

**Digital capabilities and innovation capabilities in Vietnamese SMEs****Dinh Van Hoang<sup>a\*</sup>, Tran Thi Kieu Minh<sup>a</sup>, Nguyen Quoc Toan<sup>a</sup> and Vu Thi Mai<sup>a</sup>**<sup>a</sup>Foreign Trade University, Hanoi, Vietnam**CHRONICLE***Article history:*

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*Keywords:**Digital leadership**Innovation capability**Digital capabilities**Digital culture**SMEs***ABSTRACT**

The objective of the study is to clarify the influence of digital capabilities on innovation capability, considering the direct and indirect impacts of digital leadership and digital culture in small and medium enterprises (SMEs) in Vietnam. The study used a mixed research method including qualitative with in-depth interviews and quantitative with Partial Least Squares Structural Equation Model (PLS-SEM) to analyze 271 responses. Research results show that digital capabilities have a positive impact on SMEs' innovation capability. Digital leadership and digital culture also, directly and indirectly, affect firms' digital capabilities and innovation capabilities. From there, the study confirms the theoretical contributions as well as proposes suggestions for SMEs to develop digital capabilities, and as a result, to develop innovation capabilities.

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**1. Introduction**

Digital transformation has been a general trend and occurs in all aspects of life in terms of society and the economy (Wilms et al., 2017). With the advantage of flexibility and quick decision-making, small and medium enterprises (SMEs) are seen as active participants in the digital transformation process (Kim, 2021). Many factors facilitate businesses to accelerate the digital transformation process stemming from the internal environment as well as the external environment of the enterprise, especially in the context of the strong development of technical tools. Innovation capabilities (IC) are one of the keys to helping businesses maintain competitive advantages, thereby developing sustainably (Lai et al., 2015). With the development of digital technology, the digital capabilities of enterprises (DCap) are an important factor to help businesses accelerate the innovation process.

DCap is defined as the application of digital technology in the management and production processes of enterprises to promote product development and create value for the business (Rachinger et al., 2019). The impact of DCap has been studied on various factors such as the innovation process (Freel, 2005; Khin & Ho, 2019; Renko et al., 2009) and digital innovation (Khin & Ho, 2019). On the other hand, IC is understood as the continuous implementation of the innovation process, transforming ideas into tangible products (Lawson & Samson, 2001). IC has also been examined from different perspectives and its relationship with various variables such as examining the impact of IC in strategic development (Schweitzer, 2014), business performance (Saunila, 2014), and specifically with digital leadership (DL) (Sasmoko et al., 2019). There is a significant amount of research focused on these two factors due to their important role in businesses.

However, the research on the relationship between DCap and IC is still insufficient and incomplete to clearly understand this relationship. Based on the practical and theoretical rationale, this study will contribute in the following ways to fill the existing research gaps. Firstly, the study will clarify the direct impact of DCap on IC in Vietnamese SMEs - a developing country with

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strong market fluctuations. Secondly, the study will simultaneously examine and assess the direct and indirect impacts of DL and digital culture (DCul) on DCap and IC, which have not been previously addressed in any research. Thirdly, the authors will clarify the influence of the DC - a highly important variable that has not received sufficient attention from researchers regarding its role. Therefore, this study aims to fill these gaps. Additionally, the Vietnamese business environment and the target of the study being Vietnamese SMEs will help provide a clearer understanding of the influence of these variables in a dynamic environment that requires flexibility and adaptability from businesses (Naradda Gamage et al., 2020).

To address the research gaps, the authors relied on the dynamic capabilities view (DCV) (Teece et al., 1997) to better understand the roles and nature of the variables in the research model. The authors proposed a research model based on a synthesis of insights from in-depth interviews and validated hypotheses through quantitative research using the PLS-SEM testing model, aiming to answer three main research questions: (1) How does DCap impact IC? (2) How does DL influence the relationship between DCap and IC? (3) How does DCul influence the relationship between DCap and IC?

The remaining parts of the study are divided into the following sections: Section 2 includes a detailed literature review and the development of research hypotheses. Section 3 provides specific information about the research methodology, and Section 4 discusses the results of the analysis. Finally, in Section 5, the authors highlight theoretical contributions and provide implications for Vietnamese SMEs.

## 2. Literature review and hypothesis development

### 2.1. Theoretical foundations

#### *Dynamic capabilities view (DCV)*

The dynamic capabilities theory by (Teece et al., 1997) is an extension of the resource-based view (Burisch & Wohlgemuth, 2016) and has become one of the most widely applied theories in management research (Jiao et al., 2019; Kano, 2021). According to DCV, businesses concentrate on seeking methods to adjust and thrive in a constantly changing business environment through the incorporation, construction, and restructuring of both internal and external resources (Teece et al., 1997). Dynamic capabilities within a business are manifested through three capabilities: sensing capability, seizing capability, and reconfiguring capability (Al-Hawary & Al-Rasheedy, 2021; Linde et al., 2021; Naldi et al., 2014).

Previous studies have considered DCap as a dynamic capability of a business because enhancing DCap enables businesses to quickly adapt to the changing dynamics of the market (Hanelt et al., 2021; Hirvonen & Majuri, 2020) through the development of new products and improved efficiency of business processes (Khin & Ho, 2019). IC is recognized as a dynamic capability within a business (Birchall & Tovstiga, 2005; Helfat et al., 2009; Wang & Ahmed, 2007), characterized by the capacity to consistently convert information and ideas into novel products, processes, and systems that bring advantages to both the company and its stakeholders (Kafetzopoulos & Psomas, 2015). DCul is characterized as a collection of fresh principles, behaviors, and anticipations regarding individuals' actions and interactions within a community (Deuze, 2006). This DCul encourages innovation and the development of new knowledge, thereby supporting the generation of innovative products and services (Duerr et al., 2018). Consequently, it can be regarded as another dynamic capability of a business. Furthermore, DL inherently possesses the characteristics of a dynamic capability as it plays a vital role in driving digital transformation (Mihardjo et al., 2019). By merging organizational culture and knowledge with digital technologies, it maximizes business performance and value (Wasono & Furinto, 2018).

#### *Digital capabilities*

DCap is considered a dynamic capability of businesses and is defined as the introduction and integration of digital technology into the business management practices to drive product development and create value within the organization (Rachinger et al., 2019; Rönnerberg Sjödin et al., 2016). DCap contributes to enhancing operational efficiency, reducing costs, and gaining competitive advantage for businesses (Nambisan et al., 2017; Vial, 2019), serving as an effective tool to support businesses in realizing and assessing their digital resources, thereby helping them maintain market competitiveness (Ansong & Boateng, 2019). The DCap of a business is primarily examined from two main perspectives: the technical perspective, which includes capabilities such as the Internet of Things (IoT), big data analytics, and cloud computing (Edu et al., 2020) or data collection, connectivity, and analysis capabilities (Ajaegbu, 2020); and the dynamic capability perspective, where DCap encompasses the abilities of sensing, seizing, and reconfiguring the firm's resources (Annarelli et al., 2021; Gökcalp & Martinez, 2021). This study will consider DCap as a dynamic capability of businesses.

#### *Innovation capabilities*

IC refers to the ongoing ability to convert information and ideas into fresh products, processes, and systems, benefiting the business and its stakeholders (Lawson & Samson, 2001). This capability plays a significant role in establishing specific competitive advantages over rivals (Chandler et al., 1999) and is considered a crucial factor in a business's overall success (Saunila, 2014). Across organizations of all sizes and structures, IC is viewed as essential for achieving sustainable changes in today's dynamic business landscape (Imran et al., 2019). Consequently, the survival and resilience of SMEs are contingent on their capacity to innovate in terms of products, processes, marketing, and organizational structure (Heenkenda et al., 2022).

Drawing upon the DCV and the aforementioned context, this study examines the four dimensions of IC: product innovation, process innovation, marketing innovation, and organizational innovation.

## 2.2. Digital capabilities and innovation capabilities

Previous research has highlighted that IC is recognized as a dynamic capability within a business (Breznik & D. Hisrich, 2014; Helfat et al., 2009; Wang & Ahmed, 2007). Dynamic capabilities empower businesses to adapt to changes in the business landscape by engaging in innovative practices (Hill & Rothaermel, 2003; Teece, 2007). Consequently, dynamic capability serves as the underlying basis for IC (Breznik & D. Hisrich, 2014). The emergence of new digital technologies facilitates the advancement of innovation within organizations by reshaping their organizational structures (Boeker et al., 2021). By effectively utilizing and leveraging digital technologies, thereby fostering Dcap, businesses can generate heightened levels of innovation (Zammuto et al., 2007), ultimately enhancing their IC (Kastelli et al., 2022).

**H<sub>1</sub>:** *Dcap has a positive significant effect on IC.*

## 2.3. Digital leadership, digital capabilities, digital culture and innovation capabilities

DL refers to the combination of leadership skills and the effective use of digital technologies (Zhu, 2015). Its primary role is to drive digital transformation within businesses, enabling them to develop DCap (Oberer & Erkollar, 2018; Wasono & Furinto, 2018). According to (Toduk & Gande, 2016), DL encompasses a business mindset focused on innovation and novelty, digital skills for gaining a competitive advantage through technology and enhancing personal knowledge value, deploying digital technologies to establish strong domestic and global networks that facilitate collaboration, and inspiring commitment to the overall vision of the organization. DL significantly influences a business's dynamic capabilities based on market orientation (Mihardjo et al., 2019) and also impacts the organization's digital skills (Tulungen et al., 2022). DCap is a dynamic capability strongly influenced by DL (Amelda et al., 2021) and the absence of DL presents a significant obstacle to digital business activities (Mirković et al., 2019).

**H<sub>2</sub>:** *DL has a positive significant impact on DCap.*

Previous studies have demonstrated that DL directly affects digital business performance and overall outcomes (Fores & Camison, 2011; Sarfraz et al., 2022) by digitizing the fundamental aspects of a business (Benitez et al., 2022). IC acts as a catalyst for businesses to continually foster innovative changes in their processes and products, meeting the dynamic demands of the market (Le & Lei, 2019; Slater et al., 2010). DL encourages the effective utilization of digital tools, providing opportunities to explore new avenues for creating value, leading to significant changes in products, services, organizational frameworks, and business models (Borowska, 2019). Organizations with DL possess a greater ability to implement digital transformations and demonstrate IC (Li et al., 2023).

**H<sub>3</sub>:** *DL has a positive significant impact on IC.*

DCul represents a collective set of assumptions and a comprehensive understanding of digital business activities (Deshpande & Webster Jr, 1989). DCap and DCul play crucial roles in preparing a business for a new business model, particularly a digital one (Nilsen & Birken, 2020). Adopting a DCul necessitates digital leaders who possess strategic thinking and leverage advancements in digital technology to create new business prospects that benefit the organization's customers (de Araujo et al., 2021). DCul enables businesses to recognize the potential of digitization in new endeavors, with leaders exerting significant influence over this organizational culture (El Sawy et al., 2020). Digital leaders can persuade and support the development of a new DCul that can adapt to the digital environment and strive for sustainable goals (Oberer & Erkollar, 2018).

**H<sub>4</sub>:** *DL has a positive significant impact on DCul.*

## 2.4. Digital culture, digital capabilities and innovation capabilities

In the era of technology, businesses need to undergo digitalization to maintain their competitiveness. This process is facilitated by the emergence of technologies such as AI, IoT, Big data, and cloud computing in the VHS environment (Shin et al., 2023). As technology continues to advance and online business activities on a global scale become prevalent, businesses are expanding their culture to incorporate digital workplace activities (Duerr et al., 2018), leading to the formation of the DCul (Ludolf et al., 2017). Moreover, DCul enables businesses to recognize the advantages of digital transformation (Deuze, 2006; Nylén & Holmström, 2015) while DCap is regarded as the cornerstone of digital transformation (Bonnet & Westerman, 2020; Carcary et al., 2016). Consequently, the authors argue that the DCul influences a business's DCap.

**H<sub>5</sub>:** *DCul has a positive significant influence on Dcap.*

Additionally, DCul serves as a significant indicator for the adoption of digital technologies, offering novel approaches and solutions for business processes through advanced business models (Borda & Bowen, 2019). DCul has become an indispensable component of new business models, fostering organizational preparedness and innovation, particularly in the

realm of digital innovation (Dery et al., 2017). Furthermore, DCul stimulates innovative changes and the acquisition of new knowledge, thereby supporting the development of new goods and services (Duerr et al., 2018).

**H<sub>6</sub>:** *DCul has a positive significant impact on IC.*

### 2.5. The mediating role of digital capabilities and digital culture

The dynamic nature of leadership capability is essential for businesses and plays a vital role in propelling digital transformation (Mihardjo et al., 2019) through the effective utilization of digital technologies to optimize performance and value (Wasono & Furinto, 2018). DL contributes to the improvement of a business's DCap (Oberer & Erkollar, 2018), consequently enhancing its IC (Zammuto et al., 2007). The disruptive impact of digital technology underscores the equal significance of DCap and DL in determining a business's competitive position (Abidin, 2023), with DCap directly influencing IC and DL playing a crucial role in sustaining a business's competitive advantage (Ferreira et al., 2020; Liu et al., 2020; Lo & Tian, 2020). As a result, the mediating role of DCap in the relationship between DL and IC becomes evident.

Successfully adapting to DCul necessitates the presence of digital leaders who possess strategic thinking to guide the exploration of new business domains, particularly in fostering innovative changes within the organization (de Araujo et al., 2021). In businesses embracing DCul, hierarchical delegation decisions made by digital leaders facilitate creativity and positive transformations in digital products and services (Nylén & Holmström, 2015). DCul plays a crucial role in driving innovative changes in businesses; however, it requires guidance from digital leaders (Duerr et al., 2018; El Sawy et al., 2020). Therefore, the authors propose that DCul serves as a mediating factor in the relationship between DL and IC within a business.

Based on the aforementioned overview, the authors put forward the following hypotheses concerning the mediating roles of DCap and DCul:

**H<sub>7</sub>:** *DCap acts as a mediator between DL and IC.*

**H<sub>8</sub>:** *DCul acts as a mediator between DL and IC.*

**H<sub>9</sub>:** *DCul acts as a mediator between DL and DCap.*

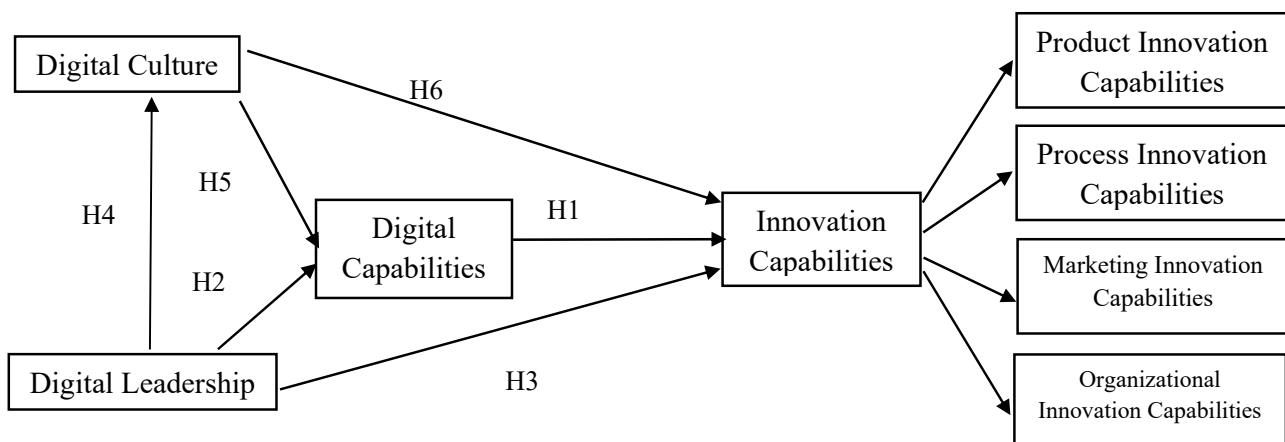
**H<sub>10</sub>:** *DCap acts as a mediator between DCul and IC.*

**H<sub>11</sub>:** *DCap and DCul jointly mediate the relationship between DL and IC.*

## 3. Research methodology

### 3.1. Research design and research model

The authors applied a mixed-method research approach, combining qualitative and quantitative methods, in their study to gain a comprehensive understanding of the research issue (Choi et al., 2016). Firstly, the authors conducted in-depth interviews with 30 leaders at middle and higher management levels of SMEs. The interviews aimed to: firstly, provide an overview of the development of DCap and IC and; secondly, explore the factors influencing the relationship between DCap and IC. Based on the interview data and a review of relevant literature, the authors developed a research model that aligned with both practical and theoretical considerations. Subsequently, the research model was evaluated using a quantitative method, specifically Partial Least Squares Structural Equation Modeling (PLS-SEM), with the second-order results analyzed using SmartPLS 4 software. The authors collected an appropriate sample size to assess and test the hypotheses of the study.



**Fig. 1.** Research Model (Source: Authors' proposal)

### 3.2. Sample and data collection

#### 3.2.1. Questionnaires and measurement scales

To develop the questionnaire, the authors followed two steps as follows: (1) The authors conducted a literature review and expert interviews. In this step, the research team collected and adapted measurement scales for the variables in the research model to ensure their validity and reliability. (2) The authors conducted a pilot survey with 30 participants to refine the questionnaire, ensuring its practicality, validity, and reliability. After completing these two steps, the authors assessed the validity and reliability of the measurement scales using Cronbach's alpha coefficient. The results showed that all the scales achieved values above 0.7, thus ensuring their validity and reliability (Hair et al., 2011). In the questionnaire, the authors used a 5-point Likert scale to evaluate the participants' level of agreement.

**Table 1**  
Questionnaire and measurement scales (Source: Authors' compilation)

Constructs	Items	Source
Digital capabilities		
DCap1	Our company can acquire important digital technologies.	(Annarelli et al., 2021; Khin & Ho, 2019)
DCap2	Our company can identify opportunities related to new digital technology.	
DCap3	Our company can adopt digital transformation.	
DCap4	Our company can master new digital technologies.	
DCap5	Our company is developing new processes/ services/ products based on digital technology.	
Digital leadership		
DL1	Digital leaders will raise employees' awareness of the risks of information technology.	(Borah et al., 2022)
DL2	Digital leaders will raise awareness of technologies that can help improve organizational processes.	
DL3	Digital leaders show shareholders ethical behaviors related to information technology.	
DL4	Digital leaders play the role of providing information for businesses to reduce resistance to information technology innovations.	
DL5	Digital leaders share their own experiences about how technology can help colleagues understand the structure of the company.	
DL6	To increase participation in realizing the enterprise's vision, the digital leader will guide employees on technology tools.	
Digital culture		
DCul1	We openly discuss failures with all team members.	(Duerr et al., 2018)
DCul2	Decisions are based on the opinion of the whole group, not just one person.	
DCul3	We work in cross-functional teams (incorporating members from IT, marketing, finance, etc.).	
DCul4	In our company, we avoid a strong hierarchy in project work.	
DCul5	Every team member comes up with ideas and suggestions for digital products and services.	
Innovation capabilities		
Product innovation capabilities		
ProdIC1	Our company regularly develops new products and services that are well received by the market.	(Bao et al., 2020)
ProdIC2	The majority of our company's profits are generated by newly developed products and services.	
ProdIC3	New products or services developed by our company always cause competitors to imitate.	
ProdIC4	Our company can often launch a new product or service faster than the competition.	
ProdIC5	Our company has a better ability to R&D new products or services than competitors.	
ProdIC6	Our company is always developing new skills to turn old products into new products.	
Process innovation capabilities		
ProciC1	Our company has knowledge of innovation in production process and technology.	(Bao et al., 2020; Najafi-Tavani et al., 2018)
ProciC2	Our company knows the best work organization processes and systems.	
ProciC3	Our company can provide environmentally friendly processes.	
ProciC4	Our company often tries different operational processes to accelerate the realization of the company's goals.	
ProciC5	Our company is always acquiring new skills or equipment to improve production operations or service processes.	
ProciC6	Our company can develop a more efficient production or operating process.	
ProciC7	New production or operating procedures adopted by our company always cause competitors to imitate	
Organizational innovation capabilities		
OrgIC1	Our company is capable of managing an organizational structure that encourages individual accountability and decision-making.	(Wilcox King & Zeithaml, 2003)
OrgIC2	Our company can cooperate with other parties for product innovation and development.	
OrgIC3	Our company can create innovative, value-added, and differentiated products.	
OrgIC4	Our company is capable of maintaining organizational culture, individual trust, and integrity.	
OrgIC5	Our company is capable of maintaining an organizational culture of trustworthiness, reliability, and individual integrity.	
OrgIC6	Our company can quickly respond and supply the needs of customers.	
Marketing innovation capabilities		
MarIC1	We innovate our marketing programs to stay ahead of the market.	(Aksoy, 2017)
MarIC2	We strive to find new ways to build and improve relationships with our customers.	
MarIC3	Sales techniques are always being revised and we strive to find new methods.	
MarIC4	We implement innovative marketing programs.	
MarIC5	We are always looking to develop new business models.	
MarIC6	Product designs are constantly being innovated according to customer needs and competitive products.	
MarIC7	We seek to improve our advertising methods and tools.	

### 3.2.2. Data collection

The survey was conducted from October 2022 to May 2023. The survey participants were leaders at the middle management level and above, who had a significant influence on the decision-making processes of Vietnamese SMEs. To ensure the representativeness of the sample, the authors surveyed the three regions of North, Central, and South Vietnam, in proportion to the distribution of SMEs in these regions. According to the Ministry of Planning and Investment of Vietnam (2022), Vietnam has approximately 873,000 SMEs, with 30% located in the North, 4% in the Central region, and 66% in the South. Based on this information, the sample was distributed to ensure its representativeness. The authors distributed 1000 questionnaires and received 400 responses. After filtering and selecting an appropriate sample, a total of 271 responses were suitable for analysis.

**Table 2**  
Sample demographics (Source: Authors' compilation)

Characteristics	Items	Frequency	Percentage
Gender	Male	162	59.8%
	Female	109	40.2%
Age	<36	80	29.5%
	36-40	71	26.2%
	41-45	61	22.5%
	46-50	48	17.7%
	>50	11	4.1%
Position	General manager/manager	43	15.9%
	Deputy general manager/manager	21	7.7%
	Branch manager	31	11.4%
	Head of the department	84	31%
	Leader	22	8.1%
	Others	70	25.8%
Business domain	Chemical and basic industry	15	5.5%
	FMCG sector	41	15.1%
	Finance	27	10%
	Transport and Infrastructure	22	8.1%
	Construction and real estate	28	10.3%
	Trade. service. investment	73	26.9%
	Others	65	24%
Working time (years)	<5	73	26.9%
	5-10	81	29.9%
	11-15	68	25.1%
	>15	49	18.1%

### 3.3. Data analysis and results

#### 3.3.1. Outer model and scale validation

The measurement scale's reliability was assessed by examining the item loadings in the survey questionnaire, with a threshold value of 0.7 (Chin & Newsted, 1999) used to determine the scale's reliability. The composite reliability values, presented in Table 3, demonstrate that all variables have values exceeding 0.7, meeting the reliability standard (Henseler et al., 2016). Furthermore, outer loadings and average variance extracted (AVE) values higher than 0.5 indicate that the scale has convergent validity (Hair et al., 2011). Additionally, variance inflation factor (VIF) values below 0.5 for the measurements, as outlined by (Hair et al., 2011), indicate the absence of multicollinearity in the model.

**Table 3**  
Reliability analysis and convergent validity (Source: Authors' calculation)

Constructs	Items	Cronbach's alpha	Composite reliability	AVE	Factor loading	VIF
DCap	DCap1	0.915	0.936	0.747	0.878	3.303
	DCap2				0.838	2.508
	DCap3				0.888	3.240
	DCap4				0.865	2.745
	DCap5				0.850	2.523
DL	DL1	0.922	0.939	0.719	0.838	2.765
	DL2				0.845	2.763
	DL3				0.830	2.357
	DL4				0.841	2.506
	DL5				0.878	3.074
	DL6				0.855	2.629

**Table 3**  
Reliability analysis and convergent validity (*Source: Authors' calculation*) (Continued)

Constructs	Items	Cronbach's alpha	Composite reliability	AVE	Factor loading	VIF
DCul		0.872	0.907	0.662		
	DCul1				0.791	1.876
	DCul2				0.825	2.029
	DCul3				0.799	1.974
	DCul4				0.817	2.060
DCul5	0.835	2.158				
ProdIC		0.889	0.941	0.727		
	ProdIC1				0.806	2.105
	ProdIC2				0.842	2.553
	ProdIC3				0.859	2.768
	ProdIC4				0.879	3.335
	ProdIC5				0.884	3.400
ProdIC6	0.842	2.636				
ProcIC		0.925	0.941	0.696		
	ProcIC1				0.856	3.135
	ProcIC2				0.838	2.743
	ProcIC3				0.847	2.831
	ProcIC4				0.850	2.856
	ProcIC5				0.830	2.573
	ProcIC6				0.847	2.666
ProcIC7	0.766	1.938				
OrgIC		0.930	0.945	0.741		
	OrgIC1				0.873	3.021
	OrgIC2				0.838	2.773
	OrgIC3				0.821	2.361
	OrgIC4				0.892	4.023
	OrgIC5				0.877	3.788
OrgIC6	0.864	2.838				
MarIC		0.945	0.955	0.751		
	MarIC1				0.860	3.119
	MarIC2				0.853	2.832
	MarIC3				0.896	4.041
	MarIC4				0.891	3.816
	MarIC5				0.854	2.965
	MarIC6				0.838	2.715
MarIC7	0.874	3.462				

We evaluated the discriminant validity, which refers to the ability to differentiate between the tested structural criteria in the model. In this study, two testing approaches were utilized: the Heterotrait-Monotrait (HTMT) ratio proposed by (Henseler et al., 2016), where an HTMT value equal to or below 0.9 is considered acceptable, and the criterion suggested by (Fornell & Larcker, 1981), which requires that the square root of the average variance extracted (AVE) be greater than the correlations among the latent variables in the model. Tables 4 and 5 presented below demonstrate that all variables exhibit discriminant validity.

**Table 4**  
Discriminant validity results by HTMT (*Source: Authors' calculation*)

	DCap	DCul	DL	MarIC	OrgIC	ProcIC	ProdIC
DCap							
DCul	0.716						
DL	0.845	0.786					
MarIC	0.673	0.770	0.696				
OrgIC	0.769	0.800	0.795	0.872			
ProcIC	0.773	0.804	0.797	0.857	0.932		
ProdIC	0.712	0.799	0.691	0.866	0.843	0.894	

**Table 5**  
Discriminant validity results by Fornell and Lacker (*Source: Authors' calculation*)

	DCap	DCul	DL	MarIC	OrgIC	ProcIC	ProdIC
DCap	0.864						
DCul	0.642	0.814					
DL	0.776	0.707	0.848				
MarIC	0.626	0.702	0.653	0.867			
OrgIC	0.708	0.724	0.737	0.819	0.861		
ProcIC	0.713	0.725	0.739	0.802	0.865	0.834	
ProdIC	0.655	0.720	0.641	0.809	0.782	0.827	0.852

3.3.2. Inner model result and hypotheses testing

PLS analysis of the second-order internal model to test the hypothesis. Table 6 below shows the results of hypothesis testing.

**Table 6**  
Summary of the inner model result (Source: Authors' calculation)

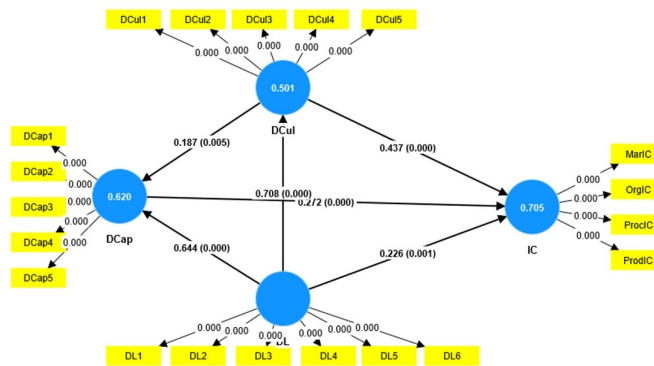
Hypotheses	Path Coefficient	t-value	p-values	Results
H1: DCap → IC	0.272	3.884	0.000	Accepted
H2: DL → DCap	0.644	10.559	0.000	Accepted
H3: DL → IC	0.226	3.224	0.001	Accepted
H4: DL → DCul	0.708	17.900	0.000	Accepted
H5: DCul → DCap	0.187	2.820	0.005	Accepted
H6: DCul → IC	0.437	6.483	0.000	Accepted

3.3.3. Testing of mediation effects

The authors performed bootstrapping to assess the role of mediating variables in the research model (Hair et al., 2011). Table 7 below shows the results of the mediating role of the variables included in the model.

**Table 7**  
Mediation test result (Source: Authors' calculation)

Hypotheses	Path Coefficient	t-value	p-values	Results
H7: DL → DCap → IC	0.175	3.763	0.000	Accepted
H8: DL → DCul → IC	0.310	5.971	0.000	Accepted
H9: DL → DCul → DCap	0.133	2.721	0.007	Accepted
H10: DCul → DCap → IC	0.051	2.185	0.029	Accepted
H11: DL → DCul → DCap → IC	0.036	2.127	0.033	Accepted



**Fig. 2.** A framework of the inner model result

4. Discussion and conclusion

The analysis results indicate that the proposed hypotheses were supported, and these findings are consistent with previous research studies. The study demonstrates that DCap positively influences the IC of SMEs, which aligns with the studies conducted by (Boeker et al., 2021; Kastelli et al., 2022; Zammuto et al., 2007). DCap drives business innovation by transforming the organization (Verstegen et al., 2019), and leveraging resources, human capabilities, and organizational capacities (Khin & Ho, 2019) to adapt to the rapidly changing market. DCap impacts various aspects of the innovation process, including product innovation, process innovation, marketing innovation, and organizational innovation (Khin & Ho, 2019). On the other hand, DL has a positive impact on DCap, IC, and DCul. These findings are in line with the research conducted by (de Araujo et al., 2021; Mihardjo et al., 2019; Oberer & Erkollar, 2018; Schweitzer, 2014). DL enables leaders to effectively combine their leadership abilities with leveraging technological advancements to enhance DCap within their businesses, thereby fostering digital business performance (de Araujo et al., 2021). It also expedites the innovation process by generating new products, establishing new processes, implementing new marketing strategies, and creating a more efficient organizational structure (Niu et al., 2022). Furthermore, DCul has a positive impact on DCap and, particularly, the IC of businesses. This aligns with previous studies suggesting that businesses with DCul accelerate their digital transformation process and, as a result, enhance their DCap (El Sawy et al., 2020). The positive impact of DCul on IC is also mentioned in prior research by (Duerr et al., 2018), indicating that DCul drives research and development activities within businesses, thereby expediting the innovation process.



Considering the mediating effects of the variables, the research findings reveal that DCul and DCap act as mediators in the relationships between DL and IC. DCap serves as a positive mediator between DL and IC, DCul and IC. Firms can enhance their DCap by developing DCul under the guidance of DL, fully utilizing technology in their organizational processes and business operations, thus accelerating the innovation process. Moreover, DCul also functions as a positive mediator in the relationships between DL and IC, as well as between DL and DCap. Developing DCul fosters a collaborative, trustworthy, and cohesive environment within the organization based on digital infrastructure, thereby strengthening the impact of DL on IC and facilitating leaders in enhancing DCap within the organization.

## 5. Conclusion and implications

The study aims to clarify the impact of DCap on the IC of Vietnamese SMEs. Through the mixed research method, the authors have proposed a model to study the factors affecting the relationship between DCap and IC. The impact of these variables in the proposed research model is based on the reality of enterprises in Vietnam and has a suitable theoretical basis to explain these relationships. The research results allow the authors to accept all hypotheses about the interrelationships between the variables of DCap, IC, DCul, and DL with theoretical and practical implications.

### 5.1. Theoretical implications

This study has several theoretical contributions. First of all, the study has clarified the influence of DCap on the IC of Vietnamese SMEs in four aspects: product, process, organization, and marketing, under the influence of DCul and DL. Secondly, there are limitations of previous studies on the influence of DCul on IC and DCap as well as the influence of DL on DCul, this study has explored this research gap by clearly analyzing the impact as well as the role of DCul in business.

### 5.2. Practical implications

Based on the research results, the authors make some recommendations for Vietnamese SMEs. First of all, for businesses to survive and develop sustainably in the digital age, businesses must constantly innovate and DCap is one of the keys to helping businesses accelerate this process. Businesses with DCap can sense market changes, seize opportunities, and thereby redesign their internal resources on a digital platform to respond to market changes, and thanks to DCap, highlighting the competitive advantages of enterprises. On the other hand, enterprises having DL will help enterprises plan to develop, and transform businesses faster and thereby accelerate the innovation process because leaders with DL have technological understanding, combined with management skills will promote the innovation process to take place faster. Besides DL, DCul also plays an important role in the relationship between DCap and IC. DCul can change the way of interaction and working of internal members within the enterprise, thereby having a direct impact on IC and indirectly through Dcap on firms' IC.

### 5.3. Limitations and suggestions for future research

Although this study is considered by the authors from both practical and theoretical perspectives, there are still some limitations that researchers can continue to develop in the future. Firstly, the study has not included age and firm size variables in the research model to determine the impact of these control variables. Second, the authors propose that future research papers may consider studying specific industries to compare the different impacts of DCap on IC across industries. Third, in addition to the research object being SMEs, scholars can research other subjects.

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