mối quan hệ trên. Nghiên cứu khẳng định vai trò của tư duy khởi nghiệp và đổi mới mô hình kinh doanh tới kết quả đổi mới sản phẩm trong các doanh nghiệp công nghệ ở các nước đang phát triển. Bên cạnh đó, các doanh nghiệp công nghệ cũng có thể áp dụng kết quả nghiên cứu này vào thực tiễn.

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1. Introduction

Understanding how tech-based firms navigate and drive innovation is crucial in an era of rapid technological advancements. Product innovation, a cornerstone for these companies, is crucial in sustaining competitiveness and meeting evolving consumer demands [1]. By delving into this research, we aim to uncover the underlying mechanisms contributing to successful product innovation in tech-based firms. This research explores the role of an entrepreneurial mindset, which fosters a culture of creativity and risk-taking, and business model innovation, which can reshape the foundations of these firms' operations. The insights from this research contribute to academic knowledge and provide practical implications for tech-based firms aiming to thrive in a dynamic and ever-changing technological landscape.

Existing research on product innovation in tech-based firms underscores innovation's dynamic and multifaceted nature in the rapidly evolving technology sector [2]. Scholars have explored various dimensions, including the pivotal role of entrepreneurial mindset and business model innovation in shaping product innovation outcomes. Entrepreneurial mindset within tech-based firms has been identified as a catalyst for creativity, risk-taking, and adaptability, fostering an environment conducive to groundbreaking product development [3]. Additionally, researchers have investigated the mediating role of business model innovation, recognizing its significance in redefining how these firms operate and bring products to market [4]. Overall, the existing body of research provides valuable insights into the complex dynamics of product innovation in tech-based firms, contributing to theoretical advancements and practical implications for firms navigating the intricacies of the technology-driven landscape [5].

While existing research has delved into various aspects of product innovation in tech-based firms, a notable research gap centres around the nuanced interactions between entrepreneurial mindset, business model innovation, and product innovation outcomes [6], [7]. While studies acknowledge the individual impacts of entrepreneurial mindset and business model innovation, there is a need for more comprehensive investigations into how these factors collaboratively influence the innovation landscape within tech-based firms. Moreover, more attention should be given to exploring these dynamics in the context of developing countries, such as Vietnam. Understanding the special challenges and opportunities faced by tech-based firms in these settings is crucial for tailoring effective strategies that foster innovation [8]. Additionally, there needs to be more research explicitly focusing on the practical implementation of findings, providing actionable insights for firms aiming to enhance their product innovation capabilities.

Future research can contribute significantly to refining theoretical frameworks, guiding managerial practices, and fostering a more holistic understanding of the intricate relationships shaping product innovation in tech-based firms by addressing these gaps. Studies highlight the interplay between these factors, emphasizing the need for a holistic understanding of the innovation process. The role of leadership, organizational culture, and strategic decision-making has also been scrutinized to comprehend how these elements influence product innovation performance [9]. Furthermore, the research delves into the challenges and opportunities presented by technological disruptions, considering factors such as market dynamics, competition, and the integration of emerging technologies. This paper contains four main parts; following this introduction are methodology, results and discussion. The final part mentions implementation in both academic and practical approaches.

2. Methodology

2.1. The research model and proposed hypothesis

This research examines the effect of entrepreneurial mindset and business model innovation on product innovation performance. The proposed hypotheses are as follows:

H1: Product innovation is positively impacted by an entrepreneurial mindset.

H2: Entrepreneurial mindset has a positive effect on business model innovation.

H3: Business model innovation has a positive effect on product innovation.

H4: Business model innovation has a mediating role in the relationship between entrepreneurship mindset and product innovation.

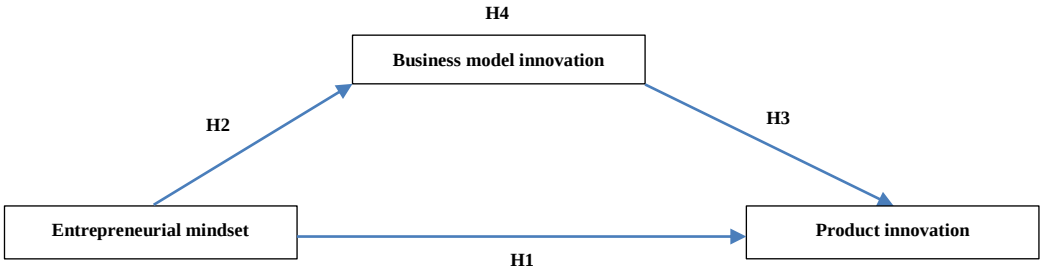

Figure 1. *The research model*

Figure 1 proposes the role of the entrepreneurial mindset and business model innovation on product innovation of tech-based firms.

2.2. Measurement scale

The research paper employed PLS-SEM (a partial least square equation model) to examine the proposed hypothesis. A five-point Likert scale assessed the degree of EM-entrepreneurial mindset, BMI-business model innovation and PI-product innovation. The entrepreneurial mindset has nine items adopted and modified by Ferreras-Méndez et al. [10]. Business model innovation scales have six items and were adapted from Clauss [11] and Bouncken & Fredrich [12]. Product innovation has six items and was adapted and validated by Nakata & Hwang [13]. Table 1 shows the measurement scale of each variable.

Table 1. *Measurement scale items for variables*

Item code	Item description	Source
Entrepreneurial mindset		
EM1	Our company emphasises R&D and technical innovation instead of validating actual products.	
EM2	Our company has to develop many new lines of products/services.	
EM3	We often change products/services radically compared to incremental change.	
EM4	We typically adopt a very competitive.	
EM5	We often introduce new products/services or operating techniques compared to competitors.	[10]
EM6	We typically adopt a very competitive.	
EM7	We often aim for high-risk projects with high potential returns.	
EM8	We use strong, bold and wide-ranging acts in the external environment to achieve our goals.	
EM9	We often adopt aggressive posture to exploit opportunities.	
Business model innovation		
BMI1	The company regularly changes the way it delivers value to customers.	
BMI2	The company frequently explores new sales strategies to generate revenue.	
BMI3	The company often tests new business models in its market.	[11],
BMI4	The company regularly uses new distribution and sales channels.	[12]
BMI5	The company actively seeks opportunities to save production costs.	
BMI6	The company changes aspects of its business model frequently.	
Product innovation		
PI1	Sales of the new product/service have reached the set target.	
PI2	The market share of the new product/service has reached the set target.	
PI3	The profit margin of the new product/service has reached the set target.	[13]
PI4	The profit from the new product/service has reached the set target.	
PI5	In general, the company's new product development program has been successful.	
PI6	The results of the product innovation program attract more customers than competitors.	

2.3. Population and sampling

The data is collected from managers in tech-based companies' first-line, middle-level, and C-level positions. In this paper, the sampling technique employed is proportional stratified Random Sampling (SRS). This method includes a process of segregation using the random selection from initial data. Specifically, SRS was applied to firms with new products/services, totalling 163 companies in Vietnam. The selection process included randomly sampling subjects from each identified stratum within the population.

First, direct communication was established with each general manager, who was personally contacted and provided with a detailed information sheet explaining the research's necessity and significance. Then, the authors sent links to online questionnaires to more than 500 managers of tech-based companies from the Ministry of Planning and Investment list. In the 179 online questionnaires collected for the survey, which gave a response rate of 35%, four businesses provided false answers, and twelve businesses did not work in the technology sector. Thus, 163 valid questionnaires constitute the official sample for analysis. Respondents of information technology companies accounted for 58%, and other tech-based companies accounted for 42%. These firms play a crucial role in Vietnam's economy [14]. Regarding the information of respondents, the survey was completed exclusively by first-line managers (18%), middle managers (47.5%) and top managers (34.5%).

2.4. Data analysis

This study employs PLS-SEM to assess the predictive ability to estimate the statistical model through Smart PLS 4.0.9.2. The algorithm, based on ordinary least squares regression, allows for the unrestricted use of single indicators, reflections, or formulas that are genuinely collected in the company's database. PLS-SEM proves to be efficient with small samples, such as the 163 questionnaire responses in this study, and the model includes various constructs with a substantial number of items.

3. Results and discussion

3.1. Statistical analysis of the measurement scale

The descriptive statistics table details the data sample; the results show that the mean values of all observed variables range from 3.33 to 3.56. The data in table 2 shows that the respondents tend to be neutral and agree to statements. The standard deviation values for the variables ranged from 0.691 to 0.889, showing that the survey respondent’s answers were consistent.

Table 2. *Descriptive statistic*

	N	Minimum	Maximum	Mean	Std. Deviation
Entrepreneurial mindset (EM)					
EM1	163	1	5	3.33	0.785
EM2	163	1	5	3.39	0.772
EM3	163	1	5	3.42	0.823
EM4	163	1	5	3.43	0.785
EM5	163	2	5	3.52	0.788
EM6	163	2	5	3.38	0.763
EM7	163	1	5	3.43	0.846
EM8	163	1	5	3.40	0.814
EM9	163	2	5	3.41	0.691
Business model innovation (BMI)					
BMI1	163	1	5	3.33	0.737
BMI2	163	1	5	3.41	0.807
BMI3	163	2	5	3.44	0.779
BMI4	163	2	5	3.36	0.783

	N	Minimum	Maximum	Mean	Std. Deviation
BMI5	163	1	5	3.35	0.828
BMI6	163	1	5	3.45	0.818
Product innovation (PI)					
PI1	163	1	5	3.43	0.889
PI2	163	1	5	3.33	0.794
PI3	163	2	5	3.56	0.861
PI4	163	2	5	3.42	0.784
PI5	163	2	5	3.37	0.832
PI6	163	1	5	3.42	0.867

In this study, we ran a pre-test with four experts from each industry under analysis to make sure the items made sense in the context of those businesses. The items' clarity and readability were confirmed in the pre-test interviews, guaranteeing the validity of the test. After that, we evaluated the competency of the model by construct reliability, individual items reliability, convergent validity and discriminant validity. In table 3, Cronbach's Alpha indicator of all variable is more than 0.6 thus meets requirement. The values of composite reliability meet the proposed benchmark (>0.7). The average variance extracted values were more significant than the suggested criteria, that is 0.5. As a result, the convergent validity of the model has been accepted.

Table 3. *Measurement model results*

Items	Loadings			Cronbach's Alpha	Composite reliability	Average variance extracted
	EM	BMI	PI			
Entrepreneurial mindset (EM)				0.888	0.909	0.528
EM1	0.773					
EM2	0.729					
EM3	0.768					
EM4	0.685					
EM5	0.755					
EM6	0.635					
EM7	0.705					
EM8	0.752					
EM9	0.726					
Business model innovation (BMI)				0.843	0.884	0.560
BMI1		0.675				
BMI2		0.817				
BMI3		0.734				
BMI4		0.798				
BMI5		0.699				
BMI6		0.756				
Product innovation (PI)				0.896	0.921	0.659
PI1			0.855			
PI2			0.744			
PI3			0.842			
PI4			0.815			
PI5			0.811			
PI6			0.801			

Table 4. *Discriminant validity analysis*

	Variables	1	2	3
1	Entrepreneurial mindset	0.727		
2	Business model innovation	0.442	0.748	
3	Product innovation	0.436	0.358	0.812

Finally, we evaluated the discriminant validity using the Fornell-Larcker criterion to ensure that each concept measures a separate reality of the phenomenon under study. This means that the

latent variable's AVE must be greater than the square root of the correlation between the constructs [15]. This criterion is satisfied in every instance, according to the data in Table 4.

Table 5. *Heterotrait-Monotrait analysis*

	Variables	1	2	3
1	Entrepreneurial mindset			
2	Business model innovation	0.488		
3	Product innovation	0.477	0.402	

Finally, we also added the heterotrait-monotrait ratio to further assess the validity of this criterion. According to established procedures, table 5 demonstrates that heterotrait correlations are always smaller than monotrait correlations. The convergent and discriminant validity is supported; then it confirms the variables' discriminants and can be used to test the structural model.

3.2. Evaluation of the structural model

Research model was tested, and estimated two models: model 1 is the direct effect of entrepreneurial mindset to product innovation, model 2 is indirect effect model and assesses the mediating role of business model innovation. Since all of the study's components are reflective, we evaluated the inner route using three different methods of analysis: the R2 of the endogenous latent variables, estimates for the path coefficients and the significance of the predictions. Table 6 shows result of R^2 and f^2 ratio.

Table 6. *R^2 of endogenous latent variables and f^2 ratio*

Factor	R^2	R^2-adjusted	Effect size	f^2
Business model innovation	0.195	0.190	$f^2_{\text{Entrepreneurial mindset -> Business model innovation}}$	0.243
Product innovation	0.224	0.214	$f^2_{\text{Business model innovation -> Product innovation}}$	0.044
			$f^2_{\text{Entrepreneurial mindset -> Product innovation}}$	0.123

According to the R^2, the proposed model accounts for 23% of the variance in product innovation and 20% in business model innovation. Both results show that the suggested model accounts for more than 10% of the construct variability. Belonging effect size f^2 shows effect of independent variables to dependent variables.

Table 7. *Effect on product innovation and business model innovation*

		Model 1[1]			Model 2[2]		
	Hypothesis	**Total effect**	**t-value**	**P-value**	**Total effect**	**t-value**	**P-value**
H2	Entrepreneurial mindset -> Business model innovation	0.442***	5.803	0.000			
H3	Business model innovation -> Product innovation	0.206**	2.628	0.009			
H1	Entrepreneurial mindset -> Product innovation	0.345***	3.846	0.000			
H4	Entrepreneurial mindset -> Business model innovation -> Product innovation				0.091*	2.219	0.027

Table 7 displays the path coefficient values and significance levels for the direct effect model (Model 1) and the mediated model (Model 2). Results for Model 1 show that EM and BMI have a positive and substantial association. Medium impact when combined with the coefficient $f^2_{\text{Entrepreneurial mindset -> Business model innovation}} = 0.243$. As a result, hypothesis 1 is accepted.

The analysis's findings demonstrate that the influence of business model innovation on product innovation has a standardized impact coefficient of 0.206 and P values = 0.009 less than

[1] Direct effect model
[2] The mediated model

0.05. It has a negligible effect when combined with the coefficient $f^2_{\text{Business model innovation -> Product innovation}}$ = 0.044. As a result, hypothesis 2 is accepted since the author concludes that business model innovation positively affects product innovation.

According to the analysis's findings, the influence of entrepreneurial mindset on product innovation has a standard impact coefficient of 0.345 and a P value = 0.000 less than 0.05. It has a negligible effect when used with the coefficient $f^2_{\text{Entrepreneurial mindset -> Product innovation}}$ = 0.123. As a result, hypothesis 3 is accepted since the author concludes that an entrepreneurial attitude positively influences product creation.

Standardized effect coefficient (Original Sample) = 0.091, P-value = 0.027 less than 0.05 for those above separate indirect impact. As a result, hypothesis 4 is accepted since the author concludes that business model innovation plays an partial intermediary role in the interaction between entrepreneurship mindset and product innovation.

3.3. Discussion

The results of this study align with the entrepreneurial mindset theory, affirming its positive impact on product innovation within tech-based firms. Entrepreneurial mindset encompasses various facets such as initiative, risk-taking, and a proactive emphasis on initiatives [16]. The study raises the notion that teach-based firms often need more awareness of product innovation, and the entrepreneurial mindset, particularly the willingness to seize opportunities and promote novel concepts, addresses this gap [17]. The ability to identify new possibilities, reallocate resources, and actively engage in product development aligns with the proactive nature of the entrepreneurial mindset, fostering competitiveness. The study emphasizes that the entrepreneurial mindset actively seeks novel combinations, regulates, and takes risks, crucial for fostering product innovation that meets evolving customer needs [18]. Overall, the findings support the idea that cultivating an entrepreneurial mindset is integral for tech-based firms seeking to drive product innovation and navigate the challenges of a dynamic market landscape.

The result shows that business model innovation mediates connecting entrepreneurial mindset with product innovation. Previous research has often overlooked the participatory impact of an entrepreneurial mindset on driving business model innovation despite the acknowledged importance of the latter in gaining a competitive edge [19]. The study reveals that entrepreneurship mindset and product innovation are mediated by business model innovation. Organizations must have appropriate mechanisms to foster the need for business model innovation, and dynamic capabilities, encompassing activities, processes, and leadership qualities, play a vital role in enabling this change [4]. Business model innovation becomes the internal mechanism essential for enhancing value creation in newly introduced goods and services, thereby boosting innovation [20]. The study's conclusion aligns with these justifications, emphasizing that the impact of entrepreneurial mindset on product innovation is effectively channelled through the critical intermediary of business model innovation. This underscores the pivotal role of business model innovation in translating entrepreneurial ideas into tangible product innovation outcomes.

These findings have important implications for developing managerial behavior. First, founding members must remain highly committed and complement each other's skills to give the startup team intrinsic strength. Learning from the market is essential, especially in new ways like lean startups and innovative and innovative businesses. Regularly review the business model to identify and modify products and services to meet changing market needs. That bring potential to meet emerging requirement of competitiveness in technological changing world, for example investors or capital market need [14]. In addition, it is necessary to improve foreign language skills to actively seize opportunities from the integration process, especially in the global trend of the Industrial Revolution 4.0.

Secondly, increase production and deliver unique items to the market using existing facilities. In order to fully transition from an outdated chain to an existing chain, it is necessary to establish

a plan and prioritize several investment areas in Vietnam's specific conditions. Instead of arbitrarily investing in key technology areas, businesses should prioritize efficiency. The quality of human resources has a significant influence on intelligent products.

Thirdly, entrepreneurs must understand their internal resources to establish a company or a startup. From idea generation to project launch, it's essential to create a well-structured strategy that includes the following elements: foundation, premise for starting a business, and choosing a suitable, compact, and effective business line. Besides, businesses need the government to support and expedite administrative procedures for a new company to succeed.

4. Conclusion

The research includes several shortcomings that need to be fixed and from which lessons need to be learnt, in addition to specific contributions. The author only had access to a limited sample due to time and financial restrictions, which lessens the representativeness of the findings. Additionally, this research is cross-sectional. The independent and dependent variables' respective data are both gathered simultaneously. Future studies might examine the validity of this supposition and offer suggestions as to what time frame could be appropriate. Additionally, researchers can analyze the impact of product innovation on business model innovation in the following period by undertaking a longitudinal or time-lapse study. Returning to the questions posted at the beginning of this study, it is now possible to state that business model innovation and entrepreneurial mindset have crucial roles in innovation output and product innovation. This research extends our understanding of the mediating role of business model innovation, that process of creating value to innovation.

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