Journal of Applied Engineering and Technological Science
Vol 7(2) 2026: 1511-1530

WHY DIGITAL CAPABILITIES ALONE DON'T DRIVE SME PERFORMANCE: THE MEDIATING ROLE OF PROCESS INNOVATION IN RETAIL SMES

Nurul Syazana Samsuden[1], Alhamzah F. Abbas[2], Nor Amira Syairah Zulkarnain[3], Poon Wai Chuen[4], Ummu Ajrah Abdul Rauf[5*]
Faculty of Management, Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia[1,2]
Faculty of Human Resources Development and Psychology, Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia[3]
Sunway Business School, Sunway University, Bandar Sunway 47500, Malaysia[4]
Graduate School of Business, Universiti Kebangsaan Malaysia, 43500, Bangi, Selangor, Malaysia[5]
nurulsyazana6422@gmail.com[1], alhamza.fadil@gmail.com[2], noramirasyairah@utm.my[3], eugenep@sunway.edu.my[4], ummu@ukm.edu.my[5*]

Received: 24 February 2026, Revised: 12 May 2026, Accepted: 13 May 2026
**Corresponding Author*

ABSTRACT
This study explores the role of digital capabilities (DC) in enhancing the business performance (BP) of retail SMEs in Johor, Malaysia, with a particular focus on the mediating effect of process innovation (PI) and the moderating role of competition intensity (CI). Despite the rising relevance of digital transformation, retail SMEs in Johor, Malaysia, continue to face structural constraints, including limited technological readiness, skill shortages, and intensified competitive pressures. Using primary data from 371 retail SMEs, this study employs Partial Least Squares Structural Equation Modelling (PLS-SEM) to test a multidimensional model grounded in the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). The findings reveal that while DC do not exert a direct influence on BP, they significantly enhance PI, which in turn fully mediates the impact on performance. CI does not significantly moderate the relationship between DC and business outcomes. These results suggest that the BP benefits of DC are only realised through innovation-enabling mechanisms rather than direct technological adoption. The study underscores the importance of investing in internal innovation processes and strategic integration to translate digital potential into sustained competitive advantage within the retail SME context.
Keywords : *Digital Capabilities, Process Innovation, Business Performance, SMEs*

1. Introduction

Small and medium-sized firms (SMEs) in retail constitute a significant element of Malaysia's economic framework, especially in terms of their scale and contributions. In 2023, over 650,000 retail-related enterprises were registered, underscoring their significant contribution to employment and macroeconomic activity (Hairani & Aziz, 2024). Forecasts for Malaysia's wholesale and retail sectors suggest a compound annual growth rate (CAGR) of 7.5% from 2021 to 2027, surpassing certain trends noted in developed nations (Ming & Soon, 2023). The retail sector contributes around 16% to the national GDP and provides around 1.5 million jobs (Anika, 2024; Castellano et al., 2023). The sector faces considerable competitive pressure and frequent product turnover, requiring enterprises to remain attuned to changing customer behaviour (Rizaldi & Munandar, 2024).

The adoption of digitisation among retail SMEs has significantly expanded post-pandemic, while the extent and efficacy of implementation have varied. In 2020, global e-commerce transactions increased by 27.6%, indicating a transformation in consumer purchasing behaviours that has challenged the flexibility of digital business models (Lutfi et al., 2022). SMEs are compelled to augment their digital capabilities to ensure company continuity and promote efficiency. Digital capabilities denote an organisation's capacity to assimilate, cultivate, and reorganise both internal and external skills in order to adapt to evolving digital landscapes (Momeni et al., 2024; Purwati et al., 2025). These digital competencies facilitate strategic

adaptability, improve decision-making, and allow for the reconfiguration of fundamental processes (Mangifera et al., 2024).

The digital capabilities framework, derived from Freitas Junior & Maçada, (2020) encompasses four interconnected capabilities: sensing (SS), which entails recognizing digital opportunities and threats; responsiveness (RP), the capacity to swiftly respond to identified changes; process digitalisation (PD), which promotes the automation and integration of business processes; and ecosystem connectivity (EC), which fosters digital collaboration with external stakeholders, including suppliers, customers, and partners. Digital capabilities enhance organisations' proficiency in utilising technologies such as inventory monitoring software, supplier portals, and CRM systems, which are vital for managing internal logistics and customer interactions (Bruce et al., 2023; Isango, 2024). These systems facilitate process innovation and enable rapid adaptation to evolving market demands. The agility and innovation aimed at enhancing workflows, minimising errors, and augmenting responsiveness link technological utilisation with quantifiable results (Li, 2022). Moreover, digital competencies in artificial intelligence enable firms to facilitate data management and remote system access (Rasheed et al., 2023).

Retailers that have already created these digital capabilities exhibit noticeable disparities in market performance for several reasons. Firstly, the growing number of third-party suppliers necessitates that digital capabilities facilitate and manage supply chain activities (Oh et al., 2023). Secondly, digital capabilities increase marketing initiatives and improve customer relationship management (CRM), hence impacting sales results (Xing & Wu, 2023). Thirdly, considering retail's significance in several economies, digital competencies enhance operational efficiency and adaptability (Lin, 2023). Consequently, shops devoid of these competences may encounter difficulties in adapting to prevailing market conditions (Pan et al., 2022). This positioned digital capabilities as essential for retailers to maintain competitiveness and resilience amidst persistent economic risks (Samsuden et al., 2024). Despite the growth of the retail sector in Malaysia, numerous retailers are constrained by antiquated systems, inadequate infrastructure, and insufficient digital literacy (Aziz & Long, 2023; Chan & Zailani, 2024). The implementation of these capabilities is often fragmented or reactive, hindered by insufficient resources and ambiguous tactics (Rehan et al., 2023). Despite heightened awareness of the importance of digital capabilities, many gaps persist in the literature. Initially, a limited number of empirical research investigate the correlation between digital capabilities, process innovation, and company performance within a cohesive analytical framework. Secondly, a significant portion of the existing literature focuses on high-income nations, while insufficient emphasis is placed on the structural and contextual factors influencing retail SMEs in emerging regions such as Malaysia (Zahoor & Lew, 2023). Third, investigations into intermediary mechanisms, including the role of digital capabilities in process innovation and external factors like competitive intensity, are still insufficient (Ghi et al., 2022). Addressing these gaps may be essential to enhance comprehension of how digital capabilities facilitate process innovation, hence fostering operational efficiency and improving company performance in resource-constrained environments.

The Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) elucidate business competitiveness but frequently neglect the reality of resource-constrained, competitive, and digitally transitioning environments, such as Malaysia (Poon & Tung, 2023). Retail SMEs frequently depend on "resource bricolage," which refers to the innovative reorganisation of existing resources (Samudzimu & Munkumba, 2022; Abid et al., 2023). This work, grounded on RBV, addresses these gaps by integrating scarcity-driven innovation and context-specific resource use, while adapting DCT to simulate capability reconfiguration under intense competitive pressure. It contends that digital capabilities augment performance via process innovation, which reorganises processes and enhances adaptability, with the intensity of competition serving as a boundary condition. Market factors, especially in competitive contexts, influence the efficacy with which retail SMEs utilise digital tools. In these contexts, retailers may need to extract enhanced value from digital capabilities to maintain performance. Therefore, this study addresses the following research questions:

1. How do digital capabilities influence retail SME’s business performance?

2. What is the relationship between digital capabilities and process innovation among retailers' SMEs?
3. Does process innovation mediate the effect of digital capabilities on business performance?
4. How does competition intensity moderate the relationship between digital capabilities and business performance?

This research, rooted in RBV and DCT, enhances theoretical comprehension by elucidating the mechanisms via which digital capabilities augment the competitiveness of SMEs. It provides pragmatic counsel for retail SMEs and policymakers in developing nations aiming to formulate successful digital strategies that enhance performance amid escalating market rivalry and constrained resources. The work is structured to include literature reviews, methods, data analysis, results, discussion, contributions, practical implications, and suggestions for future research.

2. Theoretical Background

Digital Capabilities (DC)

Digital capabilities (DC) form the foundation for retail SMEs to compete in digital environments, with a framework of sensing, responsive, process digitalisation and ecosystem connectivity. Sensing enables firms to identify emerging technologies and market trends, supporting innovation (Hassan et al., 2024). Activities such as environmental scanning and knowledge assimilation help firms recognise digital opportunities (Poon et al., 2020). Effective activation of DC requires identifying both internal and external drivers of change (Omrani et al., 2024). Responsiveness corresponds to the seizing function, through which retailers convert insights into strategic decisions that enhance agility and innovation (Joensuu-Salo & Matalamäki, 2023). During disruptions such as the pandemic, DC-enabled firms to respond quickly and sustain operations (Amoa-Gyarteng et al., 2023). DC supports process transformation by embedding digital tools into workflows, which improves efficiency and service delivery (Nazir et al., 2025; Mangifera et al., 2022). Ecosystem connectivity reflects a firm's ability to restructure partnerships and engage with digital networks, promoting value co-creation and resilience (Al-Omoush et al., 2023). The integration of sensing, seizing, and transforming equips retailers with the structure needed to manage DC effectively (Foss et al., 2023).

In practice, the ability to deploy DC with technology tools such as e-commerce platforms and point-of-sale (POS) systems has become an essential source of competitive advantage for retail SMEs. Modern POS systems enhance performance by streamlining transactions, managing inventory in real time, and improving service delivery (Mushtaq et al., 2024). Together, these technologies improve internal efficiency and customer experience, both critical to performance. Recent classifications of DC aim to clarify their role in strategic change and operational improvement. Thai et al. (2024) propose a model linking sensing, responsiveness, and connectivity to innovation and performance outcomes, supporting Teece's (2018) view that dynamic capabilities theory drives competitive advantage through learning and adaptation. Kwiotkowska (2024) presents a configurational approach that combines DC with strategic orientation, guiding transformation based on internal and external factors. Rajala and Hautala-Kankaanpää (2023) emphasise the practical relevance of this approach, showing how platform-based connectivity supports business model redesign under uncertainty. This aligns with Warner et al. (2019) who argue that DC provide a strategic lens for understanding digital change. During crises, DC helped SMEs adopt digital tools to maintain productivity (Mishrif & Khan, 2023), highlighting their role in resilience and operational reconfiguration. Collectively, these frameworks show that DC enable SMEs to detect environmental shifts, pursue innovation, and transform internal processes, linking them to both strategic renewal and business performance.

Business Performance (BP)

Kaplan and Norton (1992) identified key limitations in traditional performance measurement systems, which primarily relied on financial metrics and lacked strategic foresight (Kaplan et al., 2005; Kaplan & Norton, 2004). In contrast, the Balanced Scorecard (BSC) incorporates both financial and non-financial indicators across four dimensions: financial, customer, internal business processes, and learning and growth. This framework enables

managers to align operational activities with strategic goals, thereby supporting organisational control and strategic alignment (Raval et al., 2019). Subsequent developments introduced strategy maps and cause-and-effect relationships, linking short-term actions to long-term objectives. These enhancements make the BSC particularly relevant for strategic management in digitally evolving environments, especially for SMEs that must balance immediate operational needs with long-term competitiveness (Aulianda et al., 2024; Purwati et al., 2025).

Although originally designed for large organisations, retailers have increasingly adopted the BSC as a cost-effective tool for strategic performance management. Due to limited formal structures and specialised departments, retail SMEs often require simplified versions that reflect their resource constraints (Dudic et al., 2020). Common implementation barriers include limited leadership involvement, underdeveloped data systems, and resistance to organisational change (AL-Dabaibeh & Hasan, 2023; Nasution & Rossieta, 2023). Financial and human resource limitations may also impede effective use (Gonçalves et al., 2024). Nevertheless, retailers that adapt the BSC to their context report improvements in strategic focus, internal coordination, and performance monitoring (Curado et al., 2025). The integration of financial and non-financial indicators enables these retailers to formalise strategic planning and monitor outcomes across key areas without exceeding their operational capacity. Thus, the BSC serves as both a performance measurement tool and a mechanism for strategic learning and organisational development in resource-limited settings.

The BSC has gained increasing relevance in digital environments, where aligning it with firms' DC has become essential, particularly for retail SMEs. The impact of DC on financial performance is the most discussed factor by scholars, as it reflects the critical role financial outcomes play in businesses' overall success and sustainability and its quantitative indicator is easily understood and analysed. From a financial perspective, the most discussed elements are the profit ratio and export performance. This supports the idea that digital capabilities make firms more competitive internationally and improve profits. DC contribute to increased efficiency, higher profit margins, enhanced asset returns, capital market benefits, and reduced costs, ultimately leading to higher profitability for the firm (Hsu et al., 2014; Park et al., 2018; Putra et al., 2023). Furthermore, DC facilitate broader international networking, positively influencing export performance (Torres Mazzi & Foster-McGregor, 2021). DC has an impact on non-financial indicator such as from a customer perspective, by facilitating real-time insights into market trends and client needs. Seizing enhances the financial and internal process dimensions through timely investment, operational efficiency, and resource allocation (Shao et al., 2024). Strong DC also help firms overcome common barriers to BSC implementation, such as digital infrastructure gaps, limited leadership engagement, and procedural complexity (Zaheer et al., 2023). In this context, DC enhance the relevance and flexibility of the BSC, enabling retailers to maintain strategic alignment and performance monitoring in rapidly evolving digital environments (Ellström et al., 2022). Accordingly, the following hypothesis is proposed:

H1: There is a positive relationship between digital capabilities and business performance.

Digital Capabilities (DC) and Process Innovation (PI)

Digital technologies (DC) enable process innovation (PI) in retail SMEs by automating tasks, tracking inventory in real time, and supporting supply chain redesign. Digital inventory systems improve stock accuracy, reduce waste, and lower costs, thereby increasing customer satisfaction (Khalil et al., 2022; Wardani et al., 2026). PI involves introducing new or significantly improved production or delivery methods to enhance efficiency, adaptability, and value creation (Liu et al., 2023). In DC, it functions as a capability-conversion mechanism, translating the technical potential of digital tools into performance gains (Tilaar et al., 2023; Rosalin et al., 2025) by reconfiguring workflows, integrating technology into daily operations, and aligning resources with strategic objectives.

DC helps retailers to implement PI by reducing the cost of stock holdings in the company, such as by using an inventory and store merchandising system. This system will also increase transparency through real-time information, which will generate a fast response. Access to real-time quality data can also be used in quality management, especially across the supply chain (Müller et al., 2018). DC will also help the firm use an automated system, data, and information

that can help improve the efficiency of the process, such as transparency of the process, stock, and logistics, allowing retailers to manage and plan inventories. In addition, errors can also be avoided, and employees can be trained more quickly. This digital system can also be self-organising and work autonomously, which will result in lower control costs and lower energy consumption over time.

DC helps retailers to implement automation in their business by allowing staff to focus on higher-value tasks, improving responsiveness and adaptability (Mishrif & Khan, 2023). DC increase the ability of retailers to use technologies such as blockchain that will increase supply chain transparency and efficiency, helping retailers manage risks and strengthen customer trust (Manzoor et al., 2022). DC also support real-time decision-making, especially during disruptions like the COVID-19 pandemic (Tatua et al., 2023). Retailers that have a DC tend to build flexible and responsive operations (Yuen & Baskaran, 2024). Research indicates that firms with greater DC show stronger process flexibility and innovation (Robertson et al., 2022). Accordingly, the following hypothesis is proposed:

H2: There is a positive relationship between digital capabilities and process innovation.

H3: There is a positive relationship between process innovation and business performance.

H4: Process innovation mediates the relationship between digital capabilities and business performance.

Competition Intensity (CI) as Moderator

While DC have been linked to improved BP the outcomes may vary significantly due to external factors such as competition intensity (CI) within the industry (Kumar Roy & Duraipandian, 2021). CI is essential in BP, particularly among retail SMEs (Liu & Si, 2022). CI refers to how a firm competes among different competitors in the industry. Competition intensity manifests in intense price battles, diverse product alternatives and different service situations, and the extent of competition companies face in their sector (Cocioc, 2021). Gamage et al., (2020) suggested that CI will present substantial challenges to SMEs.

Since retail SMEs are relatively small, they will have difficulty competing with large, resource-rich companies, well-established brands, and international companies. Retail SMEs are also difficult to compete due to their inadequate resources and capabilities to respond to changes in the market (Kumalaningrum et al., 2023). They are also faced with financial restrictions that hinder their ability to react quickly to market trends, threatening their BP (Zhang & Huang, 2023). Intense competition often leads to misallocation of resources, lower total factor productivity and diverting focus from core business strategies (Vachadze, 2022). SMEs' resource misallocation negatively impacts environmental quality and energy efficiency, leading to increased energy input and decreased energy efficiency (He & Qi, 2021).

However, contrasting views suggest that competition can also have positive outcomes for firms (Liu & Si, 2022). Finelli et al. (2018) propose that competitive pressure encourages firms to make strategic decisions that enhance performance, such as investing in innovation and differentiation strategies (Lestari et al., 2020). Competition helps firms to collect available information about innovative ideas, product market, and related industries, ultimately strengthening their competitive advantage (Wang & Gao, 2021). Moreover, Guimaraes et al. (2020) found that higher competition levels can improve management quality and overall BP. The competitive landscape affects internal strategies and shapes external market behaviour and orientation. Khan et al. (2019) found that firms facing intense competition must innovate, explore new markets, and differentiate themselves from competitors (Anning-Dorson, 2021). This dynamic environment encourages firms to adopt differentiated competitive strategies, including digitalisation efforts, to strengthen their market position and respond effectively to market forces (Kim et al., 2022; Suoniemi et al., 2020). Therefore, the following hypothesis is proposed:

H5: Competitive intensity moderates the relationship between digital capabilities and business performance.

3. Research Methods

Developing the measures model

Building on this foundation, we conceptualised DC and BP as multidimensional constructs. DC was measured as a second-order reflective construct, based on Freitas Junior & Alegre, 2018), while BP was treated as a second-order formative construct, following Shukri & Ramli (2015). The use of second-order constructs has become common in PLS-SEM studies, as it simplifies the model structure while improving the representation of construct content (Hair et al., 2019; Sarstedt et al., 2022). We also included first-order factors, such as PI, measured with five items adapted from Rodríguez-Rebés et al. (2021). For the moderating construct, CI was measured using five items from Prajogo & McDermott, (2014), ensuring coverage of key aspects of market dynamics and innovation potential. Table 1 lists the items used to measure the research construct.

Table 1 - Descriptive statistics, convergent validity, and reliability of the item

Reflective Construct		Items	Outer Loading	VIF	α	CR	AVE
PI		Our firm introduced a new method of production.	0.879	3.236	0.943	0.956	0.813
		Our firm significantly improved existing method of production.	0.908	3.825			
		Our firm introduced new logistic, delivery and distribution process.	0.926	3.825			
		Our firm significantly improved existing logistic, delivery and distribution process.	0.911	4.995			
		Our firm introduced a new supporting activities.	0.885	4.700			
DC	Sensing	Our firm used digital technology to identify new business opportunities.	0.834	2.486	0.918	0.939	0.754
		Our firm used digital technology to review the possible changes of demand among our customers.	0.892	3.372			
		Our firm used digital technology to better visualize the data and information.	0.895	3.556			
		Our firm used digital technology to present the data and information.	0.836	2.838			
		Our firm used digital technology to analyse data from multiple sources.	0.884	3.17			
	Responsive	Our firm used digital technology to quickly respond to new customer needs	0.905	3.437	0.915	0.939	0.795
		Our firm used digital technology to respond appropriately to market changes	0.929	4.123			
		Our firm used digital technology to take corrective action immediately when customers are unhappy with our products/services	0.855	2.71			
		Our firm able to incorporate digital technology in our products/services to satisfy our customers.	0.876	3.017			
	Process Digitalization	Our firm's production is integrated with the supply chain system through digital technologies.	0.841	2.093	0.854	0.900	0.694
		Our firm uses digital technology to share information with our business partners.	0.847	1.865			
		Our firm uses real-time information report.	0.858	2.211			

		Our firm uses digital technology to improve product distribution to our customers.	0.783	1.776			
	Ecosystem Connectivity	Our firm easily exchanges information with our suppliers through our digital platform.	0.840	2.459	0.914	0.936	0.744
		Our firm easily exchanges information with our partners through our digital platform.	0.880	3.144			
		Our firm easily exchanges information with our employee through our digital platform.	0.880	3.561			
		Our firm easily exchanges information with our customer through our digital platform.	0.870	3.411			
		Our firm easily exchanges information with public sector through our digital platform.	0.844	2.364			
Formative Construct		**Items**	**Outer Weight**	**VIF**	**α**	**CR**	**AVE**
BP	Financial Perspective	Our firm have increased operating revenue.	0.338	2.467	-	-	-
		Our firm have achieved cost saving.	0.478	3.013			
		Our firm have increased company profit	0.276	3.321			
	Customer Perspective	Our firm have increased customer's satisfaction.	0.541	6.126	-	-	-
		Our firm have gained customer's acceptance	0.189	6.879			
		Our firm have increased customer's retention	0.318	3.838			
	Internal Perspective	Our firm have improved the quality of finished product or services.	0.361	3.546	-	-	-
		Our firm have improved management efficiency	0.290	3.315			
		Our firm have improved safety and health of employee through risk management.	0.432	2.789			
	Learning and growth	Our firm have improved employee's training and learning.	0.519	4.324	-	-	-
		Our firm have improved employee's satisfaction and attitude towards work	0.023	5.373			
		Our firm have encouraged creativity and innovation development.	0.534	2.705			

Note: VIF: Variance inflation factor, α: Cronbach Alpha, CR: Composite reliability, AVE: Average variance extracted.

4. Results and Discussions

Survey administration, sample, and data collection

The study targeted 10,624 retail SMEs registered with Perbadanan Usahawan Nasional Berhad (PUNB). Adopting guidelines provided by Kock and Hadaya (2018), the minimum sample size estimated for this study was 191 respondents, with the minimum R-squared method. Drawing upon the list provided by PUNB, 500 random cases were selected as target respondents using Statistical Package for the Social Sciences (SPSS). Data collection was conducted through a digital survey created in Google Docs and distributed via WhatsApp and email in both Malay and English. This approach facilitated broad access and ease of response. To address potential language discrepancies, the study applied the "translate-back-translate" method (Chirk et al., 2006), translating the original English questionnaire into Malay and then back into English to

ensure accuracy and reduce translation bias. Participants were randomly selected based on their roles within the firm. Eligible respondents included owners, co-founders, managers, or senior management staff, ensuring that each participant had adequate knowledge of the firm's operations, particularly regarding innovation practices. The final sample included individuals directly involved in the company's strategic and operational decision-making. Table 2 lists the demographic profile of respondents and SMEs

Table 2 - Demographic Profile of Respondents and Retail SMEs

Profile	Frequency (N=330)	Percentage
Position in the company		
Owner / Founders	281	85.2
Manager	49	14.8
Years of operation		
Less than 5 years	155	47
6-10 years	128	38.8
11-15 years	28	8.5
16-20 years	9	2.7
More than 20 years	10	3
Type of business premises		
Shop lot	154	46.7
Shops in shopping malls	6	1.8
Vendor License	47	14.2
No business premises (online)	123	37.3
Status of business		
Sole Proprietor	253	76.7
Partnership	37	11.2
Local Authority Licence	11	3.3
Private Limited Companies	26	7.9
Not registered	3	9
Annual Gross Sales		
Less than RM100,000/per year	218	66.1
RM100,001 - RM500,000/per year	81	24.5
RM500,001 - RM1,000,000/per year	14	4.2
More than RM1,000,001/per year	17	5.2
Business Location		
Batu Pahat	35	10.6
Johor Bahru	160	48.5
Kluang	21	6.4
Kota Tinggi	18	5.5
Kulai	23	7.0
Mersing	6	1.8
Muar	25	7.6
Pontian	16	4.8
Segamat	17	5.2
Tangkak	9	2.7

Measurement Model Assessment

As shown in Figure 1, this study evaluated the reliability and validity of the constructs in the research model to ensure robust results. The findings confirm the reliability and discriminant validity of the model while addressing potential concerns related to multicollinearity. As shown in Table 1, Cronbach's alpha values for all reflective constructs ranged from 0.854 to 0.943, exceeding the accepted threshold of 0.70, indicating high internal consistency across all latent variables. Furthermore, composite reliability values consistently exceeded 0.70, which is considered satisfactory, indicating good reliability (Moghadamzadeh et al., 2020). The highest value, 0.956, from the PI confirms the reliability of the constructs. Additionally, Average Variance Extracted (AVE) values were above the 0.50 threshold, with the lowest AVE being 0.694 for process digitalisation, suggesting that the constructs adequately capture the variance in their respective indicators. For formative constructs, the outer weight ranged from 0.023 to 0.541,

indicating that each indicator contributes to its respective latent construct. The Fornell-Larcker criterion was applied to assess discriminant validity for a reflective construct. As shown in Table 3, the square roots of the AVE values were higher than the inter-construct correlations, demonstrating that each construct is more strongly correlated with its indicators than with other constructs. However, while the Fornell-Larcker criterion yielded strong results, further analysis using the Heterotrait-Monotrait Ratio (HTMT). As shown in Table 4, all HTMT values are below the conservative threshold of 0.85, ranging from 0.431 to 7.99.

In constructing second-order models, higher-order latent variables are derived by aggregating lower-order constructs, providing a more detailed understanding of the relationships between variables. This approach is essential for accurately representing complex phenomena, particularly in multidimensional data analysis (Li et al., 2020). The Variance Inflation Factor (VIF) test is commonly used to detect multicollinearity, with a VIF value exceeding 10 indicating significant concerns. The results of the multicollinearity test in this study indicate no such issue, as all VIF values are below 10.

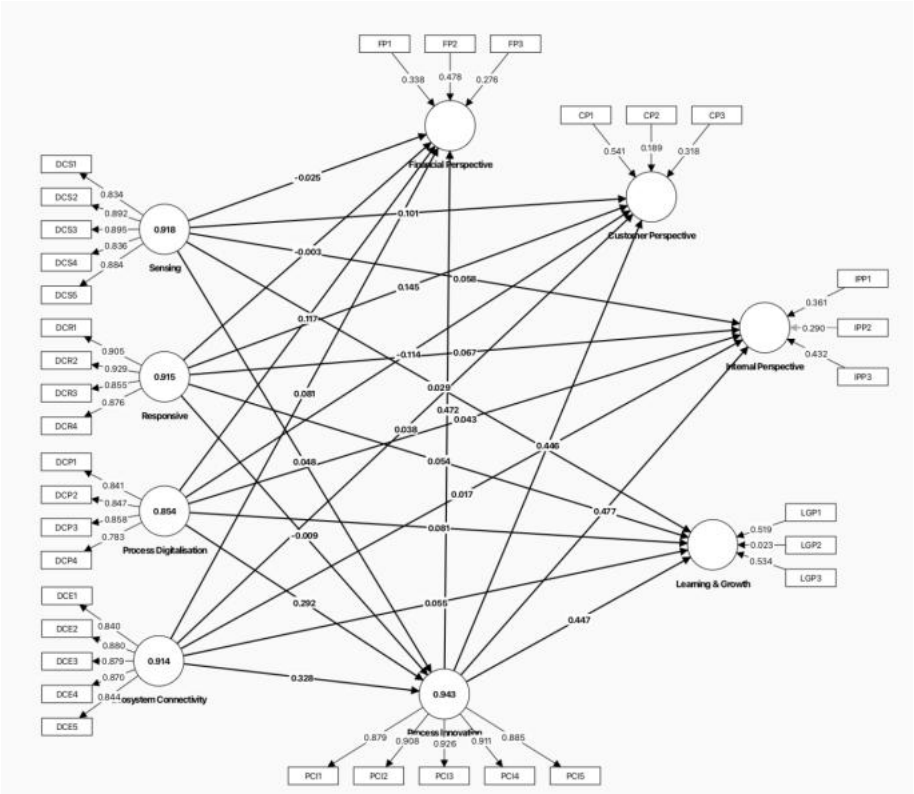

Fig. 1. Measurement model

Table 3 - Fornell-Larcker Criterion

	EC	PD	PI	RP	SS
Ecosystem Connectivity (EC)	0.863				
Process Digitalisation (PD)	0.533	0.833			
Process Innovation (PI)	0.502	0.494	0.902		
Responsive (RP)	0.522	0.703	0.403	0.892	
Sensing (SS)	0.482	0.702	0.405	0.739	0.868

Table 4 - Heterotrait-monotrait ratio of correlations (HTMT)

	EC	PD	PI	RP	SS
Ecosystem Connectivity (EC)					
Process Digitalisation (PD)	0.593				
Process Innovation (PI)	0.538	0.543			

Responsive (RP)	0.571	0.799	0.431	
Sensing (SS)	0.524	0.798	0.436	0.8

Structural model

As shown in Figure 2, this study offers valuable insights into the relationship between DC, PI, and BP, emphasising the mediating role of PI. The findings reveal a complex interaction between direct and indirect effects, illustrating how DC within organisations influence performance outcomes.

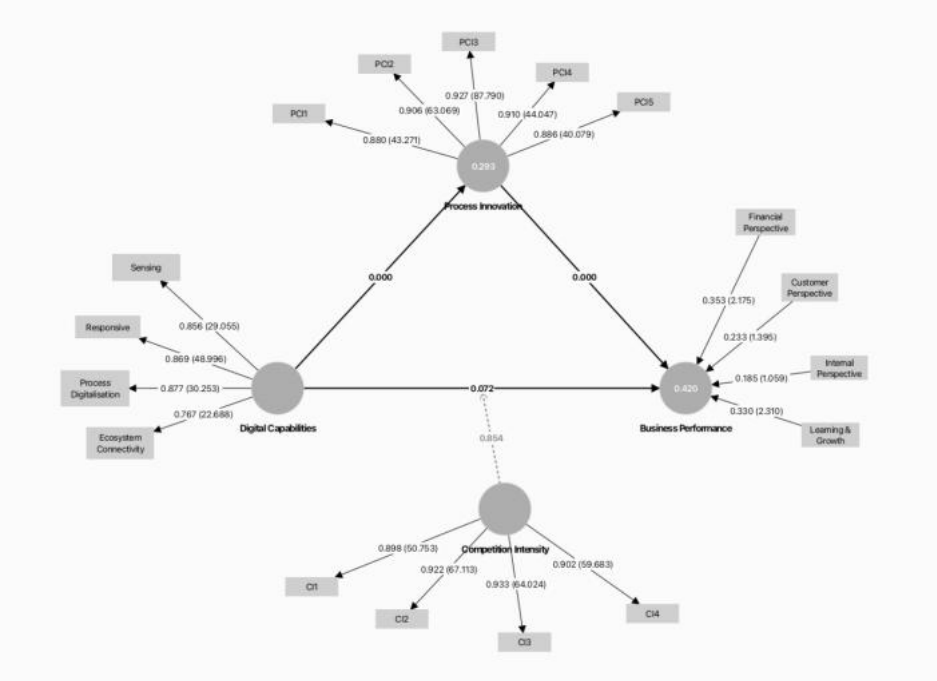

Fig. 2. Structural model

As shown in Table 5, the results indicate that H1, which hypothesised a direct positive effect of DC on BP, is not supported. The path coefficient is 0.119 with a p-value of 0.072, indicating a statistically nonsignificant relationship. However, H2 is supported, as DC significantly and positively influences PI, with a path coefficient of 0.541 and a p-value of 0.000. At the same time, PI has a significant impact on BP (β = 0.483, p = 0.000), providing support for H3, which posits that PI mediates the relationship between DC and BP.

An intriguing finding is related to H4, which proposes that CI moderates the relationship between DC and BP. This hypothesis is not supported, as the interaction effect was not significant (β = –0.008, p = 0.854). Although CI is often seen as a driver of innovation and strategic adaptation, these findings suggest that external pressures do not significantly alter the impact of DC on firm performance in this context. In contrast, the mediation analysis supports full mediation for H3, as the indirect effect of DC on BP via PI is significant (β = 0.262, p = 0.000), while the direct effect remains non-significant. This indicates that the influence of DC on performance is fully transmitted through PI, as shown in Table 6.

Table 5 - Path coefficient analysis

	β	**T statistics**	**P values**	**Result**
H1 Digital Capabilities -> Business Performance	0.119	1.801	0.072	Insignificant
H2 Digital Capabilities -> Process Innovation	0.541	11.062	0.000	Significant
H3 Process Innovation -> Business Performance	0.483	7.804	0.000	Significant

H4 Competition Intensity x Digital Capabilities -> Business Performance	-0.008	0.185	0.854	Insignificant

Table 6 - Mediation analysis

Mediation paths	β	T statistics	P values	Mediation
H5 Digital Capabilities -> Process Innovation -> Business Performance	0.262	6.862	0.000	Full Mediation

Discussion

The findings of this study highlight the essential role of DC and PI in enhancing retail SME BP. While DC did not directly influence performance, they significantly contributed to PI, which in turn positively impacted business outcomes, indicating a full mediation effect. This underscores the importance of PI as a bridge that transforms digital investments into tangible results. Interestingly, CI did not significantly moderate the DC and BP relationship, suggesting that internal capabilities and innovation play a more critical role than external pressure. These insights suggest that SMEs should focus on leveraging digital tools through PI strategies to achieve sustainable performance improvements.

Discussion of findings

The findings of this study provide a context-specific examination of how DC relate to BP in retail SMEs. While previous studies reported a positive association between DC and business performance (Isa & Mangifera, 2024; Rupeika-Apoga et al., 2022), the current results do not support this relationship in the context of Malaysian retail SMEs. Specifically, H1, which proposed a direct link between DC and BP, was not supported in this study. Although digital transformation is commonly beneficial, recent studies highlight that DCs depend considerably on specific contextual conditions, rather than arising automatically in the retail sector. DC remains uneven across firms in Malaysia. Based on the digital adoption index score, smaller firms in Malaysia are still in the initial stage, with a total of 1.24 for micro and 1.86 among small firms, which shows that they are still falling behind due to skill gaps and budget limitations (Salleh et al., 2023). Operational challenges commonly encountered during digital transformation hinder the successful use of DC. Collin-Lachaud et al. (2024) and Nagpal et al. (2023) identify persistent issues, including organisational inertia and conflicts between digital methods and established business practices. Specifically, Pan et al. (2022) note that inadequate information technology infrastructure and misaligned strategies may worsen operational problems rather than resolve them.

This insight is consistent with research that considers DC insufficient in isolation, instead requiring integration with firm-specific resources and process-level mechanisms (Martins, 2023; Zhao, 2024). For retail SMEs that often lack formal digital strategies or advanced infrastructure, digital tools may support operational activities without directly influencing broader performance outcomes unless paired with innovation-related practices. In contrast, support was found for H2 and H3, which examined the mediating effect of PI. The observed relationship between DC and PI suggests that digital adoption is associated with adjustments to internal workflows and process design. This corresponds with sectoral research indicating that digital tools may facilitate process modifications and the incorporation of new technologies in routine operations (Rachmat Kurniawan et al., 2024; Yim et al., 2023).

H4, which assessed the moderating effect of CI, was not supported. This contrasts with studies that identify competitive pressure as a driver for innovation and digital investment (Shao et al., 2024; Wu et al., 2024). A possible explanation is that competitive dynamics may not exert sufficient influence to alter the relationship between DC and BP. CI may not enhance the effectiveness of DC if firms are not agile to respond promptly to the market shift (Troise, 2022). This outcome is consistent with the arguments of Tanapaisankit et al. (2024; Yang, 2023) who propose that competition influences firm behaviour only under certain internal conditions, such as managerial capacity, organisational agility, or access to support networks. These elements may

be inconsistently available among the SMEs studied, which could account for the absence of a significant moderating effect.

The mediation analysis supports a full mediation model, where the association between DC and BP operates through PI. This result indicates that the benefits of digital tools are realised when they are applied to modify and improve internal processes. H5 result aligns with the dynamic capabilities framework, Teece (2018), particularly the concept of "transforming" capabilities that support internal adaptation in response to external change. The results reflect the view that internal innovation systems may play a key role in linking digital adoption to measurable business outcomes. Related studies, Ng et al. (2024), Zhou & Cen (2024), similarly note that innovation functions, including service and PI, can serve as mechanisms that connect digital orientation with firm performance.

In summary, the study contributes to the ongoing analysis of digital transformation in three ways. First, it suggests that DC, while relevant, does not consistently correspond with BP unless integrated with innovation processes. Second, it identifies PI as a key variable linking digital tools to organisational outcomes. Third, it indicates that the influence of competitive intensity on digital outcomes may be limited without concurrent internal development. These findings may inform further empirical work on digital adoption in SMEs by highlighting the conditional nature of digital impacts. The results also point to the importance of process-level analysis in understanding how DC operate within specific organisational contexts.

Practical implications

For retail SMEs, the results demonstrate that PI is the paramount driver of BP. DC does not directly improve performance but adds indirectly via PI. This indicates that technology adoption ought to be integrated into innovation-driven strategies, including workflow redesign, enhancement of client engagement, and operational simplification, rather than being sought as a standalone goal. Managers should concentrate on connecting digital investments with innovation initiatives to convert technical potential into quantifiable performance results. The findings indicate that CI does not influence the relationship between DC and performance. Retail SME managers should regard competition as a catalyst for enhancing service distinction and operational excellence, rather than as a factor that increases the efficacy of digital technologies. From a policy standpoint, these findings indicate that retail SMEs will derive greater advantages from initiatives aimed at enhancing capacities rather than from programs only centred on technology acquisition. Training that assists merchants in reengineering processes, utilising customer data, and creating creative service models will provide a more significant long-term effect. Similarly, technology vendors catering to retail SMEs must transcend mere product supply to provide integration assistance, employee training, and process alignment services, thereby empowering retailers to utilise digital tools effectively to improve customer experiences and operational efficiency.

Theoretical contributions

This research provides multiple theoretical contributions to the literature concerning SMEs, digital transformation, and innovation. The findings contest a fundamental premise of the Resource-Based View hypothesis, which posits that the mere ownership of valued resources immediately results in enhanced performance. DC, although acknowledged as a valuable resource, did not exert a direct influence on BP. Their contribution was indirect, facilitated by the PI. This indicates that in retail SMEs, digital resources by themselves do not ensure a competitive advantage; instead, their worth is contingent upon their application and integration within organisational processes. By emphasising this conditionality, the study enhances the Resource-Based View (RBV) by demonstrating that resources create value just when adeptly incorporated into organisational processes.

Secondly, the research enhances the DCT by recognising PI as a pivotal method via which DC is converted into BP. PI denotes a company's capacity to reorganise routines, workflows, and client engagements in response to environmental shifts. The mediation results indicate that dynamic capabilities yield performance improvements when small and medium-sized enterprises cultivate and implement reconfiguration abilities. This positions the PI as an innovative and

inadequately examined dynamic capability within the retail SME setting, enhancing the literature by elucidating the mechanisms via which digital resources are converted into outcomes.

Third, the research offers novel theoretical perspectives on the function of CI. From a Dynamic Capabilities standpoint, the lack of moderation suggests that external competition does not inherently improve firms' capacity to reconfigure resources. Retail SMEs must depend on their internal innovation capabilities to derive value from digital technologies. This enhances the Dynamic Capabilities theory by underscoring that outside forces, while pertinent to performance, do not replace the necessity for cultivating internal capabilities.

By contextualising these arguments inside retail SMEs, the study enhances ideas typically formulated in large-firm or manufacturing settings, applying them to a retail sector marked by significant dynamism and resource limitations. The results indicate that in these circumstances, performance improvements arise not from the availability of digital resources or competitive pressures, but from the capacity to integrate digital tools into inventive processes. This contextual contribution highlights the necessity of analysing the distinct manifestations of RBV and Dynamic Capabilities across sectors, especially within under-explored retail SME contexts.

5. Limitations and Future Research Direction.

This study explores the relationship among DC, PI, and BP among retail SMEs, acknowledging various limitations and identifying potential avenues for further research. The study's cross-sectional design restricts the ability to infer causality among the observable constructs. Considering that digital transformation entails temporal change, longitudinal study methodologies provide a comprehensive examination of the evolution and interaction of dynamic capabilities, innovative practices, and performance outcomes during various phases of organisational development.

The study's emphasis on retail SMEs in Johor, Malaysia, provides contextual specificity but restricts the generalizability of the findings to other industries or regions. Divergences in industrial frameworks, regulatory landscapes, and technology infrastructures may result in disparate outcomes. Comparative analyses across sectors or regions could ascertain whether the established linkages persist in different institutional and cultural contexts. This research highlighted CI as a moderating variable but excluded other organisational or environmental factors that could affect digital transformation. Factors such as leadership approach, organisational culture, digital maturity, and the availability of external support networks may influence the adoption and utilisation of digital capabilities. Incorporating these variables in subsequent models may enhance the knowledge of influential aspects.

The utilisation of self-reported metrics involves the possibility of common method bias. While the method grants access to company-specific data, it may not precisely represent true performance results. Future studies may enhance their rigour by using objective indicators such as revenue, productivity, or customer metrics, or by amalgamating data from diverse sources to augment measurement validity. Future research could enhance the current findings by utilising mixed-method designs or sophisticated quantitative methodologies. For instance, multi-group analysis with PLS-SEM may facilitate comparisons among various business subgroups. Still, case studies or qualitative interviews could provide more insights into firm-level processes that are not readily captured by survey methods.

Ultimately, as the notion of digital transformation increasingly aligns with overarching strategic goals such as sustainability, organisational resilience, and social inclusion, additional study may explore how digital capabilities correlate with outcomes beyond immediate performance. This could expand the analytical framework to encompass long-term adaptation or non-financial effects, especially for SME development. Collectively, these constraints and recommendations indicate opportunities for future research to explore better and enhance the correlation between digital transformation and SME results across diverse contexts and frameworks.

Acknowledgement

This research was funded by a research grant from the Graduate School of Business, Universiti Kebangsaan Malaysia (GSB-2026-015).

References

Albannai, N. A., Raziq, M. M., Malik, M., Scott-Kennel, J., & Igoe, J. (2024). Unravelling the role of digital leadership in developing digital dynamic capabilities for the digital transformation of firms. *Benchmarking*. https://doi.org/10.1108/BIJ-10-2023-0756

Abid, N., Dowling, M., Ceci, F., & Aftab, J. (2023). Does resource bricolage foster SMEs' competitive advantage and financial performance? a resource-based perspective. Business Strategy and the Environment, 32(8), 5833-5853. https://doi.org/10.1002/bse.3451

AL-Dabaibeh, T., & Hasan, A. (2023). Barriers to Balanced Scorecard Implementation in the Digitalisation Era. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *13*(2). https://doi.org/10.6007/ijarafms/v13-i2/17379

Al-Omoush, K. S., Navarré, C. L., & Ribeiro-Navarrete, S. (2023). The Role of Digital Business Transformation in Frugal Innovation and SMEs' Resilience in Emerging Markets. *International Journal of Emerging Markets*, *20*(1), 366–386. https://doi.org/10.1108/ijoem-12-2022-1937

Amoa-Gyarteng, K., Dhliwayo, S., & Adekomaya, V. (2023). Navigating Containment Challenges: A Quantitative Study of Ghanaian SME Performance During the COVID-19 Pandemic. *Small Business International Review*, *7*(2), e587. https://doi.org/10.26784/sbir.v7i2.587

Anika, A. (2024). Examining the challenges and opportunities of talent acquisition and recruitment in urban retail stores [Preprint]. Research Square. https://doi.org/10.21203/rs.3.rs-3818101/v1

Anning-Dorson, T. (2021). Organisational culture and leadership as antecedents to organisational flexibility: implications for SME competitiveness. *Journal of Entrepreneurship in Emerging Economies*, *13*(5), 1309–1325. https://doi.org/10.1108/JEEE-08-2020-0288/FULL/PDF

Aulianda, M., Sudarmiatin, S., & Sumarsono, H. (2024). Internationalisation of SME: A Systematic Literature Review. *Golden Ratio of Marketing and Applied Psychology of Business*, *4*(1), 11–21. https://doi.org/10.52970/grmapb.v4i1.282

Aziz, N. A., & Long, F. (2023). Examining the Relationship Between Big Data Analytics Capabilities and Organisational Ambidexterity in the Malaysian Banking Sector. *Frontiers in Big Data*, *6*. https://doi.org/10.3389/fdata.2023.1036174

Bansal, A., Panchal, T., Jabeen, F., Mangla, S. K., & Singh, G. (2023). A Study of Human Resource Digital Transformation (HRDT): A Phenomenon of Innovation Capability Led by Digital and Individual Factors. *Journal of Business Research*, *157*, 113611. https://doi.org/10.1016/j.jbusres.2022.113611

Bruce, E., Shurong, Z., Du, Y., Yaqi, M., Amoah, J., & Egala, S. B. (2023). The Effect of Digital Marketing Adoption on SMEs' Sustainable Growth: Empirical Evidence from Ghana. *Sustainability*, *15*(6), 4760. https://doi.org/10.3390/su15064760

Castellano, N. G., Gobbo, R. D., & Leto, L. (2023). Using Big Data to Enhance Data Envelopment Analysis of Retail Store Productivity. *International Journal of Productivity and Performance Management*, *73*(11), 213–242. https://doi.org/10.1108/ijppm-03-2023-0157

Chan, C. Y. R., & Zailani, S. (2024). Capabilities to create new value for business sustainability: a retailer case study from Malaysia. *Benchmarking*. https://doi.org/10.1108/BIJ-07-2023-0499

Chirk, N., Mmed, J., Ng, D., & Jenn, C. (2006). Designing A Questionnaire. *Malaysian Family Physician : The Official Journal of the Academy of Family Physicians of Malaysia*, *1*(1), 32. https://doi.org/10.4324/9780203875728-26

Cocioc, P. (2021). Determinants of competitive intensity: Substitutability and pricing policy. *Review of Economic Studies and Research Virgil Madgearu*, *14*(1), 5–16. https://doi.org/10.24193/RVM.2021.14.70

Collin-Lachaud, I., Do Vale, G., Reynolds, J., & Cuthbertson, R. (2024). A retailing dilemma: sell only in-person or go multiple channels and digital? *Journal of Business Strategy*, *45*(5), 348–355. https://doi.org/10.1108/JBS-07-2023-0149

Curado, C., Jesus, M. M., & Bontis, N. (2025). Perceptions and configurations of balanced scorecard use: evidence from Portuguese SMEs. *Management Research*, *23*(2), 203–232. https://doi.org/10.1108/MRJIAM-06-2024-1550

Dudic, Z., Dudic, B., Gregus, M., Novackova, D., & Djakovic, I. (2020). The innovativeness and usage of the balanced scorecard model in SMEs. *Sustainability (Switzerland)*, *12*(8). https://doi.org/10.3390/SU12083221

Ellström, D., Holtström, J., Berg, E., & Josefsson, C. (2022). Dynamic capabilities for digital transformation. *Journal of Strategy and Management*, *15*(2), 272–286. https://doi.org/10.1108/JSMA-04-2021-0089/FULL/PDF

Finelli, C. J., Nguyen, K. A., DeMonbrun, R. M., Borrego, M., Prince, M. J., Henderson, C., Shekhar, P., Waters, C. K., & Husman, J. (2018). Reducing student resistance to active learning: Strategies for instructors. *Journal of College Science Teaching*, *47*(5), 80–91. https://doi.org/10.2505/4/jcst18_047_05_80

Foss, N. J., Schmidt, J., & Teece, D. J. (2023). Ecosystem Leadership as a Dynamic Capability. *Long Range Planning*, *56*(1), 102270. https://doi.org/10.1016/j.lrp.2022.102270

Freitas Junior, J. C. da S., & Alegre, P. (2018). *The relationship between digital capabilities and digital business performance* (Doctoral dissertation, Universidade Federal do Rio Grande do Sul). Universidade Federal do Rio Grande do Sul. https://lume.ufrgs.br/handle/10183/184955

Freitas Júnior, J. C. da S., & Maçada, A. C. G. (2020). Examining Digital Capabilities and Their Role in the Digital Business Performance. *Revista Economia & Gestão*, *20*(56), 148–171. https://doi.org/10.5752/P.1984-6606.2020V20N56P148-171

Gamage, S. K. N., Ekanayake, E. M. S., Abeyrathne, G. A. K. N. J., Prasanna, R. P. I. R., Jayasundara, J. M. S. B., & Rajapakshe, P. S. K. (2020). A Review of Global Challenges and Survival Strategies of Small and Medium Enterprises (SMEs). *Economies 2020, Vol. 8, Page 79*, *8*(4), 79. https://doi.org/10.3390/ECONOMIES8040079

Ghi, T. N., Thu, N. Q., Huan, N. Q., & Trung, N. T. (2022). Human Capital, Digital Transformation, and Firm Performance of Startups in Vietnam. *Management*, *26*(1), 1–18. https://doi.org/10.2478/manment-2019-0081

Gonçalves, H., Magalhães, V. S., Ferreira, L. M. D. F., & Arantes, A. (2024). Overcoming Barriers to Sustainable Supply Chain Management in Small and Medium-Sized Enterprises: A Multi-Criteria Decision-Making Approach. *Sustainability*, *16*(2), 506. https://doi.org/10.3390/su16020506

Guimarães, T., do Carmo Caccia-Bava, M., & Geist, M. (2020). The moderating effect of organisation culture on competition intensity and hospital quality. *International Journal of Healthcare Information Systems and Informatics*, *15*(3), 47–64. https://doi.org/10.4018/IJHISI.2020070103

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203/FULL/PDF

Hairani, N., & Aziz, Z. A. (2024). *Resources and Capabilities of Malaysian Retailers: A Systematic Review Toward Competitive Advantage*. *133*, Norfazlirda-484. https://doi.org/10.15405/epsbs.2024.05.40

He, L.-Y., & Qi, X.-F. (2021). Resource misallocation and energy-related pollution. *International Journal of Environmental Research and Public Health*, *18*(10), 5158. https://doi.org/10.3390/ijerph18105158

Hsu, T. T., Tsai, K. H., Hsieh, M. H., & Wang, W. Y. (2014). Strategic orientation and new product performance: The roles of technological capability. *Canadian Journal of Administrative Sciences*, *31*(1), 44–58. https://doi.org/10.1002/cjas.1274

Isa, M., & Mangifera, L. (2024). Model of Creative Economy Supply Chain Resilience to Improve SME Sales. *JBTI : Jurnal Bisnis : Teori Dan Implementasi*, *15*(2), 231–243. https://doi.org/10.18196/JBTI.V15I2.22522

Isango, E. (2024). An Assessment of the Impact of E-Procurement Practices on Organisational Performance in Tanzania. *NGJSD*, *14*(2), 237–241. https://doi.org/10.4314/ngjsd.v14i2.15

Joensuu-Salo, S., & Matalamäki, M. (2023). The Impact of Digital Capability on Firm Performance and Growth in Incumbent SMEs. *Journal of Enterprising Culture*, *31*(02), 211–232. https://doi.org/10.1142/s0218495823500073

Kaplan, R., review, D. N.-H. business, & 2005, undefined. (2005). The balanced scorecard: measures that drive performance. *Academia.Edu*. https://sci-hub.se/https://www.academia.edu/download/54588379/Kaplan_Nortonbalanced_scorecard.pdf

Kaplan, R. S., & Norton, D. P. (2004). *Focusing Your Organisation on Strategy - with the Balanced Scorecard, 2nd Edition*. www.hbr.org

Khalil, A., Abdelli, M. E. A., & Mogaji, E. (2022). Do Digital Technologies Influence the Relationship Between the COVID-19 Crisis and SMEs' Resilience in Developing Countries? *Journal of Open Innovation Technology Market and Complexity*, *8*(2), 100. https://doi.org/10.3390/joitmc8020100

Khan, K. U., Xuehe, Z., Atlas, F., & Khan, F. (2019). The impact of dominant logic and competitive intensity on SMEs' performance: A case from China. *Journal of Innovation and Knowledge*, *4*(1), 1–11. https://doi.org/10.1016/j.jik.2018.10.001

Kim, J., Kollmann, T., Palangkaraya, A., & Webster, E. (2022). Does local technological specialisation, diversity, and dynamic competition enhance firm creation? *Research Policy*, *51*(7), 104557. https://doi.org/10.1016/j.respol.2022.104557

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. Information Systems Journal, 28(1), 227–261. https://doi.org/10.1111/isj.12131

Kumalaningrum, M. P., Ciptono, W. S., Indarti, N., & Purnomo, B. R. (2023). Ambidexterity in Indonesian SMEs: A systematic review and synthesis for future research. *Cogent Business & Management*, *10*(1). https://doi.org/10.1080/23311975.2023.2199490

Kumar Roy, R., & Duraipandian, R. (2021). Analysis of Business External Factors that Impact the Growth of IT Entrepreneurship. *Psychology and Education Journal*, *58*(1), 5526–5532. https://doi.org/10.17762/PAE.V58I1.2169

Kwiotkowska, A. (2024). The Role of Dynamic Capabilities and Strategic Orientation for Digital Transformation: A Configurational Approach. *European Research Studies Journal*, *XXVII*(Issue 2), 334–356. https://doi.org/10.35808/ersj/3406

Lestari, S. D., Leon, F. M., Widyastuti, S., Brabo, N. A., & Putra, A. H. P. K. (2020). Antecedents and Consequences of Innovation and Business Strategy on Performance and Competitive Advantage of SMEs. *The Journal of Asian Finance, Economics and Business*, *7*(6), 365–378. https://doi.org/10.13106/JAFEB.2020.VOL7.NO6.365

Li, L., Lin, J., Turel, O., Liu, P., & Luo, X. (Robert). (2020). The impact of e-commerce capabilities on agricultural firms' performance gains: the mediating role of organizational agility. *Industrial Management and Data Systems*, *120*(7), 1265–1286. https://doi.org/10.1108/IMDS-08-2019-0421

Li, Q. (2022). Evaluation of Artificial Intelligence Models and Wireless Network Applications for Enterprise Sales Management Innovation Under the New Retail Format. *Wireless Communications and Mobile Computing*, *2022*(1). https://doi.org/10.1155/2022/8576677

Lin, Q. (2023). The Theoretical Framework of Enterprise Digital Innovation: Insights From a Qualitative Meta-Analysis. *European Journal of Innovation Management*, *27*(6), 2149–2172. https://doi.org/10.1108/ejim-09-2022-0496

Liu, L., Long, J., Liu, R., Fan, Q., & Wan, W. (2023). Examining how and when digital platform capabilities drive technological innovation: a strategic information perspective. *Journal of Enterprise Information Management*, *36*(2), 553–582. https://doi.org/10.1108/JEIM-01-2022-0033/FULL/XML

Liu, W., & Si, S. (2022). Disruptive Innovation in the Context of Retailing: Digital Trends and the Internationalisation of the Yiwu Commodity Market. *Sustainability*, *14*(13), 7559. https://doi.org/10.3390/su14137559

Lutfi, A., Al-Khasawneh, A. L., Almaiah, M. A., Alsyouf, A., & Alrawad, M. (2022). Business Sustainability of Small and Medium Enterprises During the COVID-19 Pandemic: The

Role of AIS Implementation. *Sustainability*, *14*(9), 5362. https://doi.org/10.3390/su14095362

Mangifera, L., Wajdi, F., Amalia, F., & Khasah, A. U. (2022). The Role of Digital Innovation in SMEs: A Financial Performance Perspective. *Jurnal Manajemen Universitas Bung Hatta*, *17*(2), 157–170. https://doi.org/10.37301/jmubh.v17i2.20184

Mangifera, L., Perwithosuci, W., Aisyah, S., & Widawati, M. W. (2024). Does Financial Resource Development Effort Affect the Dynamic Entrepreneurial Capability and Performance of SMEs? *Jurnal Manajemen Universitas Bung Hatta*, *19*(1), 92–103. https://doi.org/10.37301/jmubh.v19i1.24553

Manzoor, R., Sahay, B. S., & Singh, S. K. (2022). Blockchain Technology in Supply Chain Management: An Organizational Theoretic Overview and Research Agenda. *Annals of Operations Research*, *348*(3), 1307–1354. https://doi.org/10.1007/s10479-022-05069-5

Martins, A. (2023). Dynamic capabilities and SME performance in the COVID-19 era: the moderating effect of digitalization. *Asia-Pacific Journal of Business Administration*, *15*(2), 188–202. https://doi.org/10.1108/APJBA-08-2021-0370

Mele, G., Capaldo, G., Secundo, G., & Corvello, V. (2023). Revisiting the Idea of Knowledge-Based Dynamic Capabilities for Digital Transformation. *Journal of Knowledge Management*, *28*(2), 532–563. https://doi.org/10.1108/jkm-02-2023-0121

Ming, K. L. Y., & Soon, L. P. (2023). E-Wallet Revolution: Fueling Business Performance Among SMEs in Kuching, Sarawak. *International Journal of Academic Research in Business and Social Sciences*, *13*(6). https://doi.org/10.6007/ijarbss/v13-i6/17261

Mishrif, A., & Khan, A. I. (2023a). Technology Adoption as a Survival Strategy for Small and Medium Enterprises During COVID-19. *Journal of Innovation and Entrepreneurship*, *12*(1). https://doi.org/10.1186/s13731-023-00317-9

Mishrif, A., & Khan, A. I. (2023b). Technology Adoption as a Survival Strategy for Small and Medium Enterprises During COVID-19. *Journal of Innovation and Entrepreneurship*, *12*(1). https://doi.org/10.1186/s13731-023-00317-9

Moghadamzadeh, A., Ebrahimi, P., Radfard, S., Salamzadeh, A., & Khajeheian, D. (2020). Investigating the role of customer co-creation behavior on social media platforms in rendering innovative services. Sustainability, 12(17), 6926. https://doi.org/10.3390/su12176926

Müller, J. M., Buliga, O., & Voigt, K. I. (2018). Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. *Technological Forecasting and Social Change*, *132*(January), 2–17. https://doi.org/10.1016/j.techfore.2017.12.019

Mushtaq, N., Hussain, F., Dad, A., Rehman, S. U., & Waseem, M. (2024). Digital Transformation and Its Impact on Business Performance in SMEs of Pakistan: An Empirical Study. *Abbdm*, *3*(2), 103–114. https://doi.org/10.62019/abbdm.v3i2.92

Nagpal, G., Ray, A. K., Kharkwal, N., Jasti, N. V. K., & Nagpal, A. (2023). Challenges in the Adoption of Business Analytics by Small Retailers. *International Journal of E-Adoption*, *15*(2), 1–14. https://doi.org/10.4018/IJEA.316539

Nasution, R. R., & Rossieta, H. (2023). Evaluation of Failure Balanced Scorecard and Advantages of Objectives and Key Results as a Strategic Control System: Case Study on the ABC Foundation. *Jurnal Pamator Jurnal Ilmiah Universitas Trunojoyo*, *16*(3), 590–607. https://doi.org/10.21107/pamator.v16i3.21321

Ng, P., Chow, P., Wong, P., & Luk, W. (2024). The Impact of Digital Technology Training on Developing Academics' Digital Competence in a Higher Education Context. *Education + Training*, *66*(9), 1276–1292. https://doi.org/10.1108/et-10-2023-0417

Oh, K., Yoo, H., & Jeong, E. (2023). Research Trends in Digital Transformation in Supply Chain Based on Bibliometric and Network Analysis. *Journal of Business Economics and Management*, *24*(6), 1042–1058. https://doi.org/10.3846/jbem.2023.20649

Omrani, N., Rejeb, N., Maâlaoui, A., Dabić, M., & Kraus, S. (2024). Drivers of Digital Transformation in SMEs. *IEEE Transactions on Engineering Management*, *71*, 5030–5043. https://doi.org/10.1109/tem.2022.3215727

Pan, J., Lin, J., & Wang, S. (2022). A Delphi-Based Index System for Digital Transformation Capability of Retailers. *Journal of Business Economics and Management*, *23*(5), 1106–1132. https://doi.org/10.3846/jbem.2022.17441

Park, J. H., Kook, S. H., Im, H., Eum, S., & Lee, C. (2018). Fabless semiconductor firms' financial performance determinant factors: Product platform efficiency and technological capability. *Sustainability (Switzerland)*, *10*(10). https://doi.org/10.3390/su10103373

Prajogo, D., & Mcdermott, C. M. (2014). Antecedents of Service Innovation in SMEs: Comparing the Effects of External and Internal Factors. *Journal of Small Business Management*, *52*(3), 521–540. https://doi.org/10.1111/jsbm.12047

Poon, W. C., & Tung, S. E. H. (2023). Consumer risk perception of online food delivery during the COVID-19 Movement Control Order (MCO) in Malaysia. Journal of Foodservice Business Research, 26(2), 381–401. https://doi.org/10.1080/15378020.2022.2054657

Purwati, A. A., Anisa, N., Ugli, T. D. F., & Sarbaini, S. (2025). From Digital Shopping Experience to Social Influence: Examining the Roles of Online Shopping Experience and Influencer Marketing In Shaping Consumer Trust And Loyalty In E-Commerce. *Jurnal Testing Dan Implementasi Sistem Informasi*, *3*(1), 28-40. https://doi.org/10.55583/jtisi.v3i1.2256

Purwati, A. A., Abdullah, S. I. N. W., & Deli, M. M. (2025). A Qualitative Synthesis of Artificial Intelligence Adoption in MSMEs: Insights into Opportunities and Challenges. *Jurnal Testing Dan Implementasi Sistem Informasi*, *3*(2), 84-93. https://doi.org/10.55583/jtisi.v3i2.2328

Putra, I. G. C., Mendra, N. P. Y., & Novitasari, L. G. (2023). Integration of information technology capabilities in generating small and medium enterprise performance. *Uncertain Supply Chain Management*, *11*(2), 843–854. https://doi.org/10.5267/j.uscm.2023.3.010

Rachmat Kurniawan, Anjar Tri Astuti, & Ahmad Syamil. (2024). The Relationship Between Knowledge Management, Dynamic Capability and Project Success in the Indonesian Construction Industry. *International Journal for Multidisciplinary Research*, *6*(4). https://doi.org/10.36948/IJFMR.2024.V06I04.23858

Rajala, A., & Hautala-Kankaanpää, T. (2023). Exploring the Effects of SMEs' Platform-Based Digital Connectivity on Firm Performance – The Moderating Role of Environmental Turbulence. *Journal of Business and Industrial Marketing*, *38*(13), 15–30. https://doi.org/10.1108/jbim-01-2022-0024

Rasheed, Z., Ghwanmeh, S., & Abualkishik, A. Z. (2023). Harnessing Artificial Intelligence for Personalized Learning: A Systematic Review. *Data & Metadata*, *2*, 146. https://doi.org/10.56294/dm2023146

Raval, S. J., Kant, R., & Shankar, R. (2019). Benchmarking the Lean Six Sigma performance measures: a balanced score card approach. *Benchmarking*, *26*(6), 1921–1947. https://doi.org/10.1108/BIJ-06-2018-0160

Rehan, R., Sa'ad, A. A., Haron, R., & Hye, Q. M. A. (2023). Inspecting Sector-Specific Capital Structure Determinants: The Case of Malaysian Shariah Firms. *International Journal of Applied Economics, Finance and Accounting*, *17*(2), 402–414. https://doi.org/10.33094/ijaefa.v17i2.1176

Rizaldi, F., & Munandar, A. (2024). Increasing the Effectiveness and Efficiency of Local MSME Consignment Cooperation With the Portal Vendor System. *Jurnal Indonesia Sosial Teknologi*, *5*(11), 4963–4979. https://doi.org/10.59141/jist.v5i11.7057

Robertson, J., Botha, E., Walker, B., Wordsworth, R., & Balzarova, M. (2022). Fortune favours the digitally mature: the impact of digital maturity on the organisational resilience of SME retailers during COVID-19. *International Journal of Retail and Distribution Management*, *50*(8–9), 1182–1204. https://doi.org/10.1108/IJRDM-10-2021-0514/FULL/PDF

Rodríguez-Rebés, L., Navío-Marco, J., & Ibar-Alonso, R. (2021). Influence of organisational innovation and innovation in general on eco-innovation in European companies. *Journal of Intellectual Capital*, *22*(5), 840–867. https://doi.org/10.1108/JIC-06-2020-0203

Rosalin, S., Raharjo, K., Utami, H. N., & Prasetya, A. (2025). Mapping the Intellectual Core of Technology Adoption in Digital Startups: A Bibliometric Analysis via Bibliographic Coupling and Co-Word Networks. *International Journal of Environment, Engineering and Education*, *7*(3), 168–181. https://doi.org/10.55151/ijeedu.v7i3.355

Rupeika-Apoga, R., Petrovska, K., & Bule, L. (2022). The Effect of Digital Orientation and Digital Capability on Digital Transformation of SMEs during the COVID-19 Pandemic. *Journal of Theoretical and Applied Electronic Commerce Research*, *17*(2), 669–685. https://doi.org/10.3390/jtaer17020035

Samudzimu, B. P. H. & Munkumba, P. D. M. D. B. (2022). Taxonomy of small and medium enterprises (smes) constraints: an analytical perspective of zimbabwe. Global Journal of Management and Business Research, 9-18. https://doi.org/10.34257/gjmbrcvol22is4pg9

Salleh, N. M., Stegmann, H., Ong, C.-F., Ow, Y. S., Charanya, T., Segaran, R., Cheah, A., Ming, W., & Hashim, A. W. (2023). *Harnessing the power of technology: Building a strong digital economy for Malaysia's future*. Boston Consulting Group (BCG) & Malaysia Digital Economy Corporation (MDEC). https://www.bcg.com/publications/2023/malaysia-harnessing-the-power-of-technology

Samsuden, N. S., Kohar, U. H. A., Khatib, S. F. A., & Abbas, A. F. (2024). Digital Capabilities and Business Performance: A Systematic Literature Review. *Sustainability*, *16*(24), 11108. https://doi.org/10.3390/su162411108

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2022). Partial Least Squares Structural Equation Modeling. *Handbook of Market Research*, 587–632. https://doi.org/10.1007/978-3-319-57413-4_15

Shao, Q., Jiang, C., Liou, J. J., Su, P., Yuan, Y., & Zhu, D. (2024b). Exploring the Influencing Factors of Digital Transformation: Empirical Results From SMEs in China. *Managerial and Decision Economics*, *46*(4), 2364–2380. https://doi.org/10.1002/mde.4463

Shukri, N. F. M., & Ramli, A. (2015). Organizational Structure and Performances of Responsible Malaysian Healthcare Providers: A Balanced Scorecard Perspective. *Procedia Economics and Finance*, *28*(April), 202–212. https://doi.org/10.1016/s2212-5671(15)01101-6

Suoniemi, S., Meyer-Waarden, L., Munzel, A., Zablah, A. R., & Straub, D. (2020). Big data and firm performance: The roles of market-directed capabilities and business strategy. *Information & Management*, *57*(7), 103365. https://doi.org/10.1016/J.IM.2020.103365

Tanapaisankit, R., Sirisunhirun, S., Amornsiriphong, S., Rugchatjaroen, K., & Ploywan, P. (2024). How Could Digital Transformation Help Medium-Sized Enterprises Access Thailand's New Capital Market Financing (LiVEx) to Support Sustainable Growth in the Digital Economy Era? *Sustainability*, *16*(8), 3470. https://doi.org/10.3390/su16083470

Tatua, J., Mwenda, L. K. M., & Wachira, A. W. (2023). Relationship Between Firm Readiness and the Adoption of Digitalized Marketing Operations Tactics by Chain Supermarkets in Kenya. *Ijsmp*, *5*(2), 20–29. https://doi.org/10.47604/ijsmp.2171

Tilaar, K., Mulyana, A., Komaladewi, R., & Saefullah, K. (2023). Purchase intention model based on storytelling, product innovation, value co-creation, and empowerment of farmers in indonesian natural cosmetic products. Journal of Law and Sustainable Development, 11(6), e1087. https://doi.org/10.55908/sdgs.v11i6.1087

Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*(1), 40–49. https://doi.org/10.1016/j.lrp.2017.06.007

Thai, H. V, Hue, T. H. H., & Tran, M. (2024). Dynamic Capabilities and Digitalization as Antecedents of Innovation and Sustainable Performance: Empirical Evidence From Vietnamese SMEs. *Journal of Asia Business Studies*, *18*(2), 385–411. https://doi.org/10.1108/jabs-08-2023-0325

Torres Mazzi, C., & Foster-McGregor, N. (2021). Imported intermediates, technological capabilities and exports: Evidence from Brazilian firm-level data. *Research Policy*, *50*(1). https://doi.org/10.1016/j.respol.2020.104141

Vachadze, G. (2022). Misallocation Of Resources, Total Factor Productivity, And The Cleansing Hypothesis. *Macroeconomic Dynamics*, *26*(4), 1035–1072. https://doi.org/10.1017/S1365100520000474

Wang, L. L., & Gao, Y. (2021). Competition network as a source of competitive advantage: The dynamic capability perspective and evidence from China. *Long Range Planning*, *54*(2), 102052. https://doi.org/10.1016/J.LRP.2020.102052

Wardani, R. T. I., Astuti, E. S., Sunarti, S., & Iqbal, M. (2026). Explaining Post-Adoption Mobile Banking Usage in Indonesia Using an Integrated Technology Acceptance Model and IS Success Model: Evidence from PLS-SEM. *International Journal of Environment, Engineering and Education*, *8*(1), 138–155. https://doi.org/10.55151/ijeedu.v8i1.372

Warner, K., planning, M. W.-L. range, & 2019, undefined. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Elsevier*. https://doi.org/10.1016/j.lrp.2018.12.001

Wu, S., Cheng, P., & Yang, F. (2024). Study on the Impact of Digital Transformation on Green Competitive Advantage: The Role of Green Innovation and Government Regulation. *Plos One*, *19*(8), e0306603. https://doi.org/10.1371/journal.pone.0306603

Xing, X., & WU, Q. (2023). *Research on the Mediation Model and Empirical Analysis for the Influence of Digital Investment on Retail Business Performance*. https://doi.org/10.4108/eai.6-1-2023.2330306

Yang, C. (2023). Research on the Decision-Making Mechanism of Digital Transformation of Small and Medium-Sized Logistics Enterprises in China Based on Evolutionary Game. *Academic Journal of Management and Social Sciences*, *5*(2), 126–132. https://doi.org/10.54097/ajmss.v5i2.28

Yim, D. S., Kim, W., Kang, S., & Kim, E. J. (2023). The Development Strategy for Indonesia Digital Center PIDI 4.0 toward Digital Transformation. *PICMET 2023 - Portland International Conference on Management of Engineering and Technology: Managing Technology, Engineering and Manufacturing for a Sustainable World, Proceedings*. https://doi.org/10.23919/PICMET59654.2023.10216890

Yuen, T. M., & Baskaran, S. (2024). Optimizing Sustainable Business Performance: The Role of SME Agility in Digitalization. *International Journal of Academic Research in Business and Social Sciences*, *14*(1). https://doi.org/10.6007/ijarbss/v14-i1/18431

Zaheer, H., Ramzan, A., Mahmood, K., & Nagra, M. N. (2023). Implementation of Balanced Scorecard and Financial Performance of SMEs. *Jurnal Aplikasi Manajemen Ekonomi Dan Bisnis*, *8*(1), 50–61. https://doi.org/10.51263/jameb.v8i1.177

Zahoor, N., & Lew, Y. K. (2023). Enhancing International Marketing Capability and Export Performance of Emerging Market SMEs in Crises: Strategic Flexibility and Digital Technologies. *International Marketing Review*, *40*(5), 1158–1187. https://doi.org/10.1108/imr-12-2021-0350

Zhang, J., & Huang, X. (2023). Problems in Financial Management of Small and Medium-sized Enterprises. *Academic Journal of Business & Management*, *5*(16), 144–151. https://doi.org/10.25236/AJBM.2023.051620

Zhao, X. (2024). The Impact of Digital Transformation Strategy of Manufacturing Enterprises on Digital Innovation Performance. *International Business & Economics Studies*, *6*(3), p77. https://doi.org/10.22158/ibes.v6n3p77

Zhou, J., & Cen, W. (2024). Digital Entrepreneurial Ecosystem Embeddedness, Knowledge Dynamic Capabilities, and User Entrepreneurial Opportunity Development in China: The Moderating Role of Entrepreneurial Learning. *Sustainability*, *16*(11), 4343. https://doi.org/10.3390/su16114343