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SPECIAL FOCUS PAPER

Digital Transformation in Vietnamese SMEs: Challenges, Opportunities, and Strategic Implications

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ABSTRACT

In emerging economies, digital transformation has become a demand for small and medium-sized enterprises (SMEs). However, the organizational pathways for digital adoption translating to measured business value remain not similar. Data survey from 255 SME managers in Vietnam and estimating a partial least squares-structural equation model (PLS-SEM). Using SmartPLS 3 with 5,000 bootstrap resamples, this study focuses on four capability drivers—IT capability, digital transformation strategy, human resource capability, and management support—and evaluates how the digital transformation influences innovation and performance of the firm. The result of the study identifies human resource capability and digital strategy as dominant predictors of digital transformation level (DTL), IT capability, and top management support, which display negative coefficients attributable to suppression under high predictor overlap. Digital transformation strongly increases innovation, and innovation, in turn, is the primary channel through which digital transformation improves performance. The findings focus on capability orchestration and the innovation-mediated route to outcomes in resource-constrained SME settings.

KEYWORDS

digital transformation, small and medium-sized enterprises (SME), innovation, competitiveness, suppression effects, emerging economies

1 INTRODUCTION

Small and medium-sized enterprises (SMEs) constitute the Vietnamese economy. It accounts for nearly 40% of national GDP, employs more than half of the workforce, and represents approximately 98% of all registered businesses [1]. In Industry 4.0—digital technologies such as artificial intelligence, big data analytics, cloud computing, and the internet of things—digital transformation has become a mission for SMEs to create competitiveness and give sustainable development.

Digital transformation presents both significant opportunities and considerable obstacles for Vietnamese SMEs. On the one hand, digital technology allows SMEs to

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optimize internal processes, reach customer segments through e-commerce, make decisions by business data, and create product and service innovation [2], [3]. On the other hand, many SMEs are limited by financial resources, a lack of digital employees and managers' skills, inadequate cybersecurity awareness, and uneven access to reliable digital infrastructure—particularly outside major economic centers [4].

The challenge became visible during the COVID-19 pandemic, which forced many SMEs to rapidly shift to online operations with serious gaps in digital readiness [4]. In this urgency, the Vietnamese government introduced the National Digital Transformation Program with a 2025 vision to 2030 by supporting training programs, financial incentives, and infrastructure investments [5]. However, the reports indicate that the majority of Vietnamese SMEs remain at the first or intermediate stages of digital maturity, digital activities is limited on basic tools such as social media marketing and simple online sales channels [6].

Our present study seeks to answer the following three research questions: Which organizational capabilities—information technology capability, digital transformation strategy, human resource capability, and top management support—most strongly influence the level of digital transformation in Vietnamese SMEs; To what extent does digital transformation improve innovation and overall enterprise performance? Does innovation mediate the relationship between digital transformation and enterprise performance?

The survey was conducted with 255 small and medium-sized enterprise managers in Hanoi, Ho Chi Minh City, and Da Nang. Relationships were analyzed using PLS-SEM to collect research data [7].

The research has three perspectives: Dynamic Capability Theory (DCT), Resource-Based Viewpoint (RBV), and Technology-Organization-Environment (TOE). The above approach explains how to mobilize internal capabilities to achieve digital results for businesses in emerging economies, emphasizing institutional flexibility, infrastructure disparities, and ultimately, intense competitive dynamics. It is further supported by the National Digital Transformation Program with a 2025 vision to 2030 [8].

The main contributions of this study are the pathways by which digital transformation creates value for SMEs in emerging economies, along with practical recommendations for business leaders to prioritize capacity building and for policymakers to support more targeted digitalization initiatives.

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Theoretical framework

The paper integrates RBV and DCT to describe the capacity development of Vietnamese SMEs in the development of digital transformation. The RBV approach states that a business realizes sustainable competitive advantage using resources that are valuable, cannot be easily copied, and are rare [9], [10], [11]. The factors to implement digital transformation include the IT systems, digitalization strategies, digital skills of employees, and commitment of senior management.

But the possession of resources cannot be considered sufficient. Dynamic Capabilities Theory states that organizations should also be able to detect the shift in environment, have the opportunitiy to grasp the emerging opportunities and restructure the resources to remain competitive [12]. This consideration is quite suitable for Vietnamese SMEs which tend to experience swiftly transpiring technology, volatile policies, and spontaneous disturbances like the COVID-19 pandemic.

Based on these two views, the research gives four primary drivers of digital transformation, namely information technology capability, digital transformation strategy, human resource capability, and top management support.

The model is also anticipating that digital transformation is bound to enhance innovation and performance of the enterprise, and innovation serves as a messenger (mediator) between digital transformation and business outcomes. There were also good overlaps between the four drivers that might result in suppression effects [13].

Our study integrates a capability-based logic (Resource-Based View) with a reconfiguration logic (Dynamic Capabilities) to explain why some SMEs convert digital initiatives into market-facing innovation while others remain at a superficial adoption stage. Within this lens, IT assets and managerial commitment are necessary but rarely sufficient; SMEs also need skill formation, learning routines, and a strategy that sets priorities under resource scarcity. Based on prior work, we specify four antecedents to DTL (Digital Transformation Level) [ITC (IT Capability), DTS (DT Strategy), HRC (HR Capability), and TMS (Top Management Support)] and two outcome paths (DTL→INN and DTL→FP), as well as the mediation path DTL→INN→FP.

Figure 1 is provided as an author-generated schematic (not a SmartPLS screenshot) to clarify the latent-variable model.

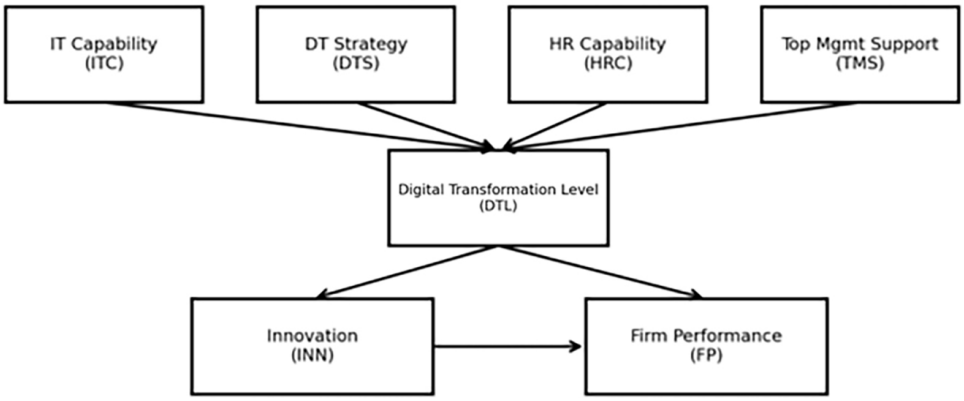

Fig. 1. Conceptual model tested with PLS-SEM

Source: Compiled by author.

2.2 Literature review

Digital transformation is not just about applying new technologies but also requires fundamental changes in how businesses operate and interact with customers to create value for organizations [14]. Successful digital transformation is based on better operational efficiency than before and stronger customer relationships to create growth [7].

In the emerging economy, digital technologies offer a powerful way to overcome structural limitations such as limitations of infrastructure and capital [3]. For example, many manufacturing and retail businesses in Bình Dương, Đồng Nai, Hanoi, and Ho Chi Minh City have been created by using e-commerce platforms like Shopee, Tiki, and TikTok Shop to reach their customers directly and reduce traditional distribution channels [9]. Some studies conducted in Hanoi and other major economic centers show that access to affordable technology, supportive public policies, and committed leadership are the key enablers of digital progress [15], [16], [17].

At last, progress remains uneven. A recent Vietnamese research key is that most SMEs continue to face constraints—especially financial resources limitations and employees' and managers' digital skills [4], [18]. With a high mobile and internet penetration rate, the majority of SMEs are limiting to basically digital activities such as social media marketing, simple online stores, or messaging tools such as Zalo [6], [9]. The application of enterprise resource planning (ERP) systems, user data analytics, and supply chain integration solutions remains limited for large enterprises.

Therefore, research focuses on core organizational factors such as digital readiness, the ability of the enterprise to effectively adopt and utilize digital technologies [19]; a clear digital transformation strategic plan aligned with digital initiatives and long-term business [20]; digital skills, employee learning, and development capabilities [21]; leadership commitment to providing resources and proactively adapting to change [22]; overall digital integration across functional management areas [23]; potential for developing new products and services, and optimizing processes to create business improvements [24]; financial efficiency and operational performance [25]. Although these elements have been studied individually in different contexts, there is still limited evidence on how they interact simultaneously within Vietnamese SMEs, particularly regarding indirect effects and situations where closely related factors overlap strongly and create suppression effects in statistical models. Our study aims to fill that gap by examining the full set of relationships using PLS-SEM.

3 METHOD

3.1 Research design

PLS-SEM was estimated in SmartPLS 3 following a two-step procedure: (1) assessment of the measurement model (indicator reliability, internal consistency reliability, convergent validity, and discriminant validity), and (2) assessment of the structural model (collinearity diagnostics, path coefficients with bootstrapped t-statistics and p-values, explained variance R^2, and indirect effects for mediation). Bootstrapping was performed with 5,000 resamples to obtain stable standard errors. PLS-SEM is chosen because of its suitability for estimating complex structural models that include multiple latent constructs and mediation relationships, as well as its relative tolerance for non-normal data distributions, which are common in survey-based research conducted in emerging-economy contexts [10], [2].

Bootstrapping was performed with 5,000 resamples to obtain stable standard errors. This procedure enhances the robustness of the statistical inferences and supports the assessment of both direct and indirect effects within the proposed model. SMEs are also adopting AI-powered solutions to increase the system trust [27]. The study allows for the identification of systematic variable associations but does not determine a strong cause-and-effect.

A cross-sectional survey of SME managers in Hanoi, Ho Chi Minh City, and Da Nang was conducted. The survey yielded 255 valid results. The constructs were modeled as latent variables and measured using an adjusted multi-item Likert scale. The questionnaire was in Vietnamese to ensure clear semantic equivalence for the interviewees. However, caution is needed when drawing conclusions from data analysis for SMEs in rural areas, because the infrastructure and available resources in those areas may differ from those of the businesses interviewed [4].

3.2 Research model

The research model focuses on several key factors: IT capabilities, digital transformation strategy, human resource capabilities, senior management support, level of digital transformation, innovation, and business performance. The relationship between these factors is determined to test their impact on digital transformation. All factors use a multi-item scale and are evaluated on a Likert scale (1: strongly disagree to 5: strongly agree).

IT capabilities are represented by the reference factor, and the digital transformation strategy is reflected by five factors [19], [20]. Human resource capabilities are determined by six factors, and senior management support is determined by five factors [21], [22]. The level of digital transformation consists of seven factors, according to Kahveci [23]. Innovation comprises five factors, while business performance comprises seven factors [24], [25].

To ensure linguistic accuracy and suitability in Vietnam, a Vietnamese questionnaire was created [28]. The model measures and evaluates the reliability of the index and its convergent validity. Most factors exhibit high external loading coefficients, and the extracted mean variance must meet the requirements. In the case of multicollinearity between some structures, the overall measurement characteristics must be within acceptable limits. Economic forces in SMEs are emerging nowadays in different countries [27].

3.3 Sample and data collection

The study included SMEs. SMEs are defined as businesses with fewer employees and meeting the specified annual revenue or total capital thresholds [29]. Target sample determination was applied across manufacturing, service, and retail sectors, as well as across different geographic locations. Data collection focused on the main economic centers of Vietnam, where many SMEs are exposed to digital initiatives (Hanoi, Ho Chi Minh City, and Da Nang).

We collected data from January to March 2025 using a mixed methodology combining online and in-person surveys. Online questionnaires were conducted via a digital platform, while in-person surveys were conducted to improve accessibility and increase response rates. The survey was sent to owners or senior managers of SMEs who have direct knowledge of digital transformation activities and business performance.

A total of 350 survey questionnaires were distributed, with 255 valid responses (73%). The rate of valid responses is comparable to previous studies on SMEs and sufficient for PLS-SEM estimation [10]. Companies participating in the survey reported an average size of approximately 50 employees and a history of operation of approximately 5–10 years. Two basic limitations: Firstly, the focus on urban SMEs limits the extent to which problems can be outlined for rural enterprises; secondly, reliance on self-reported management measures may lead to general methodological bias, although corrective tests have been performed to mitigate this concern.

3.4 Data analysis

Data analysis was performed on SmartPLS 3, using a two-stage approach: model reliability and validity assessment, followed by structural model assessment to test

the research hypothesis relationships. Model reliability was established through indicator loading coefficients exceeding 0.7, composite reliability values above 0.7, and extracted mean variance above 0.5. Convergence was established with extracted mean variance exceeding 0.5, and discriminant validity was verified by the Fornell-Larker criterion and the Heterotrait-Monotrait (HTMT) ratio, with values below 0.85, despite high correlation between the premises [10]. The structural model tested the hypotheses and assessed the path coefficient, coefficient of determination (R^2), effect size index (f^2), and predicted relevance (Q^2). Mediating effects, particularly the role of innovation in the relationship between digital transformation and business performance, were assessed using 5,000 bootstrap subsamples. Multicollinearity assessment was conducted through variance amplification factors, showing a suppressing effect for certain premises.

3.5 Validity and reliability

In preparation for the formal survey, a pilot study was conducted with 30 Vietnamese SMEs to assess the internal consistency of the scales. The results showed satisfactory reliability, with Cronbach's alpha coefficient exceeding the recommended threshold of 0.70 for all constructs. The experimental study results provide a basis for minor adjustments to the wording, improving clarity and cultural and linguistic precision.

The measure of convergence was based on loading coefficients, composite reliability, and extracted mean variance (AVE). The indicators presented good values of loading coefficients for all the model constructs, and the composite reliability and AVE were both within the established criteria of model fit. The Fornell-Larker criterion was used to determine the discriminant validity as well as the HTMT ratio. Although these tests established reasonable levels of discriminant validity, the moderate positive correlation among some of the antecedent constructs (especially the value of 0.910 between IT competence and human resource competence) was reflected in multicollinearity.

Harman's single-factor test was performed, and variance amplification factor (VIF) values were used to address general methodological bias. The test results showed that no single factor accounted for a large proportion of the variance, and all VIF values were below the conservative threshold of 3.3 [30]. In summary, these tests provided sufficient confirmation evidence to proceed with further structural model analysis.

4 RESULTS

4.1 Measurement model

Convergence is supported by the loading coefficients, composite reliability, and mean variance extracted, which are reasonable. Correlation-based testing methods were used to determine if there was any type of discrimination. Despite a high level of correlation between the structures, it could be noted that the group of testing methods has reasonable discriminability to estimate the model (refer to Table 1).

Table 1. Latent variable correlations

Construct	ITC	DTS	HRC	TMS	DTL	INN	FP
ITC	1.000	0.885	0.910	0.835	0.847	0.852	0.843
DTS	0.885	1.000	0.892	0.845	0.852	0.858	0.849
HRC	0.910	0.892	1.000	0.850	0.862	0.867	0.858
TMS	0.835	0.845	0.850	1.000	0.820	0.825	0.817
DTL	0.847	0.852	0.862	0.820	1.000	0.914	0.906
INN	0.852	0.858	0.867	0.825	0.914	1.000	0.932
FP	0.843	0.849	0.858	0.817	0.906	0.932	1.000

Source: Compiled by authors.

4.2 Structural model

Bootstrapping analysis identified HRC ($\beta = 1.474$, $p < 0.001$) and DTS ($\beta = 0.354$, $p < 0.001$) as the most strongly positive factors influencing DTL, ITC, and TMS, which had negative correlation coefficients ($\beta = -0.706$ and $\beta = -0.312$). Due to the strong correlation between factors (Table 2), this indicates a canceling effect rather than a negative influence. Evidence suggests that technology and leadership play a very important role, but their increased explanatory power becomes unstable when skills and strategy dominate the overall variance.

Table 2. Results of pathway coefficients

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-Values
HRC → DTL	1.474	1.474	0.151	9.762	0.000
DTS → DTL	0.354	0.354	0.097	3.649	0.000
ITC → DTL	–0.706	–0.706	0.143	4.937	0.000
TMS → DTL	–0.312	–0.312	0.104	3.000	0.003
DTL → INN	1.232	1.232	0.057	21.614	0.000
DTL → FP	0.124	0.124	0.063	1.968	0.049
INN → FP	0.819	0.819	0.061	13.426	0.000

Source: Compiled by authors.

The level of digital transformation strongly impacts the innovation factor ($\beta = 1.232$, $p < 0.001$), while innovation strongly impacts business performance ($\beta = 0.819$, $p < 0.001$). The DTL-FP direct path has a positive but relatively small value ($\beta = 0.124$, $p = 0.049$). This evidence confirms that operational efficiency benefits are achieved through innovation. Figure 2 illustrates the estimated structural coefficients used for interpretation.

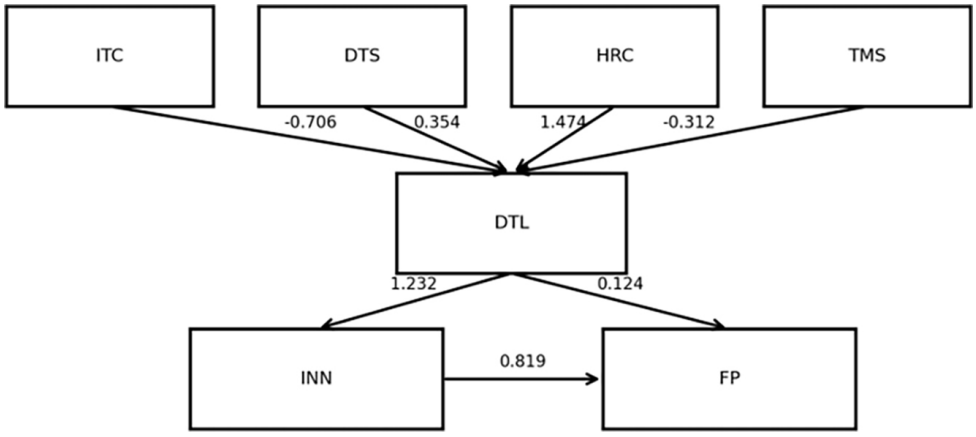

Fig. 2. Estimated structural path (standardized coefficients)

Source: Compiled by authors.

4.3 Mediation effects

To evaluate mediation, we examined bootstrapped specific indirect effects. The indirect DTL-INN-FP pathway has significant statistical and economic implications. The results reinforce the view that innovation is the primary mechanism driving digital transformation, generating performance improvements (refer to Tables 3 and 4).

Table 3. Specific indirect effects

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-Values
HRC → DTL → INN → FP	1.816	1.816	0.203	8.945	0.000
DTS → DTL → INN → FP	0.437	0.437	0.123	3.552	0.000
ITC → DTL → INN → FP	–0.870	–0.870	0.188	4.628	0.000
TMS → DTL → INN → FP	–0.385	–0.385	0.129	2.984	0.003
HRC → DTL → FP	0.182	0.182	0.093	1.956	0.050
DTS → DTL → FP	0.044	0.044	0.023	1.913	0.056
ITC → DTL → FP	–0.088	–0.088	0.045	1.956	0.050
TMS → DTL → FP	–0.039	–0.039	0.020	1.950	0.051

Source: Compiled by authors.

Table 4. Total effects

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-Values
HRC → DTL	1.474	1.474	0.151	9.762	0.000
HRC → INN	1.816	1.816	0.203	8.945	0.000
HRC → FP	2.033	2.033	0.210	9.676	0.000
DTS → DTL	0.354	0.354	0.097	3.649	0.000
DTS → INN	0.437	0.437	0.123	3.552	0.000

(Continued)

Table 4. Total effects *(Continued)*

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-Values
DTS → FP	0.481	0.481	0.126	3.817	0.000
ITC → DTL	–0.706	–0.706	0.143	4.937	0.000
ITC → INN	–0.870	–0.870	0.188	4.628	0.000
ITC → FP	–0.958	–0.958	0.194	4.938	0.000
TMS → DTL	–0.312	–0.312	0.104	3.000	0.000
TMS → INN	–0.385	–0.385	0.129	2.984	0.000
TMS → FP	–0.424	–0.424	0.133	3.188	0.001
DTL → INN	1.232	1.232	0.057	21.614	0.000
DTL → FP	1.133	1.133	0.078	14.526	0.000
INN → FP	0.819	0.819	0.061	13.426	0.000

Source: Compiled by authors.

5 DISCUSSION

Human resource capacity is essential to the functioning of SMEs: Digital technology can only be productive when the employees are able to operate it, comprehend it, and implement it. The strategies of digital transformation are a system of coordination, and SMEs are unable to digitalize everything. Correlation structure reveals that the relationship between SMEs and high human resource capabilities also indicates the existence of stronger IT capabilities and management support; where one process in an equation matches, the human resource capability model will have an impact, hence the other factors have an inverse effect. According to the estimated findings, IT investment or leadership commitment is negative; it shows that they are unified and statistically hard to uncombine without them.

The most important finding of the model is that digital transformation drives innovation, which in turn is a mechanism for improving performance. SMEs benefit more from using digital technologies to reorganize customer interactions, product/service offerings, and operational processes, rather than focusing solely on immediate cost savings [11] [12]. However, organizations enable changes to the knowledge and ideation process when creative confidence is driven by AI [31], [32], [33].

Table 5. Summary of hypothesis testing and implications

Hypothesis	Path	Result	Key Implication for SME Managers	Implication for Policymakers	Examples from Vietnam
H1	ITC → DTL	Rejected (suppression)	Invest selectively in technology—avoid buying tools without proper employee training.	Provide subsidies for both hardware and hands-on usage training.	Many firms purchase ERP software but rarely use it because staff lack training.
H2	DTS → DTL	Supported	Build and clearly communicate a realistic, step-by-step digital transformation plan.	Organize free or low-cost workshops on how to create a digital strategy.	Businesses with a clear plan for using Zalo OA usually expand their customer base more quickly.

(Continued)

Table 5. Summary of hypothesis testing and implications *(Continued)*

Hypothesis	Path	Result	Key Implication for SME Managers	Implication for Policymakers	Examples from Vietnam
H3	HRC → DTL	Supported (strongest)	Make continuous investment in digital skills training for employees a top priority.	Scale up nationwide digital literacy programs, especially in provincial areas.	Short training courses on Zalo and Facebook have helped many suburban Hanoi SMEs improve sales noticeably.
H4	TMS → DTL	Rejected (suppression)	Combine strong leadership commitment with practical upskilling of the workforce.	Include leadership training modules in national digital transformation programs.	Many owners support digital change, but results remain limited if employees cannot keep up.
H5	DTL → INN	Supported	Actively use digital tools to experiment with and develop new products or services.	Establish digital innovation hubs and startup accelerators.	Many shops on Shopee and TikTok Shop now use mini-games and livestreams to attract more customers.
H6	DTL → FP	Supported (weak direct)	Focus on fully integrating digital tools across the business rather than chasing short-term efficiency gains.	Introduce policies that encourage comprehensive (not partial) digital adoption.	Firms that combine online and offline channels usually see clearer performance improvements.
H7	INN → FP	Supported	Treat innovation (new ways of doing business) as the main driver of better business results.	Strengthen tax incentives and intellectual property support for innovative projects.	Businesses that innovate their sales model (e.g., livestream + flash sales) tend to have more stable revenue.
H8	DTL → INN → FP	Full mediation	View innovation as the most important bridge that turns digital adoption into real business value.	Build ecosystems that connect digital transformation directly to innovation activities.	The real value often comes from using digital tools to create new customer experiences (e.g., personalized offers).

Source: Compiled by authors.

5.1 Limitations

Horizontal research designs limit the interpretation of causal relationships, while vertical designs lead to a more self-contained capacity-building process, greater transformation depth, and better performance outcomes.

The strong correlation between factors creates multicollinearity and cancellation effects; future research could address this by considering hierarchical models.

The study sample is concentrated in major cities, so inferring SMEs in provinces and rural areas would be imprudent.

Self-reported measures can lead to methodological bias in general; further research should compare them to indicators such as audited financial results or platform usage logs.

6 CONCLUSION

According to the estimates of the PLS-SEM model and the research conducted based on the competency, it was demonstrated in the study that human resource competencies and digital transformation strategies have the strongest impact on the digital transformation in the Vietnamese SMEs. First, the digital transformation

leads to increased innovation, and innovation is the major direction of changing the operational performance. The findings reflect a management observation: SMEs are required to get digital transformation as a capacity-building and innovation program rather than a common investment.

The Vietnamese SMEs can use the digital environment to develop new models of interaction with customers, and the results are improved through the improvement of the skills of employees, instead of buying expensive software. The study agrees that innovation is a key mediator in the adoption of digital and business achievement. The practical implications are more significant to the managers of SMEs, and these are as follows: the emphasis should be made first on digital skills training, then on the development of the digital transformation plan in phases, instead of investing in large-scale technology that has not been adapted to humans. To policymakers, the findings illustrate that the National Digital Transformation Program must focus more on reachable digital literacy programs, particularly for SMEs in the rural setups [5], [6]. This work is valuable towards enhancing the digital transformation journey in the developing economies, as it gives evidence that digital transformation is a capacity process and it is a process that is led by innovation and not the application of technologies. The study design might be extended longitudinally in future studies, including rural SMEs, and also objective performance measures, including tax returns and sales records, can be used to further substantiate the findings.

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