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Businesses model innovation: a key role in the internationalisation of SMEs in the era of digitalisation

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Abstract

The study investigates the relationship between digital technology (DT) and the degree of internationalisation of small- and medium-sized enterprises (SMEs). The theoretical model is further extended by reviewing the mediating effects of business model innovation (BMI). The study employed partial least squares structural equation modelling (PLS-SEM) to test the hypotheses based on the cross-sectional data from 495 SMEs in Vietnam. The findings provide a novel perspective on the vital role of DT in BMI. However, DT poses challenges for SMEs in the degree of the internationalisation process. This study combines the internationalisation theory, particularly the Uppsala model and the resource-based view to examine the impact of DT on the internationalisation of SMEs through the mediating role of BMI.

Keywords: Business model innovation, Digital technology, Internationalisation, SMEs

Introduction

Small and medium-sized enterprises (SMEs) significantly contribute to growth in global industrial economies in terms of innovation, production, and employment (Child et al., 2017; Dabić et al., 2020; Gherghina et al., 2020; Memili et al., 2015). SME is a “catch-all” category for micro, small growing, and medium-sized enterprises (Miller et al., 2021), namely (i) micro-businesses: 1–9 employees; (ii) small businesses: 10–49 employees; and (iii) medium-sized businesses: 50–249 employees (Meramveliotakis & Manioudis, 2021; OCED, 2023). In Europe, over 99 per cent of the companies are SMEs, employing two-thirds of the workforce (Muller et al., 2018). More than 95 per cent of its firms are SMEs in sub-Saharan Africa (Abisuga-Oyekunle et al., 2020). SME representation in Asia exceeds 96% of the business population, sustaining two-thirds of private-sector employment and supplying national gross domestic products ranging from 17 per cent to 50 per cent (Yoshino & Taghizadeh-Hesary, 2018). Therefore, finding a path to prosperity for SMEs is also finding the source of the success of nations (Nazir et al., 2024). Internationalisation is considered a crucial strategy for business growth (Lu & Beamish, 2004) because it provides the chance to enter new markets, draw in new customers, realise economies of scale and scope, improve capabilities and flexibility, diversify

risks, obtain knowledge, skills, and technologies, and avoid fierce competition in domestic markets (Elango, 2004). SMEs can benefit greatly from operating in the international marketplace, including access to larger markets, technological benefits, technical level upgrades, risk reduction, and financing (Aghazadeh & Zandi, 2023; Fernandes et al., 2023). However, SME internationalisation experiences common barriers, including limited human, financial, and informational resources (Luu, 2024). Furthermore, SMEs also need more internal management capabilities to navigate volatility, uncertainty, complexity, and ambiguity (VUCA) environment (e.g. geopolitical fragmentations and risk, trade barriers, sanctions, and restrictions on exports and imports) for internationalisation (Meyer et al., 2023; Miller et al., 2021), limiting market access for businesses (Al-Hyari et al., 2012; Moreira et al., 2024).

Despite increased research on the internationalisation of SMEs, most studies have focused on developed economies, with a bias toward North America, Western Europe, and Japan (Chandra et al., 2020; Coudounaris, 2021; Roberts & Muralidharan, 2022; Vasconcelos-Garcia & Carrilho-Nunes, 2024). Vietnam is undergoing a significant and rapid economic transformation to help manufacturing firms; exporting accounts for 88% of international firms and more than half of Vietnam's export/cross-border volume (OECD, 2023). Vietnam has also enacted a law to boost firm internationalisation and competitiveness, making the country one of the Asian countries that have successfully implemented an open market economy for many years. The number of SMEs comprised 98% of all actively operating businesses and 88% of all exporting businesses, with 19% of export-related jobs and 50% of export volume (OECD, 2023). However, foreign-owned SMEs that moved to the nation to be nearer to multinational companies (MNCs), their primary purchasers, account for about 70% of SME exports. Thus, a manager or an entrepreneur of SMEs may need help deciding whether to join international markets due to their limited resource base.

RQ1. What is the ideal path for SMEs to arrive at their global markets?

SMEs' resources and capabilities might influence internationalisation (Chen et al., 2023), as demonstrated by a resource-based view (RBV) (Buyukbalci et al., 2024). International business (IB) has significantly transformed due to digital technology (DT) (Wang et al., 2024), which completely changes internationalisation strategies and procedures (Alcacer et al., 2016; Bargoni et al., 2024; Coviello et al., 2017). DT have a significant impact on the capacity of SMEs to endeavour globally, generate and supply value, refine their internationalisation strategies, enhance their services and products, reallocate resources, and foster entrepreneurial spirit and business innovation in global markets is notably influenced (Yordanova et al., 2024). DT encompass a range of concepts and platforms, including the Internet of Things, big data, blockchain, e-commerce, e-cloud, artificial intelligence, machine learning, and technology platforms (Acker et al., 2012; Legner et al., 2017; Luz Martín-Peña et al., 2018). The movement of commodities and knowledge across geographical borders has changed due to this digital environment (Banalieva & Dhanaraj, 2019). DT has affected established and innovative sectors, typically not distinguished by high levels of technological investment (Cortellazzo et al., 2019; Teece, 2010; Warner & Wager, 2019), creating an essential foundation for SMEs to participate in the global market and improving internationalisation performance (Luu, 2024).

SMEs' survival and long-term success ultimately depend on their ability to adapt their BM and innovation for internationalisation (Codini et al., 2023; Ferreira et al., 2024; Knight & Cavusgil, 2004; Massa et al., 2014). Firm internationalisation can be understood by using business model (BM) dynamics to comprehend the firm's reasoning behind this process, as it was defined as the process of adapting the firms' operations (i.e. strategy, structure, resources) to international environments (Calof & Beamish, 1995; Lecerf & Omrani, 2020; Reim et al., 2022). A business model describes how a company creates, delivers, and captures value (Teece, 2010), could be well adapted to the local ecosystem and is built on the specific conditions in the country of origin (Kolagar et al., 2022). However, internationalisation impacts all components of a BM (Adomako, 2024), which is associated with the need for innovation. However, BM innovation (BMI) only automatically translates into positive performance outcomes due to considerable costs and risks (Peprah et al., 2022). The advancement of DT is a critical enabler of firm resource-efficient in the internationalisation process (Bargoni et al., 2024) and BMI (Bresciani et al., 2021; Caputo et al., 2021; Reim et al., 2022; Soluk et al., 2021). Despite recognising the impact of BMI on international performance, empirical findings still need to be explored, with only a few studies explicitly examining the impact of BMI on performance outcomes in an international context that overlooks SMEs' context (Petzolt et al., 2022). Furthermore, although the complementarity between technology transformation and BMI is acknowledged by previous studies (Baden-Fuller & Haefliger, 2013), little attention has been devoted to connecting these two concepts (Smajlović et al., 2019), especially in the context of digital technology and SME internationalisation (Bouwman et al., 2019; Denicolai et al., 2021; Krenn, & Chiarvesio, 2024). Thus, more data must be needed to determine how DT and BMI are related to SME internationalisation (Ancillai et al., 2023; Bouwman et al., 2019; de Mattos et al., 2023; Kraus et al., 2022; Ojala et al., 2018).

This study aims to comprehend the crucial role of DT in the internationalisation process of SMEs through BMI, with cross-sectional data of 495 SMEs in Vietnam, using PLS-SEM for hypothesis testing. This study is based on the lens of internationalisation theory (Johanson & Vahlne, 1990; Johanson & Vahlne, 2017) and a resource-based view (Barney, 1991) to link DT and SMEs' internationalisation via the role of BMI. The author develops a conceptual framework and hypothesis development in the next section. The methodology involves a quantitative design emphasising mature theory research design and with cross-sectional data from 495 SMEs in Vietnam, using partial least squares structural equation modelling (PLS-SEM) to test the hypotheses. Then, the author discusses and presents the findings. In conclusion, theoretical and managerial implications, limitations, and future research directions were discussed.

Literature review and hypothesis development

Digital technology and SMEs internationalisation

Digitalisation is increasingly necessary to maintain competitiveness in the global markets for SMEs (Luu, 2024) based on the advancement of digital technology (DT) as a result of the Fourth Industrial Revolution (Ghobakhloo, 2020; Moll, 2023). Because many resources are now virtually available with little expense and effort, DT has lessened the resource gap between large and SMEs, which impacts the output of international

market expansion (Scuotto et al., 2017). Digitally transferred, implemented, and utilised firm-specific advantages might be less location-bound (Autio et al., 2021). DT remarkably alters organisational structures and procedures, enabling businesses to tap into more production factor marketplaces and new national markets (Ritter & Lettl, 2018), decreasing the cost of transferring firm-specific benefits across international borders (Coviello et al., 2017; Li et al., 2019).

However, DT's drawbacks must be considered, such as SMEs struggling to exploit and benefit from new technologies (Nguyen et al., 2015). The nations where multinational corporations conduct business may establish regulations, norms, and standards connected to DT, leading to regulatory multiplicity, variance, incompatibility, and worsening interruptions to cross-border activities (Luo, 2022; Wu & Gereffi, 2018). SMEs' ability to successfully transform and take advantage of DT is constrained by their resources and organisational capacity, which might create an exceptionally high barrier to translating digital capacity into core competitiveness for internationalisation (Estensoro et al., 2022; Feliciano-Cestero et al., 2023; Lehtinen et al., 2021). Besides, problems were linked to the detrimental effects of DT on the internationalisation of firms because of characteristics relating to individuals and groups of SMEs (Clemente-Almendros et al., 2024). Employees in SMEs may lack the aptitude, expertise, and skills to use DT efficiently (Ameen et al., 2021; Ardito et al., 2020; Kromidha & Robson, 2021; Park et al., 2022; Venkatesh et al., 2003). Considering two sides of the same coin, DT brings potential and promise and is attractive for the internationalisation process, but it also contains risks related to the resource readiness of SMEs. Therefore, we pose the following hypothesis:

H1. Digital technology is negatively related to the internationalisation of SMEs.

Digital technology and SMEs internationalisation: the mediating role of business model innovation

Business model (BM) could be characterised and evaluated based on the building blocks: customer segments, value propositions, channels, customer connections, income streams, essential resources, fundamental operations, meaningful partnerships, and cost structure (Nielsen, 2023; Osterwalder et al., 2010). As new products and technology emerged, BMs had to be updated and transformed into a more targeted model that considered innovation, creating the term BMI (Saebi et al., 2017; Spieth et al., 2014). BMI is the process of designing a new or modifying the firm's extant activity system (Zott & Amit, 2010), modifying or improving at least one of the value dimensions (Henley & Song, 2020), which is referred to as designed, novel, non-trivial changes to the critical elements of a firm's business model and the architecture linking these elements (Foss & Saebi, 2017; Nunes et al., 2024). Previous works emphasise the dynamic nature of BMI, characterising it as an iterative process (Kajanus et al., 2014) and ongoing learning (McGrath, 2010; Sosna et al., 2010), where businesses evolve their business models through continuous improvement (Kraus et al., 2020).

The last decade has been dominated by the rapid creation of new business models with a strong emphasis on DT (Ferraris et al., 2019; Jean et al., 2024), which may change location-based restrictions, affecting the value of innovation (Drori et al., 2024). Regarding business model influence, one of the primary innovations created by DT is the emergence of new models distinguished by a reduced dependence on physical components

(Autio et al., 2018; Erevelles et al., 2016; Haaker et al., 2021). Business model innovation (BMI) pertains to deliberate, complex, and ever-evolving modifications implemented on the fundamental components of the enterprise model through the conversion of analogue, physical entities, procedures, or material content into predominantly (or exclusively) digital formats (Christofi et al., 2024; Trischler & Li-Ying, 2023). DT emphasises how crucial innovative business models are to the commercialisation of DT, and each business model component, including value creation, delivery, and capture, needs to be carefully considered (Gil-Gomez et al., 2020; Lopez-Cabarcos et al., 2020). Operating in international markets differs significantly from the way of doing business in the home market (Evers et al., 2023; Garzella et al., 2021; Kraus et al. al., 2020; Teoh et al., 2023), which must be updated and modified BM in response to an international environment (Bohnsack et al., 2021; Chesbrough, 2010; Colovic, 2022; Monaghan et al., 2020), rather than being merely transplanted into a new market situation (Casadesus-Masanell & Zhu, 2013; Heij et al., 2024). Besides, in the context of limited resources, it is difficult for SMEs to invest heavily in infrastructure and early digitalisation to serve internationalisation. Instead, it is necessary to make appropriate progress via BMI. Therefore, we pose the following hypothesis:

H2. Business model innovation positively mediates the relationship between digital technology and the internationalisation of SMEs.

Figure 1 depicts the conceptual framework of the study.

Methodology

Research design and data collection

The author applied a quantitative design that emphasised mature theory research (Edmondson & McManus, 2007) according to a multi-theoretical approach to comprehend the transmission mechanism of DT, internationalisation, and the mediating role of BMI.

The data collection process relied on the dataset from The World Bank Enterprise Survey (WBES) implemented in Viet Nam between April 2023 and November 2023. This survey encompassed 1,028 enterprises in Vietnam, spreading diverse regions of various sizes. SMEs are classified as businesses with less than 250 employees (SME Support Law 2017; OCED, 2023), a catch-all category for micro-businesses, small-growing businesses, and medium-sized enterprises (Miller et al., 2021). The author filtered out companies

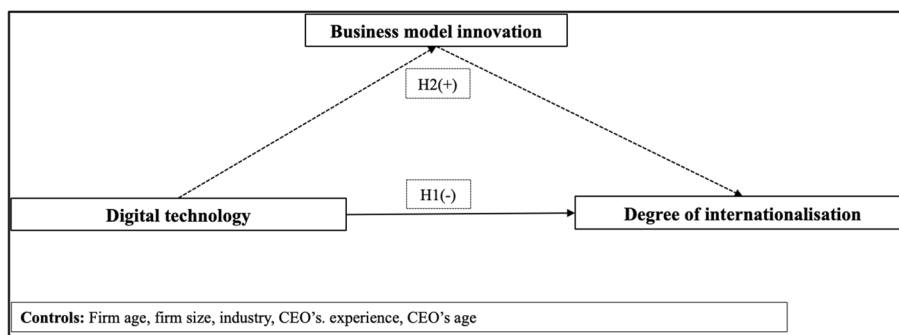


Fig. 1 Conceptual model. Source(s): Figure by author

with a size of fewer than 250 employees. Besides, we also have to eliminate businesses whose answers to the main variables in the research model are “do not know or -9/-7 value”. The filtering results were 495 SMEs, provided in detail in Table 1.

The author determined questions appropriate for research variables in the conceptual framework. The responses within the dataset were subsequently filtered based on the selected queries. The search for questions in the survey data was conducted based on the subsequent search string. “Digital technology” was identified through keywords such as “website”, “email”, “social network”, technology license. “Internationalisation” was presented by “export” and “foreign sale”. Terms related to innovation, e.g. “certificate”, “new product”, “new service”, were utilised to search for the BMI factor. Using these search parameters, the study obtained 11 questions, including 2 questions for each primary variable: Digital technology, internationalisation, BMI, and five questions for control variables: firm size, firm age, industry, top manager experience and top manager gender.

Measurements

Digital technology. Two determinants include the company utilisation of the website, email, and social media (e.g. “Our firm has our website or social media page at present.”), Moreover, technology-licensed (e.g. “The company currently uses digital technology licensed from a foreign-owned business, excluding office software.”) (Chu et al., 2019; Porfírio et al., 2021).

Table 1 Sample characteristics

Variables	Frequency	Percentage (%)
1. Firm age		
Five years or less	56	11.34
6–10 years	116	23.34
11–15 years	129	26.06
16–20 years	112	22.68
21 and above	82	16.58
2. Firm size		
1–9 employees	173	35.01
10–49 employees	191	38.60
50–249 employees	131	26.39
3. Industry		
Manufacturing	265	53.44
Retail	230	46.56
4. Top Manager experience		
Five years or less	45	9.16
6–10 years	102	20.61
11–15 years	104	21.05
16–20 years	119	23.99
21 and above	125	25.19
5. Top Manager gender		
Male	107	21.59
Female	388	78.41
Total	495	100

Source(s): Table by Author

SMEs' internationalisation. Internationalisation of SMEs is measured via the degree of internationalisation, which describes the scope of a company's international operations (Dar & Mishra, 2019; Sullivan, 1994). It is operationalised as the percentage of sales from international activity (e.g. "estimated percentage of this establishment's sales were indirect exports in the last fiscal year").

Business model innovation was measured with two items, referring to the dimensions of a business model (Nielsen, 2023; Trischler & Li-Ying, 2023; Zott & Amit, 2008). Value capturing and dispersion are measured by the investment in research and development performances (e.g. "During the fiscal year, did this establishment spend on research and development activities, either in-house or contracted with other companies, excluding market research surveys?").

Control variables

The SME's internationalisation is approached differently depending on organisations and industries. The size, age, and sectors of the firms, and the experience and gender of top managers are involved in control variables as determinants affecting the internationalisation of SMEs (Love et al., 2016; Rua et al., 2018). Firm age was determined by the year the company began operations; the size and industry of the company were ascertained from the screener before the interview. The number of years of experience working in the top manager sector has indicated their experience.

The PLS-SEM analysis

Many academics are interested in the partial least squares structural equation modelling (PLS-SEM) approach since it makes it possible to estimate complicated models with many constructs, indicator variables, and structural pathways without imposing distributional assumptions on the data (Hair et al., 2019). PLS-SEM is predictive causal modelling to structural equation modelling (SEM) that prioritises prediction in statistical model estimation, the structure of which is intended to yield causal explanations (Sarstedt et al., 2017; Wold, 1982). In this study, the data are analysed using the PLS-SEM technique, and hypotheses are suggested using the SmartPLS 4 program (Ringle et al., 2015).

Results

Evaluation of the measurement model

Using a component-based approach to estimating based on variance, the partial least square path model is used to evaluate the measurement model fit level and causal analysis (Wold, 1982).

The estimated findings indicate that the model's constructs have indicator loadings of 0.715 or above, implying that the construct analysed over 50% of the indicator, resulting in satisfactory reliability (Hair et al., 2019).

Table 2 shows that composite factor reliability coefficients ranged from 0.803 or above, fulfilling the study's internal consistency dependability (Hair et al., 2019).

The convergent validity of each construct measure is indicated by the average variance extracted (AVE) for each construct in the model, reaching the recommended threshold of 0.597 or higher (Hair et al., 2019) (see Table 3). While comparing 'the

Table 2 Results of reliability and convergent validity tests

	Composite reliability	Average variance extracted (AVE)
Digital technology	0.803	0.638
Business model innovation	0.898	0.623
Degree of internationalisation	0.834	0.597

Source(s): Table by Author

Table 3 Fornell–Larcker criterion analysis for testing discriminant validity

	Business model innovation	Digital technology	Degree of internationalisation
Business model innovation	0.789		
Digital technology	0.141	0.799	
Degree of internationalisation	– 0.105	– 0.121	0.772

Source(s): Table by Author

variance extracted estimates for the constructs' that comprise each potential pair, the pairwise correlations between PLS-SEM analyses assessed discriminant validity (Fornell & Larcker, 1981). Below their AVEs are the common variance for all model constructs, as shown in Table 2 (Hair et al., 2019). However, the Fornell–Larcker criterion needs more sensitivity and specificity in combination with the results of variance-based structural equation modelling and consistent estimates (Voorhees et al., 2016).

Hypothesis testing

The hypotheses are analysed using the Bootstrapping method based on the partial least square method (Wold, 1982). Evaluation of the model's predictive capabilities and the relationships in the structural model is calculated via R Square value, f Square, goodness-of-fit, Stone–Geisser's Q^2 and path coefficients (Hair et al., 2019). The model's VIF values of the predictor constructs are lower than 2.00, ideally showing that collinearity is not an issue in the model (Hair et al., 2019). The R^2 value of the endogenous constructs is a measure of the model's explanatory power and in-sample predictive power (Hair et al., 2019). The R^2 value of the endogenous construct's degree of internationalisation (0.220) and Business model innovation (0.341). The value of f Square reflects the significance of Digital technology on the degree of internationalisation (f square = 0.0113) and Business model innovation (f square = 0.121). Standardised root means square residual equal 0.112, thus proving the fitting model (Hair et al., 2019). Q^2 values are positive and higher than 0, 0.50, 0.25, depicting the PLS-path model's small, large and medium predictive relevance (Hair et al., 2019): degree of internationalisation ($Q^2=0.131$) and Business model innovation ($Q^2=0.320$). A bootstrapping procedure using 5000 subsamples be used to determine the statistical significance of each path coefficient (Chin, 1998). The hypothesised path coefficients, bootstrap values, and T-values are listed in Table 4.

Table 4 Results of the regression analysis

Model	Mediation model Mediator = Business model innovation	
	(1) Degree of internationalisation	(2) Business model innovation
<i>Predictor</i>		
Digital technology	- 0.038 (s.d = 0.018; p = 0.035)	0.133 (s.d = 0.058; p = 0.022)
<i>Mediator</i>		
Business model innovation	0.035 (s.d = 0.021; p = 0.062)	
<i>Controls</i>		
Firm age	- 0.063 (s.d = 0.041; p = 0.043)	
Firm size	0.177 (s.d = 0.048; p = 0.000)	
Industry	- 0.301 (s.d = 0.029; p = 0.000)	
Top manager experience	0.013 (s.d = 0.033; p = 0.605)	
Top manager gender	- 0.149 (s.d = 0.087; p = 0.084)	
Source(s): Table by author		

Table 5 The total indirect effects of digital technology on the degree of internationalisation via the mediating role of business model innovation

	co. eff	s.d	t	p	Mediation type
The total effect of digital technology on the degree of internationalisation	- 0.053	0.030	1.777	0.074	-
The total direct effect of digital technology on the degree of internationalisation	- 0.038	0.018	2.112	0.035	-
Total indirect effects of effects of digital technology on the degree of internationalisation via the mediating role of business model innovation	Effect - 0.015	SD 0.008	LLCI - 0.375	ULCL - 0.193	Partial mediation effect
Source(s): Table by author					

Controlling for variables in the research model, the estimates in Table 4 reveal that, as expected, the firm Digital technology directly and significantly affects SMEs’ degree of internationalisation ($\beta = -0.038$; $p < 0.05$). Therefore, H1 is fully supported by the data.

Table 5 shows that Business model innovation positively mediates Digital technology’s effect on SMEs’ degree of internationalisation ($\beta = - 0.015$; $p < 0.1$), fully supporting H2. Besides, the variance accounted for (VAF) method tests the structural model of indirect influences. This method is considered the best approach for PLS-SEM, which uses the resampling method and has higher statistical power than the Sobel method (Hair et al., 2019). The mediation effect could be categorised as follows: $\geq 80\%$ has a full mediation effect, 20–80% is a partial mediation effect, and $\leq 20\%$ reveals no mediation effect. The formula for calculating VAF is (an indirect effect)/(total effect). The mediation effect of Business model innovation between DT and SMEs’ degree of internationalisation is $-0.015/-0.053 = 0.2830$ or 28.30%.

Robustness checks

Nonlinear effects assessment. The interaction terms describe the quadratic effects between variables to examine for potential nonlinearities in the structural model relationships (Sarstedt et al., 2020). The estimates in Table 6 indicate that the nonlinear effects of Digital technology on Business model innovation ($p=0.993$), the nonlinear effects of Digital technology on SME degree of internationalisation ($p=0.995$), and the nonlinear effects of Business model innovation on SME degree of internationalisation ($p=0.183$) is insignificant. Thus, the linear effects model is robust.

Endogeneity assessment. Table 7 describes that none of the Gaussian copulas, including Digital technology, degree of internationalisation and Business model innovation, is significant ($p>0.05$). Therefore, endogeneity is absent from the findings, supporting the robustness of the structural model results.

Unobserved heterogeneity assessment. The results of the fit indices for the one- to five-segment solutions paint an unclear picture (see Table 8). Sarstedt et al. (2011) indicated that whenever AIC3 and CAIC describe an identical number of segments, it is likely that the results point to the appropriate number of segments. However, AIC3 and CAIC point to a four-segment solution in this analysis. Additionally, Sarstedt et al. (2011) pointed out that they typically work well when AIC4 and BIC are utilised to calculate the number of segments in FIMIX-PLS. According to Hair et al. (2016), both criteria indicate a four-segment solution that appears densely clustered based on the EN criterion. A four-segment solution is also indicated by minimal description length with factor 5 (MDL5). It has been demonstrated that this criterion underestimates the number of segments. As a result, researchers should typically extract more segments than MDL5 suggests (Hair et al., 2016). Because the MDL5 indicates the same number of segments as the AIC4 and BIC, the analyses do not suggest a particular segmentation solution. As a result, unobserved heterogeneity is not at a critical level, which validates the analysis’ findings for the full data set.

Discussion

Main findings

Draw inspiration from the captivating journey to Rome to pursue historical affluence and development (Denisov & Maslova, 2021); internationalisation signifies the trajectory that SMEs must pursue amidst the prevailing global competitive environment (Linder et al., 2020; Stieg et al., 2017). However, do all roads lead to Rome? In developing

Table 6 The nonlinear effects with standardised regression weights

	Original sample	Sample mean	Standard deviation	t statistics	p values
QE (Digital technology) → Business model innovation	0.023	0.044	1.855	0.013	0.993
QE (Digital technology) → Degree of internationalisation	− 0.010	0.016	1.427	0.006	0.995
QE (Business Model Innovation) → Degree of internationalisation	− 0.034	− 0.026	0.026	1.334	0.183

Source(s): Table by Author

Table 7 Assessment of endogeneity via the Gaussian copula approach

	Original sample	Sample mean	Standard deviation	t statistics	p values
Gaussian copula of model 1					
GC (Digital technology) → Business model innovation	0.062	0.05	0.049	1.266	0.202
GC (Digital technology) → Degree of internationalisation	− 0.032	− 0.03	0.04	0.784	0.431
GC (Business model innovation) → Degree of internationalisation	− 0.045	− 0.043	0.031	1.512	0.130
Gaussian copula of model 2					
GC (Digital technology) → Business model innovation	0.062	0.05	0.049	1.266	0.203
GC (Digital technology) → Degree of internationalisation	− 0.032	− 0.03	0.04	0.784	0.432
Gaussian copula of model 3					
GC (Digital technology) → Business model innovation	0.062	0.05	0.049	1.266	0.202
GC (Business Model Innovation) → Degree of internationalisation	− 0.045	− 0.043	0.031	1.512	0.130
Gaussian copula of model 4					
GC (Digital technology) → Degree of internationalisation	− 0.021	− 0.02	0.04	0.545	0.587
GC (Business model innovation) → Degree of internationalisation	− 0.042	− 0.04	0.031	1.382	0.168
Gaussian copula of model 5					
GC (Digital technology) → Business model innovation	0.062	0.05	0.049	1.266	0.210
GC (Digital technology) → Degree of internationalisation	− 0.021	− 0.02	0.04	0.545	0.588
GC (Business model innovation) → Degree of internationalisation	− 0.042	− 0.04	0.031	1.382	0.1678
Source(s): Table by Author					

Table 8 Fit indices for the one- to five-segment solutions

Indicators	Number of segments				
	1	2	3	4	5
AIC (Akaike's information criterion)	5046.821	1747.717	− 536.275	− 1667.143	− 1482.513
AIC3 (modified AIC with Factor 3)	5056.821	1768.717	− 504.275	− 1624.143	− 1428.513
AIC4 (modified AIC with Factor 4)	5066.821	1789.717	− 472.275	− 1581.143	− 1374.513
BIC (Bayesian information criterion)	5095.032	1848.961	− 381.999	− 1459.835	− 1222.173
CAIC (consistent AIC)	5105.032	1869.961	− 349.999	− 1416.835	− 1168.173
HQ (Hannan–Quinn criterion)	5065.222	1786.358	− 477.393	− 1588.021	− 1383.151
MDL5 (minimum description length with factor 5)	5367.877	2421.934	491.102	− 286.605	251.186
LnL (LogLikelihood)	− 2513.411	− 852.859	300.137	876.571	795.257
EN (normed entropy statistic)	0	0.932	0.843	0.957	0.82
NFI (non-fuzzy index)	0	0.955	0.843	0.966	0.792
NEC (normalised entropy criterion)	0	62.494	143.651	39.388	165.276
Source(s): Table by Author					

countries, this is particularly challenging for SMEs as they need to mitigate uncertainty while leveraging limited resources. Consequently, numerous routes and expedients have been and continue to be delineated to shed light on the internationalisation process for SMEs. DT has become a strategic priority for many SME internationalisation (Wang et al., 2024), but not all DT investments generate the expected results (Luo, 2022; Wu & Gereffi, 2018). This study's findings indicate that DT might hurt SME access to the international market (Yordanova et al., 2024). However, DT has a significant positive association with BMI (Reim et al., 2022). We argue that DT is a key resource for BMI (Ancillai et al., 2023), which can translate into international performance (de Mattos et al., 2023; Luu, 2024; Menter et al., 2023).

Theoretical contributions

The research contributes significantly to the theory of internationalisation of SMEs and the resource-based view, clarifying that DT fosters internationalisation via BMI. Firstly, in SMEs' efforts to find a path to prosperity through internationalisation, we are convinced by the appeal and timeliness of DT in efforts to conquer international markets (Luu, 2024; Vahlne & Johanson, 2017). DT plays a crucial role in assisting small businesses and entrepreneurs in identifying new and developing business prospects in dynamic marketplaces and the underlying connections and repercussions (Cassetta et al., 2020; Wang et al., 2024). However, our findings indicate that the links between DT and SME internationalisation are contradictory (Bhandari et al., 2023; Clemente-Almendros et al., 2024; Verbeke & Hutzschenreuter, 2021). The lack of connection or effective communication of the best of DT to the success of SMEs in the global market mainly comes from a lack of infrastructure, including hard infrastructure (e.g. investment in websites, technology traditional and information technology) and soft infrastructure (e.g. organisational capacity and staff) (Feliciano-Cestero et al., 2023; Müller et al., 2021). The adverse effects of DT on internationalisation worsen when its employees lack the skills and resources needed to deal with the challenges posed by the shift (Bouwman et al., 2019). Therefore, to be able to internationalise through a "high-speed" path such as digitalisation, SMEs must have solid resources and infrastructure or a strong "engine" (Warner & Wager, 2019). Secondly, although the bad news is that DT can negatively affect the internationalisation performance of SMEs, the good news is that other transmission channels can amplify the benefits of DT. We revealed a strong positive correlation between DT and BMI in fostering the internationalisation of SMEs (Caputo et al., 2021; Garzella et al., 2021). DT and business model innovation are inseparable, and DT is the driving force for BMI, and BMI is the transmission channel for DT on organisational performance (Ehret & Wirtz, 2017).

Practical implications

Even though DT has prioritised investments to close the digital divide, there is still more work to be done in terms of getting organisations ready to embrace and take advantage of the many opportunities that DT presents for fostering innovation and value creation as well as improving firm performance. This study contributes implications for SMEs' business performances, especially those in the internationalisation process. SMEs tend to expand internationally due to poor conditions in their home market, inadequate

assistance, and a lack of growth possibilities. In accessing the international market, DT is an essential factor that must be considered, but it also represents challenges for SMEs that could decelerate the internationalisation and development of companies. In order to succeed in DT applications in internationalisation, employees need to be up to date on the most recent advancements in technology both domestically and globally. Managers could play an essential role in developing and preserving a robust digital culture in organisations. Moreover, only managers are convinced of the importance of utilising new technologies to enhance firms' internationalisation. Hence, businesses need a solid technological foundation that may benefit them.

In addition, the results demonstrate that digital approaches assist the BMI. The author points out the role of DT that should be adopted to develop a feature BMI, establishing competitive advantages and providing favourable value to customers and stakeholders. Companies should prioritise BMI and digital innovation while setting up their operations. Decision-making in the context of internationalisation advancements requires more than just information availability, which includes many forms of information, ideas, innovation, and competencies, including mediating methods. BMI requires the strategic agility of managers in decision-making and conduction, especially in digital capabilities. SMEs may find that strategic agility helps them become more flexible, adapt, and quickly react to adverse external effects and competition to improve overall performance.

Conclusions, limitations and directions for future research

This study highlights the significance of DT in SMEs' internationalisation process via the role of BMI. Rather than focusing on analysing large organisations, more attention was paid to developing SMEs, which are an essential factor promising to provide more economic prospects, particularly in the digital era. SMEs can achieve competitive edges and become more stable on international markets through BMI when they have access to DT. However, DT can become an issue that needs to be considered in the international economy, which requires agility of managers, as suggested by this research.

The study cannot avoid a few fundamental limitations. Initially, the research of Vietnamese SMEs was conducted across a specific period, so considering data collection methods like cross-sectional analysis could result in common method bias and a lack of generalisability in the findings. The author suggests that researchers should also gather data from various sources, including interviewing SMEs and employing longitudinal data to increase the validity of the findings. Random measurement errors may affect the results. The author needs help to control potential effects, even though efforts are made to limit systematic measurement mistakes by applying tested scales. Furthermore, researchers must employ suitable corrective measures according to different endogeneity effects. To mitigate endogeneity issues, the author encourages future researchers to use more sophisticated and fine-grained solutions like the distinction test, the propensity score similarity metric, and the insider research method, which helps define any selection bias in estimating the intervention effect.

The research illuminates the reciprocal benefits of DT and BMI within an enterprise in internationalisation; the study only concentrates on SMEs. As a result, it presents opportunities for future research directions, encouraging potential researchers to broaden the survey's reach and include a more significant number of firms of varying sizes.

Moreover, this study can be conducted in multiple countries to explore how cultural variations impact the connection between BMI and the internationalisation process. In addition, BMI may impact other operations, which is positive with internationalisation. The author encourages more studies to evaluate the relationship between BMI and other elements, including profitability, corporate social responsibility, and environmental initiatives.

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Author contributions

LTD: writing—original draft and revision; literature survey; research design; methodology; data analysis. TTHD: writing—original draft and revision; literature survey; research design. All authors have read and approved the final manuscript.

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Data availability

The dataset used and analysed during the current study and the complete questionnaire form are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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