“The innovation paradox: Institutional drivers and capability orchestration in Vietnamese enterprises”

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ARTICLE INFO	Hoa Huu Cuong, Ly Thu Cuc and Nguyen Van Phuong (2026). The innovation paradox: Institutional drivers and capability orchestration in Vietnamese enterprises. *Problems and Perspectives in Management*, *24*(3), 627–645. doi:10.21511/ppm.24(3).2026.39
DOI	http://dx.doi.org/10.21511/ppm.24(3).2026.39
RELEASED ON	Tuesday, 15 September 2026
RECEIVED ON	Saturday, 21 March 2026
ACCEPTED ON	Friday, 21 August 2026

JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
58	2	10

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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THE INNOVATION PARADOX: INSTITUTIONAL DRIVERS AND CAPABILITY ORCHESTRATION IN VIETNAMESE ENTERPRISES

Abstract

Enterprises serve as the primary innovation engine in transition economies yet face significant institutional challenges. The purpose of this study is to investigate the "innovation paradox" in enterprises within a transition economy by analyzing the shift from reliance on passive subsidies (government support) to capability orchestration (absorptive capacity and internal readiness) in determining innovation performance. Grounded in the functional national innovation system and resource-based view, this paper relies primarily on a cross-sectional survey. Data were collected from November 2025 to January 2026 through direct and digital questionnaires administered to C-level executives and R&D managers from 240 enterprises across Hanoi, Da Nang, and Ho Chi Minh City. These key informants were selected for their strategic vantage point, ensuring high relevance in capturing diverse innovation modes. Using partial least squares structural equation modeling (PLS-SEM), the model explains 58.6% of the variance in innovation performance. Empirical results reveal a substantive implementation gap: internal R&D readiness is the strongest direct predictor of innovation performance ($\beta = 0.410$), and intermediary linkages significantly enhance outcomes through the partial mediation of absorptive capacity. Conversely, while direct government support marginally aids short-term output, it does not show a significant association with long-term absorptive capacity ($\beta = 0.032$). Consequently, policymakers should complement financial incentives by supporting intermediary networks, while managers must cultivate internal learning routines to exploit external knowledge.

Keywords innovation paradox, absorptive capacity, transition economy, government support, PLS-SEM

JEL Classification O32, O38, P20

Type of the article: Research Article

Received on: 21st of March, 2026
Accepted on: 21st of August, 2026
Published on: 15th of September, 2026

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Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

The transition from factor-driven economic growth to an innovation-led development model represents the defining challenge for emerging nations in the post-pandemic era, particularly for transition economies navigating the complex shift from central planning to market-oriented mechanisms (Jumambayev et al., 2025; Tran et al., 2022). For Vietnam, this trajectory involves dismantling legacy administrative structures while constructing a cohesive ecosystem capable of integrating domestic enterprises into global value chains. Consequently, the Vietnamese government has strategically positioned science, technology, and innovation (STI) as a pivotal breakthrough, signaling a robust political commitment to fostering a dynamic innovation ecosystem comparable to its successful regional peers.

However, despite this strong political will and the marked proliferation of legislative frameworks to incentivize enterprises, current diagnostics suggest a persistent "implementation gap" in Vietnam's innovation landscape. While the quantity of institutions has expanded rapidly, the system's functional quality remains problematic. Recent comprehensive assessments, such as the Global Innovation Index

analysis by WIPO (2024) and the Vietnam Innovation & Tech Investment Report by NIC (2023), indicate that the Vietnamese national innovation system is characterized by systemic challenges and inefficiency in resource allocation. Specifically, the linkage mechanism between the supply side of knowledge and the demand side is frequently described as tenuous, suffering from "missing links" in the intermediary sector where technology brokerage is misaligned with market needs (Dang & Tran, 2023; Phuong et al., 2020). Furthermore, systemic barriers continue to hinder the absorptive capacity of domestic firms, which often operate in isolation. This isolation substantially limits potential knowledge spillover effects, leaving domestic enterprises decoupled from advanced technological flows despite high trade openness (Cirera et al., 2021; Petti et al., 2021; Bozsik et al., 2023).

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Contemporary scholarly discourse on innovation in transition economies reflects a necessary shift from macro-structural descriptions to micro-level capability analyses. Prior research has extensively documented the structural constraints of emerging markets, highlighting institutional voids, resource scarcity, and policy-practice decoupling. In this context, scholars have increasingly recognized that traditional, static models of the national innovation system (NIS) are insufficient to explain firm-level heterogeneity in catching-up economies. Consequently, recent literature calls for an integrated approach that bridges macro-institutional drivers with micro-organizational dynamics to understand how firms navigate these institutional constraints.

1.1. Theoretical framework: Functional NIS approach in transition economies

The theoretical foundation of this study is rooted in the national innovation system (NIS) literature (Lundvall, 2010; Nelson, 1993; Trevor, 1989). However, traditional structuralist perspectives – which map the static roles of discrete actors – are insufficient for transition economies characterized by institutional isomorphism (Chaminade & Edquist, 2006; Edquist, 2006). Thus, this study adopts the functional NIS approach, shifting the analytical focus from the mere presence of entities to the execution of critical innovation activities, such as knowledge provision, resource allocation, and interactive learning (Edquist, 2006; Phuong et al., 2025). In transitional contexts, the state's role evolves from a direct controller of production to a facilitator addressing systemic failures (Khalidi, 2023; Quynh et al., 2023).

Applying this functional lens requires integrating institutional theory, in which institutions set the rules of the game that structure economic interactions (North, 1990). Transition economies frequently suffer from formal institutional voids, such as regulatory ambiguity and bureaucratic inefficiency, which elevate transaction costs and dampen innovation incentives (Doh et al., 2017; Istipliler et al., 2023). These constraints disproportionately burden Vietnamese enterprises and precipitate the "innovation paradox" (Cirera et al., 2021). Despite the immense potential returns of technological catch-up, firms persistently underinvest in innovation due to a severe lack of complementary factors, particularly managerial capabilities and supportive institutional frameworks (Cirera & Maloney, 2017).

To bridge macro-level institutional drivers and micro-level innovation outcomes, this study integrates the resource-based view (RBV) (Barney, 1991) and the relational view (Dyer & Singh, 1998). To survive institutional adversity, firms substitute deficient formal support with collaborative networks and intermediary linkages (Etzkowitz & Leydesdorff, 2000). Ultimately, absorptive capacity (ACAP), the dynamic capability to recognize, assimilate, and commercially exploit external knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002), serves as the vital transmission mechanism. Our framework posits that the functional efficacy of NIS relies on a mediated orchestration where external institutional inputs (government support and intermediary linkages) are cognitively processed through ACAP to drive sustainable firm innovation.

http://dx.doi.org/10.21511/ppm.24(3).2026.39

1.2. Government support and resource allocation

In emerging markets, government support is theorized to act as a critical mechanism for alleviating the "liability of newness" and financial constraints inherent in innovation activities. According to Cirera et al. (2021), the state in a transition economy plays a dual role: it is both a regulator and a direct provider of resources to correct market failures when private investment in R&D is suboptimal because of high risk. Functional interventions typically take the form of direct funding, tax incentives, and infrastructure provision (such as high-tech parks or incubation centers).

A synthesis of recent literature reveals a dichotomy regarding the efficacy of public support mechanisms. While macro-economic research emphasizes the decisive role of targeted public funding in the leapfrog development of transition economies (Hakim et al., 2026; Hernesniemi, 2000; Kalvet, 2009), micro-organizational studies caution that policy intent often diverges from actual firm-level outcomes. For instance, in the Vietnamese context, although current policy instruments aim to replicate successful regional models (NIC, 2023), administrative hurdles frequently moderate these intended benefits (Indrawati et al., 2020). Integrating these perspectives indicates that examining government support requires shifting the focus from the mere availability of funds to their functional accessibility.

Despite the persistent implementation gap and administrative hurdles characteristic of institutional isomorphism in emerging markets, direct state resource allocation theoretically lowers the marginal cost of experimentation for enterprises of varying sizes (Tran & Vu, 2018). By providing the necessary financial slack, government support empowers firms to acquire off-the-shelf technologies and execute short-term product commercialization, thereby directly enhancing their innovation output (Cirera & Maloney, 2017; Samarkhanov et al., 2025). Furthermore, these external resource injections theoretically provide firms with the financial capacity to invest in continuous learning and organizational training, which are fundamental to developing absorptive capabilities (Zúñiga-Vicente et al., 2014).

1.3. Intermediary linkages and interactive learning

Innovation is fundamentally an interactive process, not an isolated act of genius. Edquist (2006) and Lundvall (2010) posit that the core function of an NIS is to facilitate "interactive learning" among diverse actors. In advanced innovation systems, this is realized through the "Triple Helix" model, where robust linkages between government, academia (universities/research institutes), and industry foster knowledge spillovers and technology commercialization (Etzkowitz & Leydesdorff, 2000).

Intermediary linkages, including interactions with universities, research institutes, and technology brokers, provide vital cognitive scaffolding for Vietnamese enterprises navigating institutional voids (Istipliler et al., 2023). By engaging in open innovation networks, firms can circumvent internal resource scarcities and lower the transaction costs associated with knowledge search and transfer (Petković et al., 2025). Furthermore, continuous exposure to diverse, codifiable knowledge pools via external partners forces firms to systematically upgrade their internal assimilation routines, thereby significantly enhancing their dynamic learning capabilities (Huggins et al., 2020). Consequently, the strength and depth of these external linkages are critical predictors of both capacity building and realized innovation output (Corral de Zubielqui et al., 2019).

1.4. Internal R&D readiness (resource-based view)

While external institutional drivers and intermediary networks are necessary, they are structurally insufficient without robust internal mechanisms. Grounded in the resource-based view (RBV), a firm must possess specific, inimitable tangible and intangible assets to execute innovation strategies effectively (Barney, 1991). In transition economies where firms strive to catch up with the global technological frontier, internal R&D readiness (defined as the availability of skilled human capital, structured R&D departments, and dedicated financial allocations) constitutes the foundational element of innovation capability (Petti et al., 2021).

The quality of human resources and internal R&D infrastructure among Vietnamese enterprises remains highly uneven (Hien et al., 2021). Firms lacking internal competence, specifically skilled engineering staff and formalized learning routines, suffer from severe technical inertia; they will invariably fail to translate external institutional inputs and knowledge spillovers into commercialized innovation outcomes (Hien et al., 2021). Internal R&D readiness determines a firm's bandwidth to engage with the broader innovation ecosystem and is therefore posited as the primary direct antecedent to innovation performance (Cohen & Levinthal, 1990).

1.5. Mediating role of absorptive capacity

To thoroughly deconstruct the black box bridging institutional drivers and micro-level innovation outcomes, this study centralizes absorptive capacity (ACAP) as the core mediating mechanism. Defined conceptually as a firm's dynamic capability to recognize the value of novel, external information, assimilate it, and commercially exploit it, ACAP dictates the efficiency of technology adoption (Cohen & Levinthal, 1990; Zahra & George, 2002).

While prior studies often treat external institutional drivers and internal firm capabilities as parallel antecedents to innovation, a synthesized analytical landscape suggests a hierarchical relationship. In fragmented transition ecosystems, the mere availability of government support or university linkages does not automatically translate into innovation output (Nguyet, 2022; Trang, 2023). Instead, reconciling these external inputs with actual firm performance requires a transmission mechanism. Consequently, current theoretical models position absorptive capacity (ACAP) as this critical mediator, positing that external resources remain insufficiently utilized unless cognitively processed through the firm's internal capabilities (Flatten et al., 2011; Jansen et al., 2006).

In summary, the literature shows that navigating institutional voids in transition economies requires more than passive external government support. While the functional national innovation system approach highlights the necessity of institutional drivers, the resource-based view and open innovation paradigms emphasize that these macro-level inputs remain inert without robust intermediary networks and internal dynamic capabilities. To address this critical gap, the purpose of this study is to investigate the 'innovation paradox' in Vietnamese enterprises within a transition economy by analyzing the shift from reliance on passive subsidies (government support) to capability orchestration (absorptive capacity and internal readiness) in determining innovation performance. Based on the theoretical framework and the stated research purpose, this study proposes the following hypotheses:

H1: Absorptive capacity positively affects firm innovation performance.

H2: Government support positively affects absorptive capacity.

H3: Government support positively affects firm innovation performance.

H4: Intermediary linkages positively affect absorptive capacity.

H5: Intermediary linkages positively affect firm innovation performance.

H6: Internal R&D readiness positively affects absorptive capacity.

H7: Internal R&D readiness positively affects firm innovation performance.

H8: Absorptive capacity mediates the relationship between government support and firm innovation performance.

H9: Absorptive capacity mediates the relationship between intermediary linkages and firm innovation performance.

H10: Absorptive capacity mediates the relationship between internal R&D readiness and firm innovation performance.

1.6. Conceptual model

Based on the hypotheses, the research model employs a robust structural framework (Figure 1). Independent variables (exogenous) include government support, intermediary linkages, and in-

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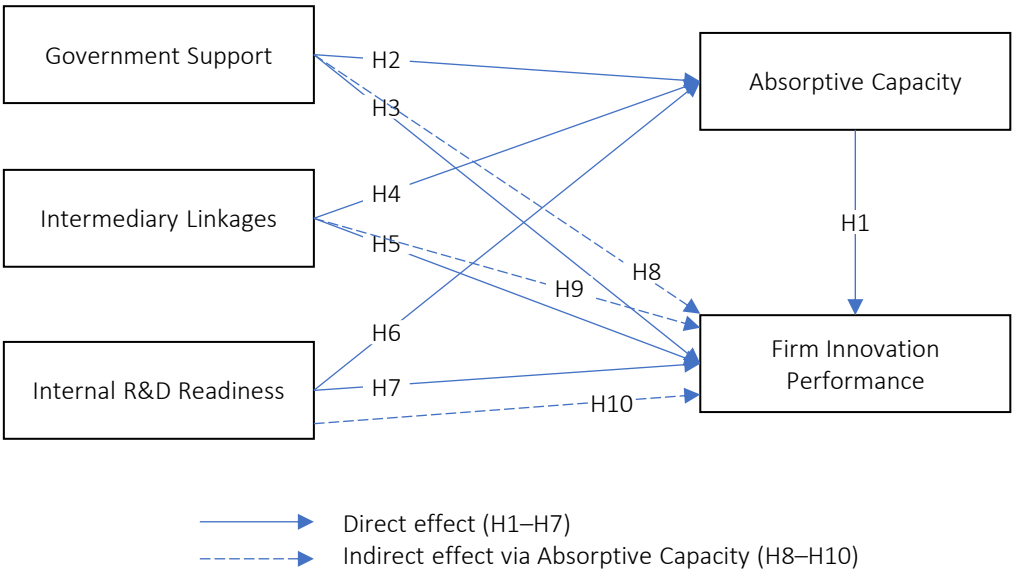

Note: Solid arrows indicate hypothesized direct effects (H1–H7); dashed curved arrows indicate hypothesized indirect effects through absorptive capacity (H8–H10).

Figure 1. Proposed research model and hypothesized direct and indirect relationships

ternal R&D readiness. The mediating variable is absorptive capacity. The dependent variable (endogenous) is firm innovation performance.

This configuration allows analysis of both direct and indirect effects (mediation), providing a granular view of how the national innovation system functions at the micro-level in Vietnam's key economic hubs (Hanoi, Da Nang, HCMC).

2. METHOD

2.1. Research context and sampling design strategy

To rigorously test the hypothesized relationships within the functional national innovation system (NIS) framework, this study employs a cross-sectional quantitative design targeting the enterprise as the primary unit of analysis. The empirical setting is strategically delimited to Vietnam's three principal economic hubs: Hanoi, Da Nang, and Ho Chi Minh City. This selection is not merely geographic but represents distinct "institutional microcosms" of a transition economy: Hanoi exemplifies a policy-driven innovation environment centered on political administration; Ho Chi Minh City represents a market-driven ecosystem with high entrepreneurial density; and Da Nang serves as an emerging logistical and technological bridge in the Central region. Collectively, these three municipalities account for approximately 70% of the nation's registered startups and R&D activities (NIC, 2023), ensuring the sample has sufficient external validity to generalize findings to the broader transitional context.

To mitigate coverage error and ensure the sample accurately reflects the structural transformation of the economy, a stratified random sampling technique was employed. The sampling frame was constructed using the enterprise databases from the respective Departments of Planning and Investment, comprising an estimated population of 15,000 active enterprises. This frame was stratified by three key sectors: high-tech agriculture (approx. 2,000 firms), manufacturing/industry (approx. 5,500 firms), and knowledge-intensive services (approx. 7,500 firms). This stratification is critical because innovation modes differ significantly across sectors, ranging from "science-based" innovation in high-tech agriculture to "doing-using-interacting" (DUI) modes in services, and a simple random sample might fail to capture these nuances. The random selection of firms from each stratum was strictly conducted using a computerized random number generator to ensure impartiality.

2.2. Data collection and key informant qualification

Data collection was executed over a four-month period from November 2025 to January 2026. A critical methodological challenge in firm-level innovation surveys is identifying the appropriate respondent to minimize single-informant bias. To address this, the survey explicitly targeted key informants defined as C-level executives (CEOs, CTOs) or R&D managers. These individuals were selected based on their "strategic helicopter view," enabling them to possess the dual vantage point required to assess both external institutional pressures (government support, linkages) and internal organizational capabilities (absorptive capacity).

The instrument followed a rigorous multi-stage protocol. Initially, measurement scales were translated from English to Vietnamese and then back-translated by independent bilingual scholars to ensure semantic equivalence (Brislin, 1970). Subsequently, a pilot study with 30 executives and 5 academic experts was conducted to refine item wording.

For the main survey, a target sample of 400 enterprises was drawn from the sampling frame, proportionally distributed across the strata: 60 for high-tech agriculture, 150 for manufacturing/industry, and 190 for services. The questionnaires were distributed through a hybrid approach combining digital platforms for service firms and direct site visits for manufacturing entities. A strict non-respondent replacement procedure was implemented: if a selected firm declined to participate or could not be reached after three contact attempts, it was replaced by the next randomly selected firm from a pre-generated backup list within the same stratum.

The final dataset comprises 240 valid responses, representing an overall effective response rate of 60.0%. Specifically, the actual valid responses per stratum were 36 for high-tech agriculture (60.0% response rate), 92 for manufacturing/industry (61.3% response rate), and 112 for services (58.9% response rate). This sample size provides statistical power exceeding 0.80 for a medium effect size ($f^2 = 0.15$) at a significance level of 0.05, meeting the requirements for robust PLS-SEM analysis (Hair et al., 2017).

Comprehensive data on the respondents and firm characteristics are presented in Table 1. To ensure research integrity, all participants were guaranteed strict anonymity and confidentiality. Informed consent was obtained prior to their participation, and the survey protocol was approved by the Research Ethics Committee of our affiliated institutions. Furthermore, we formally confirm that the dataset utilized in this study is exclusive and has not been, nor will be, used in any other publications. To maintain transparency and due to length constraints, the full questionnaire and detailed survey methodology have been uploaded to the Zenodo repository for public access (Cuong, 2026).

Table 1. Demographic profile of the sample (N = 240)

Characteristics	Category	Frequency (N)	Percentage (%)
Region	Hanoi (Northern Hub)	84	35.0
	Da Nang (Central Hub)	56	23.3
	Ho Chi Minh City (Southern Hub)	100	41.7
Industry Sector	High-tech Agriculture	36	15.0
	Manufacturing and Industry	92	38.3
	Services (IT, Logistics, Finance)	112	46.7
Firm Size (Personnel)	Micro and Small (< 50 employees)	68	28.3
	Medium (50 to 200 employees)	102	42.5
	Large (201 to 500 employees)	46	19.2
	Very Large (> 500 employees)	24	10.0
Respondent Position	Board of Directors (CEO, VP, Chair)	52	21.7
	R&D / Technology Managers	88	36.7
	Strategy / Planning Managers	60	25.0
	Other Middle Managers	40	16.6
Total		240	**100.0**

http://dx.doi.org/10.21511/ppm.24(3).2026.39

2.3. Operationalization of constructs and measurement scales

The operationalization of variables was grounded in established theoretical frameworks but meticulously adapted to the Vietnamese transitional context to ensure content validity. All constructs were measured using 5-point Likert scales (1 = Strongly Disagree, 5 = Strongly Agree). Table 2 details the specific measurement items and their sources.

Items GOV3 and GOV5 were specifically added to capture the "implementation gap" between formal policy provision and its effective implementation, a challenge particularly relevant to Vietnam, where institutional constraints may limit the consistent, transparent, and effective implementation of government policies (World Bank, 2022). Absorptive capacity was modeled as a multi-dimensional construct (acquisition, assimilation, transformation, and exploitation) following Flatten et al. (2011) to capture the dynamic nature of learning, which acts as the critical transmission mechanism in our model. For innovation performance, a holistic measure combining product and process innovation was chosen to reflect the diverse innovation strategies of Vietnamese enterprises, which often focus on incremental process improvements before radical product breakthroughs.

2.4. Robustness strategy: Controlling for common method variance

Acknowledging the potential for common method variance (CMV) inherent in self-reported cross-sectional data, this study implemented both pro-

Table 2. Measurement scales and sources

Construct	Code	Measurement Items (Operationalized for Vietnam Context)	Sources (Adapted)
GOVERNMENT SUPPORT (GOV)	**Focus: Institutional Resource Allocation**		Adapted from Doh et al. (2017) and Tran and Freel (2023)
	GOV1	The government provides adequate financial incentives (tax breaks, preferential loans) for our innovation activities.	Focus on Financial Input
	GOV2	We can easily access public infrastructure (high-tech parks, laboratories, incubation centers) necessary for our R&D.	Focus on Hard Infrastructure
	GOV3	Government administrative procedures related to science and technology are clear and efficient.	Focus on Institutional Quality
	GOV4	The legal framework for intellectual property protection effectively supports our innovation efforts.	Focus on Legal Environment
	GOV5	Information regarding state support programs for technology transfer is transparent and accessible.	Focus on Information Asymmetry
INTERMEDIARY LINKAGES (LINK)	**Focus: Triple Helix Interaction and Networking**		Adapted from Nieto and Santamaría (2007) and OECD (2018)
	LINK1	We frequently collaborate with universities for training or recruitment of high-quality personnel.	University Linkage (Human Capital)
	LINK2	We actively cooperate with public research institutes to solve technical problems or test new products.	Research Institute Linkage (R&D)
	LINK3	We utilize services from technology brokers or innovation centers (e.g., NIC, local DOST centers).	Brokerage/Intermediary Linkage
	LINK4	We participate in industry associations to exchange market information and technological trends.	Peer/Industry Linkage
	LINK5	External partners play a crucial role in our decision-making process regarding new technology adoption.	Depth of Interaction
INTERNAL R&D READINESS (RD)	**Focus: Resource-Based View (RBV)**		Adapted from Galende and de la Fuente (2003) and Rodrik et al. (2002)
	RD1	Our company has a specific budget allocated annually for R&D and innovation activities.	Financial Resource
	RD2	Our staff possesses the necessary technical skills and qualifications to conduct innovation projects.	Human Capital Quality
	RD3	We have a dedicated department or team responsible for technology development and product improvement.	Organizational Structure
	RD4	We regularly organize training programs to update employees on new technological advancements.	Learning Routine

Table 2 (cont.). Measurement scales and sources

Construct	Code	Measurement Items (Operationalized for Vietnam Context)	Sources (Adapted)
ABSORPTIVE CAPACITY (ACAP)	**Focus: Dynamic Capability (Mediator)**		Adapted from Flatten et al. (2011) and Zahra and George (2002)
	ACAP1	**(Acquisition)** Our company frequently scans the environment for new technologies and market trends.	Ability to Identify
	ACAP2	**(Assimilation)** Our employees can quickly understand and analyze the potential value of new external information.	Ability to Interpret
	ACAP3	**(Transformation)** We serve as an effective bridge, combining new external knowledge with our existing internal processes.	Ability to Integrate
	ACAP4	**(Exploitation)** We are quick to commercialize new technical knowledge into products/services.	Ability to Commercialize
	ACAP5	**(Exploitation)** We regularly use external knowledge to improve our existing product lines.	Application Capability
INNOVATION PERFORMANCE (PERF)	**Focus: Output Metrics**		Adapted from Gunday et al. (2011) and OECD (2018)
	PERF1	Compared to competitors, we have introduced a higher number of new products/services in the last 3 years.	Product Innovation (Quantity)
	PERF2	The revenue share from new products/services has increased significantly.	Product Innovation (Financial Impact)
	PERF3	We have significantly improved our operational processes to reduce costs or lead time.	Process Innovation (Efficiency)
	PERF4	Our new products/services effectively meet customer needs and enter new markets.	Market Effectiveness
	PERF5	The overall technical quality of our products has improved significantly compared to the past.	Quality Improvement

cedural and statistical remedies. Procedurally, the survey design created a psychological separation between the independent variables (institutional drivers) and the dependent variable (performance) by placing them in distinct sections and assuring respondent anonymity to reduce social desirability bias. Statistically, beyond the traditional Harman's single-factor test, we employed the more robust full collinearity assessment approach proposed by Kock (2015). This method involves checking variance inflation factors (VIFs) for all latent variables; VIF values below the threshold of 3.3 would indicate that the model is not contaminated by common method bias.

2.5. Analytical strategy: Rationale for PLS-SEM

The data analysis utilizes partial least squares structural equation modeling (PLS-SEM) via SmartPLS 4. The selection of PLS-SEM over covariance-based SEM (CB-SEM) is justified by three methodological imperatives relevant to this study.

First, the research objective is prediction-oriented (explaining variance in innovation performance) rather than strictly theory confirmation, making PLS-SEM the superior choice for maximizing the explained variance (R^2) of endogenous constructs (Hair et al., 2017).

Second, firm-level innovation data typically exhibit non-normal distributions (skewness/kurtosis); PLS-SEM's non-parametric bootstrapping technique (5,000 subsamples) provides robust estimates of significance without the stringent normality assumptions required by CB-SEM.

Third, the model complexity, which involves a multi-stage mediation analysis (absorptive capacity), is handled more efficiently by PLS-SEM.

To further elevate the rigor of the analysis, this study goes beyond standard metrics to report predictive relevance using the PLS-Predict procedure (Shmueli et al., 2019), assessing the model's out-of-sample predictive power, a standard now increasingly demanded by top-tier management journals.

3. RESULTS

The empirical analysis is based on the final dataset of 240 valid responses. The distribution of respondents reflects the structural diversity of the

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Vietnamese economy across three strategic regions (Ho Chi Minh City, Hanoi, and Da Nang) and three key sectors (manufacturing/industry, knowledge-intensive services, and high-tech agriculture). Crucially, regarding data quality, 83.3% of the respondents hold senior strategic positions. This high percentage of key informants ensures that the responses accurately reflect the firm's strategic orientation and minimize potential perception bias. Furthermore, the predominance of Vietnamese enterprises, comprising over 70% of the sample, is consistent with the general enterprise landscape in transition economies, where Vietnamese enterprises serve as the primary engine of innovation (Cirera et al., 2021). Therefore, the sample possesses sufficient ecological validity to test the proposed hypotheses.

3.1. Measurement model assessment

The evaluation of the reflective measurement model rigorously adhered to the contemporary methodological guidelines established by Hair et al. (2017), focusing on internal consistency reliability, convergent validity, and discriminant validity. As detailed in Tables 3 and 4, the reliability of the constructs was firmly established. The Cronbach's alpha values ranged from 0.797 for government support to 0.892 for firm innovation performance, all comfortably exceeding the stringent 0.70 threshold. Similarly, the composite reliability metrics for all latent variables robustly surpassed the 0.80 mark, indicating exceptional internal consistency. Convergent validity was unequivocally confirmed as the average variance ex-

Table 3. Measurement model assessment

Variables	Items	Outer loading	VIF
Absorptive Capacity	ACAP1	0.867	1.955
	ACAP3	0.769	1.672
	ACAP4	0.807	1.832
	ACAP5	0.825	1.876
Government Support	GOV2	0.808	1.583
	GOV3	0.821	1.744
	GOV4	0.807	1.937
	GOV5	0.710	1.407
Intermediary Linkages	LINK1	0.875	2.743
	LINK2	0.800	2.621
	LINK3	0.801	2.472
	LINK4	0.837	2.255
	LINK5	0.772	2.417
Firm Innovation Performance	PERF1	0.873	2.617
	PERF2	0.857	2.366
	PERF3	0.780	1.889
	PERF4	0.849	2.458
	PERF5	0.816	2.012
Internal R&D Readiness	RD1	0.773	1.693
	RD2	0.823	2.214
	RD3	0.723	1.576
	RD4	0.819	2.243
	RD5	0.845	2.114

Table 4. Reliability and convergent validity

Variables	Cronbach's alpha	Composite reliability (ρA)	Composite reliability (ρC)	Average variance extracted (AVE)
Absorptive Capacity	0.836	0.862	0.890	0.668
Firm Innovation Performance	0.892	0.899	0.920	0.698
Government Support	0.797	0.812	0.867	0.620
Intermediary Linkages	0.876	0.888	0.910	0.669
Internal R&D Readiness	0.857	0.865	0.897	0.637

Table 5. Discriminant validity assessment using Fornell–Larcker criterion

Variables	Absorptive Capacity	Firm Innovation Performance	Government Support	Intermediary Linkages	Internal R&D Readiness
Absorptive Capacity	0.818				
Firm Innovation Performance	0.605	0.836			
Government Support	0.190	0.373	0.788		
Intermediary Linkages	0.327	0.392	0.238	0.818	
Internal R&D Readiness	0.349	0.628	0.390	0.319	0.798

Table 6. Discriminant validity – HTMT criterion

Variables	Absorptive Capacity	Firm Innovation Performance	Government Support	Intermediary Linkages	Internal R&D Readiness
Absorptive Capacity					
Firm Innovation Performance	0.679				
Government Support	0.222	0.430			
Intermediary Linkages	0.370	0.431	0.282		
Internal R&D Readiness	0.393	0.709	0.469	0.358	

tracted (AVE) for all constructs ranged between 0.620 and 0.698, well above the acceptable minimum of 0.50. Furthermore, all outer loadings exceeded the 0.70 threshold (ranging from 0.710 to 0.875), indicating that the constructs explain a substantial portion of the variance in their respective indicators without item redundancy.

To robustly establish discriminant validity, this study navigated beyond the traditional Fornell–Larcker criterion. Recognizing the well-documented sensitivity limitations of the Fornell–Larcker approach in accurately detecting discriminant validity violations (Henseler et al., 2015), we positioned the heterotrait–monotrait (HTMT) ratio as the definitive analytical metric. As presented in Table 6, the highest HTMT value observed across the entire matrix is 0.709, measuring the conceptual overlap between internal R&D readiness and firm innovation performance. Because this peak value remains significantly below the most conservative threshold of 0.85, it provides compelling statistical evidence that all latent constructs within the hypothesized model are conceptually distinct and measure unique phenomena within the innovation ecosystem.

3.2. Structural model assessment

Following the confirmation of the measurement model's reliability and validity, the structural model was evaluated based on the contemporary guidelines for partial least squares structural equation modeling (PLS-SEM) delineated by Hair et al. (2019) and Hair et al. (2017).

Prior to evaluating the structural paths, the inner model was scrutinized for potential collinearity issues that could distort regression estimations. The variance inflation factor (VIF) values for all predictor constructs ranged from 1.407 to 2.743, remaining strictly below the conservative threshold of 3.0. This confirms that multicollinearity does not compromise the structural estimations. Concurrently, the overall model fit was highly satisfactory, evidenced by a standardized root mean square residual (SRMR) of 0.069 (Table 7). This value comfortably satisfies the recommended cutoff of 0.08 (Hu & Bentler, 1999), demonstrating that the empirical covariance matrix closely aligns with the theoretical model implied.

Table 7. Model fit

Fit Index	Saturated model	Estimated model
SRMR	0.069	0.069
d_ULS	1.311	1.311
d_G	0.49	0.49
Chi-square	684.808	684.808
NFI	0.786	0.786

The model's explanatory power and predictive accuracy were assessed using the effect sizes (f^2) (Table 8), coefficient of determination (R^2) (Table 9), and the out-of-sample predictive relevance (Q2 predict) using the PLSpredict procedure (Shmueli et al., 2019). After controlling for firm size, indus-

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Table 8. Effect size matrix

Variables	Absorptive Capacity	Firm Innovation Performance	Government Support	Intermediary Linkages	Internal R&D Readiness
Absorptive Capacity		0.332			
Firm Innovation Performance					
Government Support	0.001	0.025			
Intermediary Linkages	0.06	0.02			
Internal R&D Readiness	0.065	0.303			

Table 9. Coefficient of determination (R^2) and adjusted R^2

Variables	R^2	Adjusted R^2
Absorptive Capacity	0.174	0.164
Firm Innovation Performance	0.586	0.579

try sector, and firm age (which were systematically introduced into the PLS-SEM algorithm as covariates), the integrated structural model accounts for a substantial 58.6% of the variance in firm innovation performance (R2 = 0.586) and a moderate 17.4% of the variance in absorptive capacity (R2= 0.174). Specifically, the control variables, firm size (β = 0.042, p = 0.415), industry sector (β = –0.015, p = 0.782), and firm age (β = 0.028, p = 0.550), showed statistically insignificant relationships with firm innovation performance. Therefore, the control variables exerted no confounding effects, thereby confirming the robustness of the hypothesized structural paths. The substantive impact of these predictors is further illuminated by their effect sizes (f2). Internal R&D readiness exerts a large substantive effect on innovation performance (f2 =0.303), as does absorptive capacity (f2 =0.332). Conversely, the effect size of government support on absorptive capacity is statistically negligible (f2 =0.001), foreshadowing a critical divergence in the path analysis.

The significance of the structural paths was evaluated using a non-parametric bootstrapping procedure with 5,000 resamples. The empirical estimations provide a highly nuanced architectural landscape of institutional drivers in Vietnam's transition economy.

Regarding the direct antecedents of innovation, the structural path coefficients presented in Table 10 provide evidence consistent with the resource-based view (RBV). Internal R&D readiness emerg-

Table 10. Structural path coefficients

Effects	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Direct effects					
Absorptive Capacity → Firm Innovation Performance	0.408	0.410	0.068	5.989	0.000
Government Support → Absorptive Capacity	0.032	0.036	0.071	0.444	0.657
Government Support → Firm Innovation Performance	0.112	0.112	0.048	2.302	0.021
Intermediary Linkages → Absorptive Capacity	0.237	0.240	0.077	3.093	0.002
Intermediary Linkages → Firm Innovation Performance	0.101	0.105	0.051	1.962	0.050
Internal R&D Readiness → Absorptive Capacity	0.261	0.261	0.080	3.249	0.001
Internal R&D Readiness → Firm Innovation Performance	0.410	0.406	0.066	6.237	0.000
Indirect effects					
Government Support → Absorptive Capacity → Firm Innovation Performance	0.013	0.016	0.03	0.429	0.668
Intermediary Linkages → Absorptive Capacity → Firm Innovation Performance	0.097	0.097	0.031	3.15	0.002
Internal R&D Readiness → Absorptive Capacity → Firm Innovation Performance	0.106	0.108	0.04	2.661	0.008

es as the strongest predictor for firm innovation performance (β = 0.410, t = 6.237, p < 0.001), thereby strongly supporting H7. In parallel, the external institutional environment yields positive, albeit asymmetrical, direct benefits. Government support demonstrates a statistically significant direct impact on innovation outcomes (β = 0.112, t = 2.302, p = 0.021), providing support for H3. Intermediary linkages exhibit a marginally significant direct effect on firm innovation performance (β = 0.101, t = 1.962, p = 0.050), indicating support for H5.

Beyond the direct relationships, the mediation analysis reported in Table 10 and Figure 2 provides further insights into the role of absorptive capacity (ACAP). ACAP has a strong positive effect on firm innovation performance (β = 0.408, t = 5.989, p < 0.001), supporting H1. Regarding the antecedents of ACAP, intermediary linkages (β = 0.237, t = 3.093, p = 0.002) and internal R&D readiness (β = 0.261, t = 3.249, p = 0.001) have significant positive effects, supporting H4 and H6, respectively. In contrast, the indirect effect of government support on firm innovation performance through ACAP is not significant (β = 0.013, t = 0.429, p = 0.668), providing no support for H8.

The specific indirect-effect results further demonstrate the mediating role of ACAP. The indirect effect of intermediary linkages on firm innovation performance through ACAP is positive and significant (β = 0.097, t = 3.150, p = 0.002), supporting H9. Similarly, the indirect effect of internal R&D readiness on firm innovation performance through ACAP is significant (β = 0.106, t = 2.661, p = 0.008), supporting H10. Given that the corresponding direct effects remain significant, these findings indicate partial (complementary) mediation in both relationships.

Conversely, and perhaps most strikingly, the hypothesized pathway from government support to absorptive capacity does not reach statistical significance (β = 0.032, t = 0.444, p = 0.657). Thus, H2 is firmly rejected. Consequently, the indirect pathway from government support through ACAP to innovation performance is statistically null (β = 0.013, p = 0.668), leading to the rejection of H8 Together with the significant direct effect of gov-

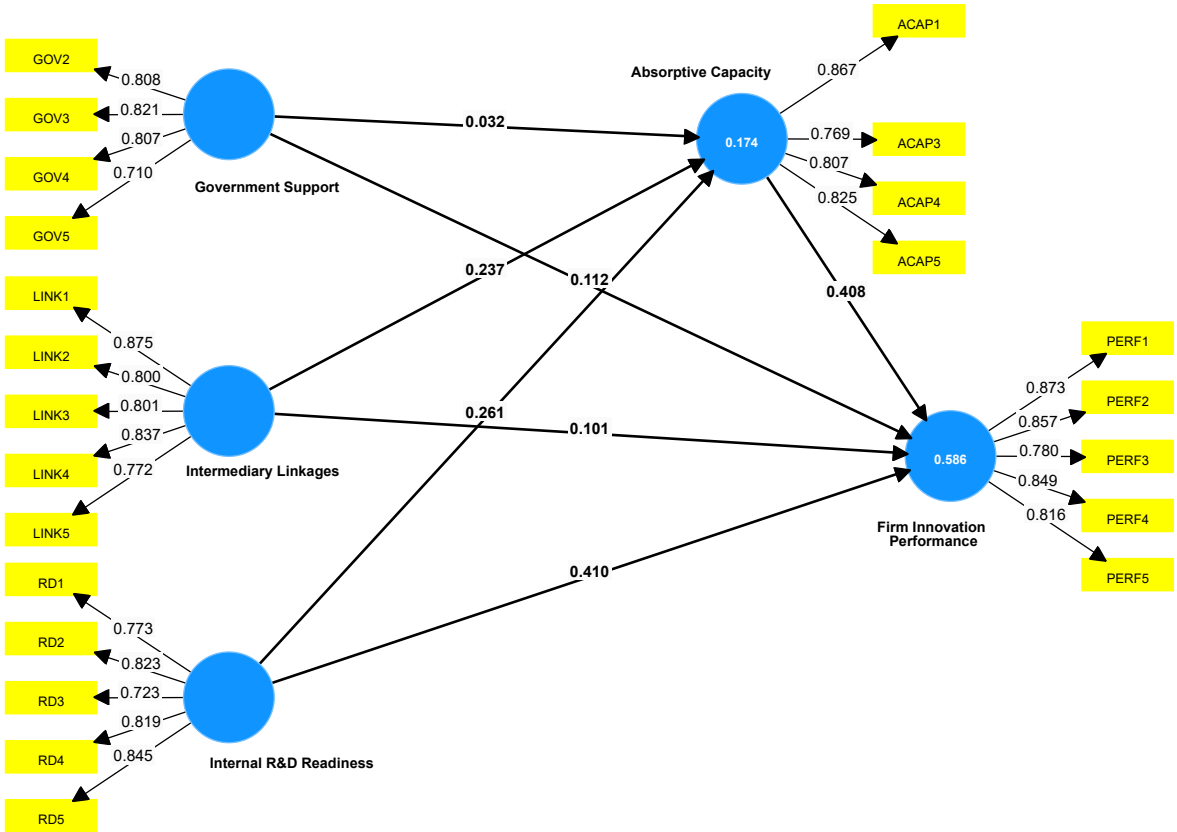

Figure 2. Structural equation modeling results

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ernment support on firm innovation performance ($\beta = 0.112$, $t = 2.302$, $p = 0.021$; H3), these findings suggest an implementation gap: government support may contribute directly to firms' innovation outcomes but does not appear to enhance innovation performance through the development of absorptive capacity. This pattern indicates that formal support mechanisms may generate immediate innovation benefits without necessarily strengthening firms' longer-term learning and knowledge-absorption capabilities.

4. DISCUSSION

The overarching objective of this study was to deconstruct the functional efficacy of the national innovation system (NIS) in a transition economy by examining how specific institutional drivers interact with internal firm capabilities. With the structural model accounting for a substantial 58.6% of the variance in firm innovation performance, the empirical findings derived from manufacturing and service enterprises across Vietnam's strategic economic hubs reveal a highly nuanced, and in some aspects paradoxical, innovation landscape. By integrating the functional NIS approach with the resource-based view (RBV) and open innovation paradigms, this discussion contextualizes the empirical results to illuminate the "black box" of firm-level innovation in transition economies.

4.1. The paradox of government support and institutional isomorphism

A notable finding of this study emerges from the dual nature of government support. While the empirical results confirm that state interventions exert a modest direct positive impact on innovation performance (supporting H1), they do not show a significant association with stimulating the firm's absorptive capacity (rejecting H4). This empirical rejection uncovers a critical "paradox of policy" within Vietnam's transitional NIS. This empirical finding directly aligns with the results of Istipliler et al. (2023), who also observed the phenomenon of "policy-practice decoupling" in emerging markets.

The direct effect suggests that current policy instruments, such as tax exemptions or preferential credit, function primarily as operational lifelines. They provide the necessary financial slack for Vietnamese enterprises of varying sizes to acquire off-the-shelf technologies or execute short-term product commercialization (Cirera & Maloney, 2017). However, the lack of statistical significance of the pathway to absorptive capacity indicates a substantive implementation gap. Our findings corroborate the "innovation paradox" articulated by Cirera and Maloney (2017). Similar to their conclusions, our results demonstrate that while the potential returns to technological catch-up are vast, the absence of complementary factors renders institutional inputs insufficiently utilized. In transition economies, institutional isomorphism (where support policies mimic global best practices on paper but lack functional depth in execution and suffer from high administrative burdens) substantially limits the long-term, capability-building intent of state interventions (Istipliler et al., 2023; Nguyet, 2022). Consequently, government support acts merely as a static resource rather than a catalyst for dynamic learning.

4.2. The imperative of intermediary linkages as cognitive scaffolding

In stark contrast to the limited association of government support with capability building in building absorptive capacity, the empirical results are consistent with the vital role of intermediary linkages. While the direct impact of linkages on innovation performance is marginally significant, their indirect impact through absorptive capacity is highly significant (supporting H2, H5, and H7). This mediation architecture highlights that the true value of interactive learning in a transition economy does not lie in the immediate generation of new products, but rather in the cultivation of dynamic learning capabilities.

Consistent with recent empirical findings by Petković et al. (2025) in Southeast Europe, our study confirms that in emerging open innovation ecosystems, strong network dynamics are essential for sustainable technology transfer. When Vietnamese enterprises interact with universities, public research institutes, or technology brokers, they are exposed to diverse, codifiable knowledge pools. Borrowing from open innovation theory, we conceptualize these intermediary linkages as vital

"cognitive scaffolding" that allows Vietnamese enterprises to overcome institutional voids (Istipliler et al., 2023). This continuous exposure forces firms to adapt and upgrade their internal routines to assimilate incoming knowledge, thereby significantly enhancing their absorptive capacity (Nguyet, 2022). By comparing these outcomes with existing literature, our results reinforce the assertion by Petković et al. (2025) that capabilities alone do not independently generate technology transfer outcomes; they strongly depend on collaborative mechanisms and robust institutional frameworks to materialize.

4.3. The primary role of internal R&D readiness

Finally, the structural model indicates the strong predictive power of internal resources. Internal R&D readiness emerged as the strongest direct predictor, exhibiting the largest substantive effect on both absorptive capacity and firm innovation performance (supporting H3). This finding strongly corroborates the resource-based view (RBV) within the specific constraints of a transition economy.

In environments characterized by institutional fragmentation and high market uncertainty, firms cannot passively rely on the external NIS to compensate for internal deficiencies. Our statistical results strongly corroborate the findings of Phung et al. (2021). Our model empirically supports their argument that weak institutional settings further strengthen the critical importance of internal innovation strategies, as external collaborations carry higher transaction risks. The data suggest that human capital quality, structured learning routines, and dedicated R&D budgets are fundamental prerequisites (Le et al., 2024). A firm lacking this internal mechanism will not only fail to innovate directly but will also be structurally incapable of decoding and utilizing knowledge spillovers, such as those generated by foreign direct investment (FDI) (Nguyet, 2022). This is in agreement with the study of Istipliler et al. (2023), confirming that Vietnamese enterprises that successfully cultivate these internal capabilities operate as resilient organizations, thriving despite the harsh institutional constraints typical of post-socialist transition economies. Internal readiness, therefore, acts as the foundational baseline that determines a firm's bandwidth to absorb and exploit external knowledge (Cohen & Levinthal, 1990).

4.4. Theoretical contributions

This paper offers three salient theoretical contributions to the existing nexus of innovation management and transition economics. First, it advances the functional NIS approach by empirically quantifying the implementation gap. By demonstrating that government support significantly impacts short-term output but is not significantly associated with stimulating long-term absorptive capacity, the study provides a robust micro-foundation for the institutional constraints theories in emerging markets (Istipliler et al., 2023; Nguyet, 2022).

Second, the study successfully bridges the macro-level NIS framework with the micro-level RBV. By operationalizing absorptive capacity as a structural mediator, the research illuminates the "black box" of technology adoption, establishing that external institutional inputs are less effective unless cognitively processed through the firm's internal learning routines (Cohen & Levinthal, 1990).

Third, the findings refine the open innovation discourse in transitional contexts. It demonstrates that the paramount value of network dynamics and intermediary linkages lies in upgrading the cognitive framework and assimilation routines of Vietnamese enterprises, thereby translating structural potential into sustainable technology transfer and commercialized innovation (Le et al., 2024; Petković et al., 2025).

4.5. Implications

This study offers profound theoretical contributions to the nexus of innovation management and transition economics. First, it advances the functional NIS approach by empirically quantifying the phenomenon of institutional isomorphism and the innovation paradox in emerging markets. By statistically demonstrating that government support impacts short-term output but fails to stimulate long-term absorptive capacity, the study provides a robust micro-foundation for under-

http://dx.doi.org/10.21511/ppm.24(3).2026.39

standing how institutional constraints and policy-practice decoupling neutralize the intended benefits of state interventions.

Second, the study successfully bridges the macro-level institutional framework with the micro-level resource-based view (RBV) and dynamic capabilities. By operationalizing ACAP as a structural mediator, we illuminate the "black box" of technology adoption. We establish that external institutional inputs are insufficiently utilized unless cognitively processed through the firm's internal learning routines. Absorptive capacity is thereby positioned not merely as a facilitator, but as the sine qua non for translating systemic drivers into competitive advantage.

Third, the findings refine the open innovation discourse in transitional contexts. Thus, the paramount value of network dynamics and intermediary linkages lies in upgrading the cognitive framework of Vietnamese enterprises rather than immediate commercialization. This confirms that successful sustainable technology transfer within emerging open innovation ecosystems requires strong network dynamics embedded within robust institutional frameworks.

The findings also yield highly actionable insights tailored to the scope of organizational management and public policy formulation.

First, policymakers should consider complementing generic financial disbursements with a capability-building approach, as the perceived government support in this specific sample demonstrated a limited association with capability building. Support could be further optimized by complementing financial assistance with the establishment of robust intermediary networks, analogous to Digital Innovation Hubs (DIHs), to act as proactive ecosystem matchmakers that lower the transaction costs of knowledge exchange. It is necessary to enforce stringent Intellectual Property Protection (IPP) to mitigate the crowding-out effects of Foreign Direct Investment (FDI) and to encourage multinational enterprises to generate positive technological spillovers for domestic enterprises.

The empirical findings deliver a stark strategic imperative. It is vital to acknowledge that external networking and state subsidies cannot substitute for internal competence, especially for Vietnamese enterprises operating as resilient organizations in weak institutional settings. Establishing formalized and dedicated budgets for internal research and development to ensure survival and innovation, and cultivating internal readiness, which is the non-negotiable baseline bandwidth required to absorb external knowledge spillovers, effectively engage in open innovation, and ultimately drive firm growth, is required as well.

4.6. Limitations

While this study provides robust empirical insights, certain boundary conditions pave the way for future scholarly inquiry. First, the reliance on cross-sectional survey data restricts the ability to make absolute causal inferences regarding the temporal evolution of absorptive capacity and technology transfer. Future research should employ longitudinal or panel data designs to map the temporal lag between institutional exposure and realized innovation outcomes. Second, while the sample encompasses Vietnam's most vibrant economic macro-regions, future studies would benefit from cross-national comparative analyses involving other transition economies in Southeast Europe or Asia to validate the generalizability of the institutional moderating effects. Finally, subsequent studies could broaden the model by incorporating mediating variables such as inter-organizational trust, the role of venture capital, or specific digital transformation capabilities to deepen the understanding of how robust institutional regimes foster open innovation ecosystems.

CONCLUSION

The purpose of this study is to investigate the "innovation paradox" in Vietnamese enterprises within a transition economy by analyzing the shift from reliance on passive subsidies (government support) to capability orchestration (absorptive capacity and internal readiness) in determining innovation perfor-

mance. Utilizing partial least squares structural equation modeling (PLS-SEM) on a robust dataset of 240 enterprises across Vietnam's strategic economic hubs, the study elucidates the intricate pathways to sustainable technology transfer.

The empirical findings provide evidence that qualifies the orthodox assumption that the mere macro-level provision of state resources inherently guarantees micro-level innovation success. While internal R&D readiness is confirmed as the foundational element of innovation capability, the external institutional environment presents a profound dichotomy. Intermediary linkages successfully function as vital cognitive scaffolding that builds absorptive capacity (ACAP), enabling Vietnamese enterprises to navigate institutional constraints and enhance innovation performance. Conversely, direct government support suffers from a severe "implementation gap"; it marginally improves short-term product output but is not significantly associated with fostering the dynamic learning routines necessary for long-term absorptive capacity. Ultimately, this study demonstrates that for enterprises in transition economies to successfully innovate and escape the middle-income trap, the NIS framework would benefit from complementing the passive allocation of resources with the active, systemic orchestration of capability-building networks.

AUTHOR CONTRIBUTIONS

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Investigation: Hoa Huu Cuong, Ly Thu Cuc, Nguyen Van Phuong.
Methodology: Hoa Huu Cuong, Ly Thu Cuc, Nguyen Van Phuong.
Project administration: Hoa Huu Cuong.
Resources: Hoa Huu Cuong.
Software: Hoa Huu Cuong, Nguyen Van Phuong.
Supervision: Nguyen Van Phuong.
Validation: Nguyen Van Phuong.
Visualization: Nguyen Van Phuong.
Writing – original draft: Hoa Huu Cuong, Ly Thu Cuc, Nguyen Van Phuong.
Writing – review & editing: Hoa Huu Cuong, Ly Thu Cuc, Nguyen Van Phuong.

ACKNOWLEDGMENT

This is the result of the national-level science and technology project entitled *"Comparative Study of Best Practices in the Development of National Innovation Systems in Selected Transition Economies of the European Union and Lessons for Vietnam"*, project code KX.07.04/21–30, under the KX07 Program of the Ministry of Science and Technology.

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