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HOW DIGITAL CAPABILITIES DRIVE INNOVATION IN BANKING: EXTENDING THE RESOURCE-BASED VIEW IN THE ERA OF DIGITAL TRANSFORMATION

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ABSTRACT

This study examines how digital transformation leads to the delivery of innovation outcomes in highly regulated banking systems, specifically the banking system in Vietnam, and the impact it has on the commercial banks and banks' operations. With the Resource-Based View and Resource Orchestration Theory derived from the study, we relate this to digital transformation with digital innovation, digital service and big data analytics capability, barriers to digital innovation, collaboration, and the ecosystem in relation to digital innovation and their performance. The study uses survey data from 388 middle- and senior-level managers and analyzes the data through Partial Least Squares Structural Equation Modeling (PLS-SEM). It can be shown that digital transformation and digital innovation positively influence digital innovation performance through digital service capability. Big data analytics enables this impact as well. These aspects are improved by collaboration in the innovation system that allows overcoming these barriers while decreasing them when they do not and can also lead to greater work capability. Our study promotes this link by providing a detailed framework that explains how digital capabilities and outside collaboration intersect to inform digital innovation performance in a regulated banking environment from an ecosystem perspective.

Keywords: *Big Data, Innovation, Digital Innovation, Digital Capability, Digital Transformation, Performance*

1. INTRODUCTION

The global banking industry is undergoing a profound digital transformation with a sea change. This change has helped change business models, customer relationships as well as innovation processes (Naimi-Sadigh et al., 2022). Digital transformation in recent years has become an important research topic in some emerging economies such as Vietnam (Hung Nguyen, 2024). While digital transformation is a key agenda for many banks these days it is more likely not just about introducing new technologies to digital innovation, but also that digital innovation will become better in all aspects - this is what is good for business when this is done (Verhoef et al., 2021). Digital transformation is that which means that firms redesign structures, processes and resource set-ups in practice to contribute value-added in digital environment (Ghosn et al., 2024). By contrast, there is a term for digital innovation that refers to the development

and implementation of novel digital products and services or procedures. While the two are similar, which is the main point of them. Rather, digital transformation is the broad strategic plan, while digital innovation focuses on more specific aspects of innovation, specifically the things in place and processes working together. In Vietnam, the movement toward digital financial services has flourished due to national policy support and international clients (Vo et al., 2024). Possible transformation not only must technology be investment but also the bank's ability to ensure that the change through digital is turned into an improvement in innovation (Paul et al., 2024; Rialti & Filieri, 2024; Sagala & Őri, 2024).

According to different theoretical paradigms, previous studies have investigated the digital innovation outcomes using the Resource-Based View (RBV), Dynamic Capability Theory (DCT), Resource Orchestration Theory (ROT) and Technology Acceptance Model (TAM) (Foss et al., 2023). The review brings much value to such studies but most of the relevant articles were related to the topic of digital transformation, digital innovation, and analytics capability (Al Issa & Omar, 2024; Hongyun et al., 2025; H. Jiang et al., 2023; Meena and Santhanalakshmi, 2025). Hence far, little focus has been on the dynamics that these relate to each other amongst diverse dimensions that in banking in highly regulatory industry have made. This gap in information is clear that a wider picture must become a coherent way of understanding how digital capabilities are developed and used to create innovation outcomes according to the regulatory norms to do so under the framework of these organizations in the service sector.

Data has already been shown that digital innovation improves organizational outcomes when enhanced productivity and customer value in support of digital innovation capabilities are provided (Khin & Ho, 2019). To this end, digital service capability appears to be an important element to shape the performance change driven by digital change as well as digital innovation in the digital innovation ecosystem (P. Chen & Kim, 2023). Big data analytics capability is also considered a strategic resource as it can support innovation and decision making (Garmaki et al., 2023). But banking the same for it may take a form. On the one hand, data analytics can enhance innovation by improving customer insights, operational efficiency and strategic responsiveness, and that is, at the same time, they might be helpful for innovation and strategic decision making but banking is more complicated. Conversely, it may reinforce compliance routines and risk controls - not all the more likely to restrict experimentation and flexibility. This dual role has not been really investigated - particularly in emerging banking markets (Hongyun et al., 2025).

Another limitation is the institutional framework in which digital transformation occurs. TAM-based studies have been focused on digital transformation which is the product of necessity and user experience. On the other hand, in most emerging countries (especially Vietnam) the transformation of institutions in banking is affected not only by the internal decision-making and policy direction, but also by national government policy and regulations (Tsindeliani et al., 2022). At these settings, adoption may not be entirely voluntary, and there is more complexity in the external environment in relation to skills building as well as ability in the internal.

To address these lacunae, this study addresses the link between digital transformation and digital innovation as well as the digital innovation performance in Vietnamese commercial banks. It also investigates the mediating role of digital service capability and moderation of big data analytics capability. The research methodology is a mixture of RBV and ROT with added insights from DCT and TAM. This is an integrated framework to explain how digital capabilities in banks form innovation outcomes within banking culture when this type of process is also very heavily regulated.

This work has two major contributions, as it helps in establishing the conceptual framework of digital innovation performance by encompassing digital transformation, digital innovation, ser-

vice capability and analytics capability within one framework. It also contributes empirically to the literature by examining evidence of Vietnamese commercial banks - the ones which are rarely studied in the areas of digital innovation, in regulated service companies. In the industry, the findings carry practical implications for company-level design of effective digital strategies or for bank managers who desire to enhance internal capability and innovation development.

The rest of what follows is organized as follows. This is the theoretical background of the paper and the hypothesis formulation. The research methodology is the scope of the paper, and in section 3 the research provide an empirical explanation and discuss the implications. The final section concludes the study and presents the limitations we need to continue our study.

2. LITERATURE REVIEW

2. 1. FOUNDATION THEORY

The RBV provides an important theoretical foundation for explaining how firms achieve competitive advantage through strategic resources (El Nemar et al., 2025). In the context of digital innovation, digital capabilities such as digital service capability and big data analytics capability can be understood as strategic resources that support stronger innovation performance (Motamedimoghadam et al., 2024). These capabilities may create value when they are difficult to imitate, well organized, and effectively aligned with organizational goals. However, although RBV explains why such resources matter, it offers limited insight into how they are mobilized and transformed into innovation outcomes in dynamic and highly regulated sectors such as banking (Kraaijenbrink et al., 2010).

To address this limitation, ROT extends the analysis by focusing on the managerial actions through which resources are structured, bundled, and leveraged. In digital banking, this perspective is especially relevant because the value of digital resources depends not only on their availability, but also on how managers combine technologies, employee competencies, data resources, and service processes to support innovation (Kraaijenbrink et al., 2010; Mastilo et al., 2025). RBV and ROT are therefore complementary. RBV identifies the strategic importance of digital resources, whereas ROT explains the managerial processes through which these resources are converted into innovation performance.

In addition to these strategic perspectives, the TAM offers a behavioral explanation for the effective use of digital technologies. TAM emphasizes that perceived usefulness and perceived ease of use influence technology acceptance, which in turn affects the development of digital service capability and the broader success of digital transformation (Park et al., 2022). This perspective is relevant because digital innovation outcomes depend not only on resource possession and managerial coordination, but also on the willingness and readiness of organizational actors to adopt and use digital systems effectively (Isiaku & Adalier, 2024).

Taken together, RBV, ROT and TAM provide an integrated theoretical foundation for this study. RBV explains the strategic value of digital capabilities, ROT clarifies how these capabilities are deployed and coordinated, and TAM highlights the behavioural conditions that support their effective use. The combination of these perspectives offers a more comprehensive explanation of how digital transformation contributes to digital innovation performance in commercial banks (Motamedimoghadam et al., 2025).

Table 1. Summary of theories applied to the conceptual model

Relationship	Theory	Key Contributions	Limitations in Current Research	Gap Addressed in This Study
Digital Service Capability → Innovation Performance	Resource Orchestration Theory (H. Jiang et al., 2023)	Explains how digital Service Capability enhances efficiency.	Prior research has mainly focused on manufacturing sectors, with a limited focus on banking.	Test the mediating role of digital service capability in Vietnamese commercial banks.
Digital Transformation → Digital Service Capability → Innovation Performance	Technology Acceptance Model (Davis, 1989; Hongyun et al., 2025)	Highlights that adoption and utilization of digital initiatives depend on organizational readiness and acceptance.	Mostly tested in developed economies, less in emerging-market banking, where policy push is strong.	Examine how digital transformation affects innovation performance via digital service capability in Vietnam.
Digital Innovation → Digital Service Capability → Innovation Performance	Resource-Based View & Dynamic Capability Perspective (Khin & Ho, 2019)	Shows digital innovation enhances outcomes when supported by service capabilities.	Previous studies neglect emerging markets and service industries.	Analyze whether digital innovation improves innovation performance through digital service capability in banks.
Big Data Analytics Capability × (Digital Transformation / Digital Innovation) → Innovation Performance	Resource-Based View (Hongyun et al., 2025)	Big data analytics provides knowledge discovery and strategic insights.	Mixed evidence, some studies show negative moderation, and limited evidence in banking.	Assess the moderating role of big data analytics in a regulated and data-intensive sector.
Barriers to Innovation → Innovation Performance	Innovation Barriers Literature (Barney, 1991)	Barriers (financial, institutional, HR) generally constrain outcomes.	Lacks evidence in service industries; negative effects are often assumed.	Re-examine whether barriers act as constraints or catalysts in banks.
Barriers to Innovation → Collaboration with Innovation System → Innovation Performance	Open Innovation Theory (Yıldız et al., 2021)	Collaboration with universities, suppliers, and customers enables access to external knowledge and integration.	Tested mainly in high-tech and manufacturing contexts, not in financial services.	Explore the mediating role of collaboration with the innovation system in the Vietnamese banking context.

Source: Author's own work

2. 2. IMPORTANCE OF DIGITAL INNOVATION PERFORMANCE IN BANKING

Digital innovation performance refers to a bank's ability to develop and implement new or improved digital products, services, and processes through its digital initiatives (Abera et al., 2025). In the banking sector, this form of performance has become increasingly important because competition is no longer based only on traditional financial services, but also on the speed, quality, and adaptability of digital offerings.

From the perspective of the Resource-Based View, digital capabilities such as information technology capability and big data analytics capability can be regarded as strategic resources that support stronger innovation outcomes (C. S. Chen et al., 2025). Prior research also indicates that digital transformation can improve innovation performance, particularly when it is sup-

ported by relevant organizational capabilities and effective managerial coordination (Qiu & Chang, 2025; Rubio-Andrés et al., 2025; Chen et al., 2026). In banking, stronger digital innovation performance is typically reflected in faster service improvement, better customer interaction, greater operational responsiveness, and a stronger competitive position (Shehadeh, 2025).

In research on banking digitalization, three constructs are especially relevant to digital innovation performance: digital transformation, digital innovation, and digital service capability. Although these concepts are closely related, they are not interchangeable. They represent different dimensions of organizational change and capability development. Table 2. summarizes the main distinctions among these constructs in the banking context.

Table 2. Conceptual Distinction of Digital Constructs in Banking

Construct	Level of Analysis	Strategic Focus	Banking Example	Role in Model
Digital Transformation	Organizational	Structural change	Cloud-based core banking, enterprise data lake	Strategic enabler
Digital Innovation	Service	New offerings	AI credit scoring, digital wallet, blockchain remittance	Innovation input
Digital Service Capability	Operational capability	Service integration & execution	API integration, automated onboarding, omnichannel platform	Mediating mechanism

Source: Author's own work

2. 3. HYPOTHESIS DEVELOPMENT

The hypotheses are organized into three related groups. The first group explains how digital innovation and digital transformation influence digital innovation performance, both directly and through digital service capability. The second group examines the moderating role of big data analytics capability. The third group focuses on barriers to innovation and collaboration with the innovation system as additional mechanisms affecting digital innovation performance.

Digital innovation refers to the use of digital technologies to develop new products, services, and processes that improve adaptability and competitiveness. From the RBV (Khin & Ho, 2019), digital innovation can be understood as a strategic resource that strengthens a bank's capacity to create value and sustain competitive advantage. By combining technological assets with managerial knowledge, banks can develop stronger digital service capability, which improves service quality, operational efficiency, and innovation outcomes (Larabi, 2025). Therefore:

H_1: Digital innovation positively influences digital service capability.

Digital transformation is a broader organizational process through which firms integrate digital technologies into operations, business models, and customer interactions (Böttcher et al., 2024). Drawing on the TAM (Hongyun et al., 2025), its effectiveness depends partly on whether digital systems are perceived as useful and easy to use (Khuntia et al., 2024). When these technologies are successfully adopted, banks can redesign workflows, improve agility, and build stronger digital service capability. Thus:

H_2: Digital transformation positively influences digital service capability.

Digital innovation is also expected to directly improve digital innovation performance (Reyes-Gómez et al., 2025). By embedding digital technologies into innovation processes, firms can accelerate idea generation, experimentation, and implementation, thereby improving innovation outcomes (Rosienkiewicz et al., 2024). Hence:

H_3: Digital innovation positively influences digital innovation performance.

Likewise, digital transformation can improve digital innovation performance by reshaping structures, processes, and decision-making routines (Xu et al., 2024). Once digital technologies are integrated across the organization, they support process optimization, coordination, and learning, which strengthen innovation outcomes (Awad & Martín-Rojas, 2024; Stergiou et al., 2023; Vial, 2019). Therefore:

H_4: Digital transformation positively influences digital innovation performance.

According to ROT, performance depends not only on possessing resources but also on how they are structured and leveraged (Asiaei et al., 2021). In this study, digital service capability represents an important orchestration mechanism through which banks align technologies, managerial expertise, and customer-oriented processes to generate innovation outcomes (Alonge et al., 2025; Grassi et al., 2022). A stronger digital service capability should therefore improve digital innovation performance (Motamedimoghadam et al., 2025).

H_5: Digital service capability positively influences digital innovation performance.

Although digital innovation and digital transformation provide important technological inputs, their effects on performance are unlikely to be automatic (Li et al., 2023). They are expected to operate partly through digital service capability , which transforms technological investments into effective service processes and operational routines (Khin & Ho, 2019). Accordingly:

H_6: Digital service capability mediates the relationship between digital innovation and digital innovation performance.

H_7: Digital service capability mediates the relationship between digital transformation and digital innovation performance.

Big data analytics capability is another important digital resource. From RBV and ROT, its value lies in helping firms collect, interpret, and apply data more effectively (Asiaei et al., 2021; Chong et al., 2024). This capability enhances organizational learning, resource allocation, and evidence-based decision-making, which can strengthen the impact of digital initiatives on innovation performance (Motamedimoghadam et al., 2025). However, its role is not always purely positive. While analytics can reveal unmet needs and improvement opportunities, excessive reliance on data may also encourage standardization, risk control, and short-term optimization at the expense of creativity and experimentation. For this reason, big data analytics capability is treated as a boundary condition rather than only as a direct driver.

First, banks with stronger analytics capability are better able to extract value from digital innovation initiatives, which should strengthen the link between digital innovation and digital innovation performance.

H_8: Big data analytics capability positively moderates the relationship between digital innovation and digital innovation performance.

Second, digital service capability is likely to have a stronger effect on digital innovation performance (G. Zhang & Ravishankar, 2024) when supported by a high level of analytics capability (Bhatti et al., 2024), because data analysis improves personalization, process improvement, and learning from customer feedback (Motamedimoghadam et al., 2025).

H_9: Big data analytics capability positively moderates the relationship between digital service capability and digital innovation performance.

Third, analytics capability can enhance the effect of digital transformation on digital innovation performance by helping banks identify opportunities, improve resource allocation, and

align technological investments with innovation goals (Adiguzel et al., 2025; Chaudhuri et al., 2024; Dudakov et al., 2020; Garad et al., 2024).

H_{10}: Big data analytics capability positively moderates the relationship between digital transformation and digital innovation performance.

In addition to digital capabilities, firms also face barriers that can hinder innovation (Torres de Oliveira et al., 2022). These may include limited financial resources, skill shortages, insufficient technological knowledge, weak institutional support, and organizational rigidities. From the RBV perspective, such barriers weaken the resource base needed for innovation and reduce the firm's ability to collaborate externally (Kazantsev et al., 2022; Kero & Bogale, 2023).

As a result:

H_{11}: Barriers to innovation negatively influence collaboration with the innovation system.

Collaboration with the innovation system may help firms reduce the negative effects of these barriers (Agrawal et al., 2025; Barney, 1991). Through partnerships with universities, research institutions, suppliers, customers, and other organizations, firms can access external knowledge, complementary resources, and new capabilities (Torres de Oliveira et al., 2022; Zheng et al., 2025). In this way, collaboration can function as a mechanism through which firms overcome internal constraints and improve digital innovation performance .

Therefore:

H_{12}: Collaboration with the innovation system mediates the relationship between barriers to innovation and digital innovation performance.

Barriers to innovation are also expected to directly reduce digital innovation performance (Barney, 1991), since they restrict firms' ability to invest, learn, experiment, and implement new solutions (Chountalas et al., 2024; Frishammar et al., 2025; Karltorp & Perez Vico, 2025; Liu et al., 2025; Nosike et al., 2024).

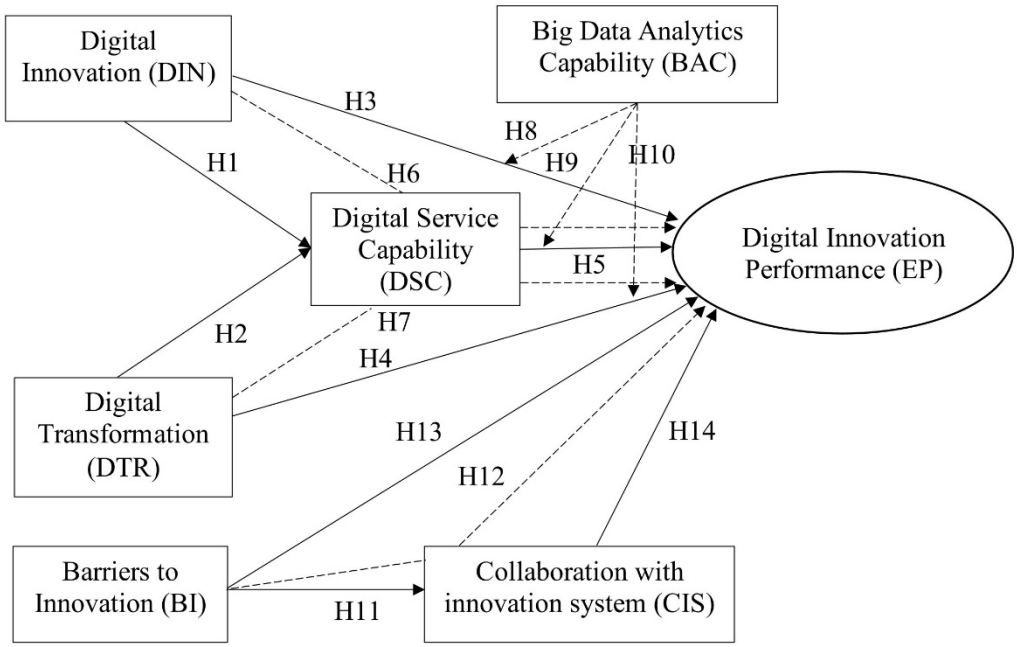
H_{13}: Barriers to innovation negatively influence digital innovation performance.

Finally, collaboration with the innovation system should positively influence digital innovation performance (Barney, 1991). In banking, collaboration with external actors can provide access to market knowledge, digital expertise, and complementary capabilities that support the development of innovative products, services, and processes (Bakri et al., 2024; El Nemar et al., 2025; Perotti et al., 2025; Xia et al., 2024).

H_{14}: Collaboration with the innovation system positively influences digital innovation performance.

Overall, this study proposes an integrated model in which digital capabilities influence digital innovation performance through both direct and indirect mechanisms, while big data analytics capability acts as a contextual condition shaping the strength of these effects. The model also recognizes that innovation outcomes in banking depend not only on internal capabilities, but also on barriers and external collaboration within the broader innovation system.

Figure 1. Proposed research model



Source: Author's own work

3. RESEARCH METHODOLOGY

3. 1. RESEARCH DESIGN

This study employed a quantitative, cross-sectional survey design to examine the relationships among digital transformation, digital innovation, digital service capability, big data analytics capability, barriers to innovation, collaboration with the innovation system, and digital innovation performance in Vietnamese commercial banks. The survey instrument was developed from established scales reported in prior studies to strengthen content validity.

The conceptual model was grounded primarily in the RBV, ROT, and the TAM, while also drawing on insights from the dynamic capability perspective. These theoretical lenses were integrated to explain how digital transformation and digital innovation influence digital innovation performance directly and indirectly through digital service capability, and how big data analytics capability conditions these relationships.

Given the complexity of the proposed model, the study applied Partial Least Squares Structural Equation Modeling (PLS-SEM). This approach is appropriate for prediction-oriented research, theory extension, and the analysis of complex models involving multiple latent constructs and interrelated paths. Data were analyzed in SmartPLS 4.0 using the standard two-step procedure: assessment of the measurement model followed by evaluation of the structural model.

3. 2. MEASUREMENTS OF CONSTRUCTS

All constructs were measured using five-point Likert scales ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Digital innovation was adapted from Khin & Ho (2019) and measured the extent to which banks develop superior digital products, features, and platforms. Big data analytics capability was adapted from Aspiranti et al. (2023) and captured the bank's

ability to use data for planning, adjustment, innovation, and decision-making. Barriers to innovation and collaboration with the innovation system were adapted from Yıldız et al. (2021). The former reflected organizational constraints that hinder innovation, while the latter measured cooperation with internal and external factors such as suppliers, competitors, universities, and customers.

Digital innovation performance was adapted from G. Zhang & Ravishankar (2024) and assessed the extent to which banks achieve innovation outcomes through digital technologies, including the development of new digital products, features, and channels. Digital transformation was based on Shehadeh et al. (2023) and captured the degree to which digital technologies are integrated into business processes and operations. Digital service capability was adapted from De la Calle et al. (2020) and referred to the bank's ability to design, deliver, and manage services through digital infrastructure, automation, and platform-based systems.

Because some original items were developed in non-banking contexts, they were carefully reinterpreted for banking based on functional equivalence. In this study, references to automation and advanced digital systems were adjusted to reflect banking applications such as digital platforms, process automation, and AI-enabled service systems. This adaptation was intended to improve contextual relevance and construct validity.

The questionnaire was translated into Vietnamese and refined through back-translation to ensure semantic consistency and cultural appropriateness. It was then reviewed by three academic experts in innovation and digital transformation. A pilot test with 30 bank managers was conducted to assess clarity, reliability, and internal consistency. Minor revisions were made on the basis of the pilot results.

3. 3. SAMPLING AND DATA COLLECTION

The study targeted middle- and senior-level managers employed in Vietnamese commercial banks, particularly those working in digital services, information technology, innovation, strategic management, and operations. These respondents were selected because they are directly involved in digital transformation and innovation-related decisions.

A purposive sampling approach was used, with participation limited to managers having at least three years of relevant managerial experience. Data were collected between March and June 2025 through both online and paper-based questionnaires. Of the 420 questionnaires distributed, 388 valid responses were retained after excluding incomplete or inconsistent cases, resulting in a response rate of 92.4%.

The final sample size exceeded commonly accepted thresholds for PLS-SEM and was sufficient for testing a model with multiple mediating and moderating relationships (Hair et al., 2021). The sample included respondents from state-owned, joint-stock, and private commercial banks, thereby enhancing the diversity of institutional representation and improving the robustness of the findings.

3. 4. DATA ANALYSIS PROCEDURE

The analysis proceeded in four stages. First, the data were screened for missing values, outliers, and major normality problems. No serious violations were identified. To reduce the risk of common method bias, the study applied both procedural remedies and statistical tests, including Harman's single factor test and full collinearity assessment. The results suggested that common method bias was not a serious concern.

Second, the measurement model was evaluated following established PLS-SEM criteria. Reliability was assessed using Cronbach's alpha and composite reliability, while convergent valid-

ity was examined through average variance extracted (AVE). Discriminant validity was tested using the Fornell–Larcker criterion and HTMT ratios.

Third, the structural model was assessed by examining collinearity, path coefficients, significance levels, and predictive ability. Variance inflation factor values remained below recommended thresholds. Hypotheses were tested using bootstrapping with 5,000 resamples.

Finally, the explanatory and predictive power of the model were evaluated using R^2, f^2, and Q^2 statistics. These indicators showed satisfactory model performance. Detailed results of the measurement and structural model assessments are presented in the following section.

3. 5. ETHICAL CONSIDERATIONS

All participants were informed about the purpose of the study and assured that participation was voluntary and confidential. No personally identifiable information was collected. The study followed standard ethical principles for research involving human participants.

4. RESEARCH RESULTS

The final sample consisted of 388 valid responses from middle-level and senior-level managers in Vietnamese commercial banks. Among the respondents, 57.2% were male and 42.8% were female. The largest age group was 31–40 years (46.1%), followed by 41–50 years (32.7%). Most respondents held a bachelor's degree (68.8%), while 26.3% possessed a master's degree or higher.

In terms of managerial position, 61.1% were middle-level managers and 38.9% were senior managers. Respondents were drawn mainly from departments related to digital technology (29.6%), innovation and product development (27.1%), operations and strategy (23.5%), and customer service (19.8%). Most participants had between five and ten years of managerial experience (54.4%), indicating that the sample was sufficiently experienced and well suited to the objectives of the study.

Table 3. Demographic Characteristics of Respondents (n = 388)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	222	57.2
	Female	166	42.8
Age (years)	Under 30	55	14.2
	31–40	179	46.1
	41–50	127	32.7
	Above 50	27	7.0
Education level	Bachelor's degree	267	68.8
	Master's degree or higher	102	26.3
	Others	19	4.9
Managerial level	Middle level	237	61.1
	Senior-level	151	38.9
Department	Digital and IT	115	29.6
	Innovation and Product Development	105	27.1
	Operations and Strategy	91	23.5
	Customer Service	77	19.8
Managerial experience	3–5 years	61	15.7
	5–10 years	211	54.4
	Over 10 years	116	29.9

Source: Author's own work

Table 4. Measurement Model Assessment Results

Variable code	Items	Loading	Cronbach's alpha	Cronbach's alpha	AVE
Digital innovation (DIN)		(Khin & Ho, 2019)			
DIN1	Digitally advanced services	0.810	0.905	0.908	0.679
DIN2	Enhanced digital features	0.770			
DIN3	New digital applications	0.842			
DIN4	New digital platforms	0.839			
DIN5	Incremental digital improvements	0.774			
DIN6	First-to-market digital launch	0.900			
Big data analytics capability (BAC)		(Aspiranti et al., 2023)			
BAC1	Explore open innovation with Big Data	0.835	0.866	0.867	0.653
BAC2	Big Data innovation strategies	0.817			
BAC3	Big Data planning process	0.779			
BAC4	Adjust innovation strategies	0.893			
BAC5	Access Big Data sources	0.703			
Barriers to innovation (BI)		(Yıldız et al., 2021)			
BI1	Lack of support	0.830	0.866	0.867	0.685
BI2	Lack of labor	0.848			
BI3	Lack of information support	0.819			
BI4	Lack of information on property rights	0.825			
BI5	Lack of experience	0.816			
Collaboration with the innovation system (CIS)		(Yıldız et al., 2021)			
CIS1	Internal innovation source	0.853	0.886	0.890	0.685
CIS2	Competitor innovation source	0.795			
CIS3	Supplier collaboration	0.785			
CIS4	University collaboration	0.758			
CIS5	Customer collaboration	0.779			
Digital Innovation Performance (EP)		(M. Zhang et al., 2024)			
EP1	Experiment with new digital tech	0.813	0.898	0.909	0.708
EP2	Superior digital features	0.880			
EP3	Invent new digital products	0.781			
EP4	Use new market opportunities	0.817			
EP5	More digital distribution channels	0.910			
Digital Transformation (DTR)		(Shehadeh et al., 2023)			
DTR1	Digitalize everything	0.789	0.890	0.892	
DTR2	Digital information exchange	0.783			
DTR3	Network business processes	0.800			
DTR4	Collect big data	0.754			
DTR5	Drive processes with tech	0.808			
DTR6	Integrate digital technologies	0.789			
DTR7	Shift to digital operations	0.704			
Digital Service Capability (DSC)		(De la Calle et al., 2020)			
DSC1	Use computer-aided design	0.786	0.786	0.795	0.609
DSC2	Use robotics	0.798			
DSC3	Use a combined computer numerical control machine	0.831			
DSC4	Combine computer numerical control, robotics, and computer-aided design	0.701			

Source: Author's own work

Table 4. presents the reliability and validity results. All factor loadings exceed 0.70 (0.701–0.910), confirming good item reliability. Cronbach's alpha and composite reliability values for

all constructs are above 0.70, indicating strong internal consistency. Average variance extracted (AVE) values range from 0.602 to 0.708, surpassing the 0.50 threshold, thus confirming convergent validity. Overall, the measurement model demonstrates satisfactory reliability and validity, supporting its suitability for further structural analysis.

Table 5. presents the inter-construct correlation matrix. The correlations among constructs range from 0.042 to 0.832, all below the recommended threshold of 0.85, indicating satisfactory discriminant validity. The constructs show moderate correlations, suggesting conceptual relatedness without multicollinearity issues. The interaction terms (BAC × DTR, BAC × DIN, BAC × DSC) exhibit low correlations with other variables, confirming that multicollinearity is not a concern. Overall, these results validate the distinctiveness of the constructs and support the adequacy of the measurement model for structural analysis.

Table 5. Discriminant Validity Results

	BAC	BI	CIS	DIN	DSC	DTR	EP	BAC x DTR	BAC x DIN
BAC									
BI	0.689								
CIS	0.814	0.768							
DIN	0.659	0.635	0.770						
DSC	0.809	0.824	0.709	0.712					
DTR	0.832	0.765	0.761	0.748	0.775				
EP	0.602	0.580	0.795	0.536	0.641	0.691			
BAC x DTR	0.311	0.153	0.288	0.107	0.236	0.294	0.226		
BAC x DIN	0.174	0.042	0.159	0.027	0.102	0.124	0.151	0.752	
BAC x DSC	0.233	0.152	0.248	0.083	0.266	0.226	0.172	0.751	0.719

Source: Author's own work

Beyond statistical significance, the effect size analysis provides important insights into the practical relevance of the findings. Digital transformation exhibits a relatively stronger effect on both digital service capability and digital innovation performance compared to digital innovation, highlighting its central role in shaping innovation outcomes. In addition, digital service capability shows a substantive effect on digital innovation performance, underscoring its importance as a key mechanism for translating digital initiatives into tangible results (see Table 6.).

Table 6. Structural Model Assessment Results

Hypothesis	Relationship	Path	p-value	Conclusion
H1	DIN → DSC	0.140	0.010	Confirm
H2	DTR → DSC	0.432	0.000	Confirm
H3	DIN → EP	0.201	0.003	Confirm
H4	DTR → EP	0.236	0.003	Confirm
H5	DSC → EP	0.235	0.001	Confirm
H6	DIN → DSC → EP	0.205	0.008	Confirm
H7	DTR → DSC → EP	0.215	0.005	Confirm
H8	BAC x DIN → EP	0.233	0.000	Confirm
H9	BAC x DSC → EP	0.268	0.000	Confirm
H10	BAC x DTR → EP	0.271	0.000	Confirm
H11	BI → CIS	-0.676	0.000	Confirm
H12	BI → CIS → EP	-0.411	0.000	Confirm
H13	BI → EP	-0.177	0.002	Confirm
H14	CIS → EP	0.592	0.000	Confirm

Source: Author's own work

Although organizational creativity is not explicitly modelled in this study, it is implicitly reflected in the interaction among digital service capability, collaboration mechanisms, and big data analytics capability. Together, these factors determine whether data-driven insights facilitate or constrain innovative experimentation. The findings reveal important differences in the relative strength of the examined relationships, providing insights that extend beyond mere statistical significance. Digital transformation and digital service capability emerge as the most influential drivers of innovation performance, while big data analytics capability plays an important amplifying role.

The results indicate that digital innovation and digital transformation exert significant positive effects on both digital service capability ($\beta = 0.140$, $p = 0.010$; $\beta = 0.432$, $p = 0.000$) and digital innovation performance ($\beta = 0.201$, $p = 0.003$; $\beta = 0.236$, $p = 0.003$). These findings are consistent with prior studies (Khin & Ho, 2019; Shehadeh et al., 2023), which argue that organizations leveraging digital technologies can enhance operational flexibility, responsiveness, and innovation outcomes. Similarly, M. Zhang et al. (2024) emphasize that digital transformation acts as a strategic enabler by restructuring business processes and strengthening digital innovation performance.

Digital service capability also demonstrates a strong positive influence on digital innovation performance ($\beta = 0.235$, $p = 0.001$), confirming its mediating role in the relationship between digital innovation, digital transformation, and innovation outcomes (H7 and H8). This finding is in line with De la Calle et al. (2020), who argue that digital service capability enables firms to convert technological investments into innovative products and services. It also supports Aspiranti et al. (2023), who highlight that the integration of technology-driven processes improves both efficiency and differentiation in service innovation.

Barriers to innovation exhibit significant negative effects on both collaboration with the innovation system ($\beta = -0.676$, $p = 0.000$) and digital innovation performance ($\beta = -0.177$, $p = 0.002$), while collaboration with the innovation system positively affects innovation performance ($\beta = 0.592$, $p = 0.000$). These results are consistent with Yıldız et al. (2021), who found that firms with strong collaborative networks are better able to overcome financial and informational constraints. Moreover, the mediation effect of collaboration ($\beta = -0.411$, $p = 0.000$) suggests that external partnerships can mitigate the negative consequences of internal barriers and convert them into more favourable innovation outcomes. This reinforces the importance of open innovation systems, particularly in resource-constrained environments.

These results, however, should be interpreted within the regulatory context of the Vietnamese banking sector. In more developed or less regulated markets, the effects identified in this study may be stronger or may even differ in direction. In environments characterized by lighter regulation and more intense fintech competition, digital innovation may have a more direct influence on innovation performance because banks are under greater pressure to experiment and differentiate rapidly (Hidayat-ur-Rehman & Hossain, 2025; Lee et al., 2025).

The moderating effects of big data analytics capability are not only statistically significant but also practically meaningful, with medium to large effect sizes ($\beta = 0.233$–0.271, $p = 0.000$). This indicates that analytics capability substantially amplifies the innovation returns of digital transformation, digital innovation, and digital service capability, rather than exerting only a marginal effect. This finding supports prior evidence from Aspiranti et al. (2023), which shows that the ability to collect, process, and interpret large-scale data enhances decision-making and strengthens the relationship between digital initiatives and innovation outcomes. Banks with advanced analytics capabilities are better positioned to prioritize and sequence digital initiatives, thereby magnifying the observed effects. From this perspective, the moderating role may partly reflect superior managerial decision-making and governance structures rather than analytics capability alone.

At the same time, the role of big data analytics capability may vary across institutional contexts. In less regulated systems, analytics may support more radical forms of innovation, whereas in stricter regulatory environments it is often used primarily for risk control and compliance purposes (Nehrebecka, 2025). This nuanced role highlights the need to balance data-driven control with organizational creativity in regulated banking settings. In such environments, analytics may favor efficiency and incremental innovation over experimentation, suggesting that the observed moderating effect reflects a context-specific balance between control and creativity rather than a universally positive influence on innovation. This interpretation is especially relevant in emerging-market banking systems, where digital transformation is frequently policy-driven, and risk considerations strongly shape the use of analytics in innovation activities. Accordingly, the role of big data analytics capability in innovation may be more complex than that of a simple performance-enhancing mechanism. Future research should therefore examine the conditions under which analytics fosters creativity rather than reinforcing control-oriented innovation paths.

Model fit and explanatory power were satisfactory, with SRMR and NFI values meeting recommended thresholds and R^2 values indicating moderate to substantial explanatory power. The SRMR value of 0.061 was below the recommended threshold of 0.08, indicating good model fit, while the NFI value of 0.921 exceeded 0.90, confirming satisfactory model adequacy (Henseler et al., 2016). In addition, the R^2 values for digital service capability (0.524) and digital innovation performance (0.637) suggest moderate to substantial explanatory power (Hair et al., 2021). These results indicate that the model explains a considerable proportion of the variance in innovation performance, confirming that digital capabilities and collaboration mechanisms play a meaningful role in shaping innovation outcomes in banking practice.

Regarding effect sizes, digital transformation and digital innovation showed medium effects on digital service capability (f^2 = 0.187 and 0.165), while digital service capability and big data analytics capability demonstrated large effects on digital innovation performance (f^2 = 0.356 and 0.324 (Cohen, 1988). These differences suggest that banks may achieve greater innovation gains by prioritizing digital transformation and service capability development, while using analytics capability as a strategic enhancer rather than as a standalone driver.

5. CONCLUSION AND MANAGERIAL IMPLICATIONS

5. 1. CONCLUSION

This study demonstrates that digital initiatives in banking do not improve innovation performance on their own. Their effect depends on the extent to which they are transformed into operational capabilities embedded within service processes. In this respect, capability transformation appears to matter more than the mere ownership of digital resources. The findings are consistent with prior studies linking digital transformation to innovation outcomes, but they further suggest that this relationship is not purely direct. Rather, innovation performance is shaped by the interaction of multiple capabilities. Big data analytics capability, for instance, does not simply drive innovation independently; instead, it can strengthen or constrain the effects of other digital efforts depending on how it is deployed and governed. By integrating strategic, managerial, and technology-adoption perspectives, this study highlights that digital advantage in regulated banking environments arises from coordination, alignment, and contextual adaptation rather than from technology investment alone. The central implication is clear: digital resources create value only when they are effectively integrated and strategically managed within institutional constraints.

5. 2. MANAGERIAL IMPLICATIONS

The empirical findings show that digital transformation and digital innovation significantly influence innovation performance both directly and indirectly through digital service capability. For bank managers, these results suggest that digital innovation, digital transformation, and big data analytics capability should be treated as core strategic resources. Managers should prioritize the development of new digital products and services that enhance service quality and improve customer experience. Since digital service capability was identified as a significant mediator, banks should focus not only on adopting digital technologies but also on strengthening their ability to operationalize those technologies within service processes. In this regard, cultivating an organizational culture that supports experimentation, learning and creativity is essential. Digital transformation should therefore be managed as a long-term, organization-wide process involving the modernization of core banking systems, the digitalization of customer interactions, and improved data integration across departments. The results further demonstrate a strong positive effect of digital service capability on digital innovation performance, providing empirical support for investments in digital platforms, automation tools, and employee digital skills. Digital service capability plays a central role in translating digital initiatives into innovation outcomes. Accordingly, managers should invest in organizational and technological mechanisms that enable the effective deployment of digital solutions. At the same time, internal barriers such as limited expertise, resource constraints, and resistance to change should be addressed through structured change management practices and through collaboration with fintech firms, universities, and technology providers. This recommendation is consistent with the finding that collaboration with the innovation system significantly mitigates the negative effects of innovation barriers. Big data analytics, meanwhile, should be used to support managerial decision-making and innovation evaluation, but without constraining organizational creativity. From the perspective of regulatory authorities, the findings highlight the importance of maintaining a regulatory environment that supports innovation while preserving financial stability. Given the conditional role of big data analytics capability in regulated contexts, regulatory frameworks should balance compliance requirements with sufficient flexibility for innovation. Clear and consistent regulations relating to digital banking, data governance, and technology adoption can reduce uncertainty and encourage long-term digital investment by banks. Regulators may also play an important role in supporting secure data-sharing arrangements and interoperability mechanisms that enable banks to use big data analytics responsibly while protecting consumers and managing systemic risks. For public policymakers, the study emphasizes the importance of strengthening the broader financial innovation ecosystem. Because collaboration with external partners was found to significantly enhance innovation performance, policies that encourage cooperation among banks, fintech firms, research institutions, and universities are strongly supported by the empirical evidence. Policy measures should therefore focus on developing digital infrastructure, improving workforce upskilling, and strengthening digital education. Encouraging collaboration across these actors can accelerate knowledge transfer and reduce innovation barriers. In addition, policies that promote the responsible use of big data analytics and artificial intelligence, while safeguarding data privacy and ethical standards, can improve the long-term competitiveness and resilience of the banking sector.

6. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study provides important insights into the relationships among digital innovation, digital transformation, digital service capability, big data analytics capability, collaboration with the innovation system, and digital innovation performance in the banking sector. Nevertheless,

several limitations should be acknowledged. First, the data were collected from Vietnamese commercial banks, where digital transformation remains at a developing stage, which may limit the generalizability of the findings to more mature financial markets. Second, the study relies on managers' perceptions, which may introduce subjective bias. Future research could address this limitation by combining perceptual measures with objective indicators, such as digital investment intensity, innovation outputs, or customer adoption rates, to enhance reliability and validity. In addition, the current model primarily emphasizes internal capabilities and collaboration-related factors, without explicitly incorporating environmental or institutional variables that may also shape innovation performance. Future studies could therefore extend the framework by integrating external determinants such as regulatory conditions, market competition, and levels of digital readiness to provide a more comprehensive understanding of innovation dynamics in banking. Further research may also examine potential nonlinear or reciprocal relationships between big data analytics capability and organizational creativity. Another limitation is the cross-sectional nature of the research design, which captures the relationships among digital capabilities and innovation performance at a single point in time. Although this approach is appropriate for theory testing, it restricts the ability to observe how digital transformation, digital service capability, and big data analytics capability evolve and interact over time. Future research should therefore consider longitudinal and comparative designs to capture the dynamic development of digital capabilities and to test the robustness of the proposed relationships across different national and institutional banking contexts. In addition, although the measurement of digital service capability is based on functionally adapted items, future studies could further refine sector-specific scales tailored more explicitly to banking and other service industries. Taken together, these limitations also point to promising directions for future research that can refine and extend the proposed framework.

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During the preparation of this manuscript, the author used ChatGPT to improve grammar, punctuation, and language fluency. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

Disclosure statement

The author states that there is no conflict of interest.

Data availability statement

The data supporting this study's findings are available on request from the author. The data are not publicly available due to the privacy of research participants.

REFERENCES

Abera, M., Marvadi, C., & Suthar, D. (2025). Digitization strategy and innovation performance of microfinance institutions: mediating role of innovation capability. *Journal of Accounting & Organizational Change*, *21*(2), 250–277. https://doi.org/10.1108/JAOC-12-2023-0241

Adiguzel, Z., Sonmez Cakir, F., & Özbay, F. (2025). Big data analytics capability and sustainability in company innovation. *International Journal of Innovation Science*. https://doi.org/10.1108/IJIS-08-2024-0231

Agrawal, R., Samadhiya, A., Banaitis, A., & Kumar, A. (2025). Entrepreneurial barriers in achieving sustainable business and cultivation of innovation: a resource-based view theory perspective. *Management Decision*, *63*(4), 1207–1228. https://doi.org/10.1108/MD-11-2023-2032

Al Issa, H. E., & Omar, M. M. S. (2024). Digital innovation drivers in retail banking: the role of leadership, culture, and technostress inhibitors. *International Journal of Organizational Analysis*, *32*(11), 19–43. https://doi.org/10.1108/IJOA-08-2023-3905

Alonge, E. O., Ifesinachi Daraojimba, A., Damilare Balogun, E., Oluwabusayo Alonge, E., Louis Eyo-udo, N., Chibunna Ubanadu, B., & Olusola Ogunsola, K. (2025). *Digital Transformation in Retail Banking to Enhance Customer Experience and Profitability*. https://www.researchgate.net/publication/390023729

Asiaei, K., Rezaee, Z., Bontis, N., Barani, O., & Sapiei, N. S. (2021). Knowledge assets, capabilities and performance measurement systems: a resource orchestration theory approach. *Journal of Knowledge Management*, *25*(8), 1947–1976. https://doi.org/10.1108/JKM-09-2020-0721

Aspiranti, T., Ali, Q., & Amaliah, I. (2023). Big Data Analytics to Support Open Innovation Strategies in Banks. *Risks*, *11*(6). https://doi.org/10.3390/risks11060106

Awad, J. A. R., & Martín-Rojas, R. (2024). Digital transformation influence on organisational resilience through organisational learning and innovation. *Journal of Innovation and Entrepreneurship*, *13*(1). https://doi.org/10.1186/s13731-024-00405-4

Bakri, A. A., Hasanah, N., & Lasmiatun, K. (2024). Financial technology innovation and banking industry transformation: A literature study on financial markets. *Jurnal Ekonomi, Manajemen Dan Perbankan*. http://altinriset.com/journal/index.php/multifinance

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17(1)*, 99–120. https://doi.org/10.1177/014920639101700108

Bhatti, S. H., Hussain, W. M. H. W., Khan, J., Sultan, S., & Ferraris, A. (2024). Exploring data-driven innovation: What's missing in the relationship between big data analytics capabilities and supply chain innovation? *Annals of Operations Research*, *333*(2–3), 799–824. https://doi.org/10.1007/s10479-022-04772-7

Böttcher, T. P., Empelmann, S., Weking, J., Hein, A., & Krcmar, H. (2024). Digital sustainable business models: Using digital technology to integrate ecological sustainability into the core of business models. *Information Systems Journal*, *34*(3), 736–761. https://doi.org/10.1111/isj.12436

Chaudhuri, R., Chatterjee, S., Vrontis, D., & Thrassou, A. (2024). Adoption of robust business analytics for product innovation and organizational performance: the mediating role of organizational data-driven culture. *Annals of Operations Research*, *339*(3), 1757–1791. https://doi.org/10.1007/s10479-021-04407-3

Chen, C. S., Liu, G., Roushan, G., & Nguyen, B. (2025). Exploring Information Technology Capabilities from Multiple Aspects of the Resource-Based Theory. *Information Systems Frontiers*, *27*, 1013–1043. https://doi.org/10.1007/s10796-024-10490-1

Chen, G., Loi, E. H. N., & Chan, K. I. (2026). The Effect of Carbon Trading on Corporate Digital Transformation. *Economics - Innovative and Economic Research Journal,* 14(1), 51-71. https://doi.org/10.2478/eoik-2026-0003

Chen, P., & Kim, S. K. (2023). The impact of digital transformation on innovation performance - The mediating role of innovation factors. *Heliyon*, *9*(3). https://doi.org/10.1016/j.heliyon.2023.e13916

Chong, C.-L., Abdul Rasid, S. Z., Khalid, H., & Ramayah, T. (2024). Big data analytics capability for competitive advantage and firm performance in Malaysian manufacturing firms. *International Journal of Productivity and Performance Management*, *73*(7), 2305–2328. https://doi.org/10.1108/IJPPM-11-2022-0567

Chountalas, P. T., Chatzifoti, N., Alexandropoulou, A., & Georgakellos, D. A. (2024). Analyzing Barriers to Innovation Management Implementation in Sustainable Tourism Using DEMATEL Method. *World*, *5*(4), 1004–1022. https://doi.org/10.3390/world5040051

Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, *7*(3), 269–297. https://doi.org/10.1037/0278-6133.7.3.269

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

De la Calle, A., Freije, I., Ugarte, J. V., & Larrinaga, M. A. (2020). Measuring the impact of digital capabilities on product-service innovation in Spanish industries. *Measuring International Journal of Business Environment*, *11*(3), 254–274. https://doi.org/10.1504/IJBE.2020.110904

Dudakov, G., Molchanov, N., & Kostenarov, K. (2020, November 18). The Impact of Digital Transformation on Building Business Models. *ACM International Conference Proceeding Series*. https://doi.org/10.1145/3446434.3446489

El Nemar, S., El-Chaarani, H., Dandachi, I., & Castellano, S. (2025). Resource-based view and sustainable advantage: a framework for SMEs. *Journal of Strategic Marketing*, *33*(6), 798–821. https://doi.org/https://doi.org/10.1080/0965254X.2022.2160486

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

Frishammar, J., Parida, V., Panda, D., & Kaipainen, J. (2025). On the Right Path to Circularity or Running Around in Circles? A Fresh Perspective on Circular Business Model Barriers. *Business Strategy and the Environment*, *34*(4), 4958–4979. https://doi.org/10.1002/bse.4225

Garad, A., Riyadh, H. A., Al-Ansi, A. M., & Beshr, B. A. H. (2024). Unlocking financial innovation through strategic investments in information management: a systematic review. *Discover Sustainability*, *5*(1). https://doi.org/10.1007/s43621-024-00542-6

Garmaki, M., Gharib, R. K., & Boughzala, I. (2023). Big data analytics capability and contribution to firm performance: the mediating effect of organizational learning on firm performance. *Journal of Enterprise Information Management*, *36*(5), 1161–1184. https://doi.org/10.1108/JEIM-06-2021-0247

Ghosn, F., Zreik, M., Awad, G., Tahan, S., & Ashaal, A. (2024). Enhancing financial inclusion in China amidst COVID-19: Opportunities, challenges, and strategies. *Journal of Infrastructure, Policy and Development*, *8*(6). https://doi.org/10.24294/jipd.v8i6.3777

Grassi, L., Figini, N., & Fedeli, L. (2022). How does a data strategy enable customer value? The case of FinTechs and traditional banks under the open finance framework. *Financial Innovation*, *8*(1). https://doi.org/10.1186/s40854-022-00378-x

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *An Introduction to Structural Equation Modeling* (pp. 1–29). https://doi.org/10.1007/978-3-030-80519-7_1

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management and Data Systems*, *116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Hidayat-ur-Rehman, I., & Hossain, N. (2025). The impacts of Fintech adoption, green finance and competitiveness on banks' sustainable performance: digital transformation as moderator. *Asia-Pacific Journal of Business Administration*, *17*(4), 987–1020. https://doi.org/10.1108/APJBA-10-2023-0497

Hongyun, T., Sohu, J. M., Khan, A. U., Junejo, I., Shaikh, S. N., Akhtar, S., & Bilal, M. (2025). Navigating the digital landscape: examining the interdependencies of digital transformation and big data in driving SMEs' innovation performance. *Kybernetes*, *54*(3), 1797–1825. https://doi.org/10.1108/K-07-2023-1183

Hung Nguyen, T. (2024). Digital Transformation in Vietnam - Trends and Solutions in the Coming Time. *International Journal of Advanced Multidisciplinary Research and Studies*, *4*(3), 407–415. https://doi.org/10.62225/2583049x.2024.4.3.2801

Isiaku, L., & Adalier, A. (2024). Determinants of business intelligence systems adoption in Nigerian banks: The role of perceived usefulness and ease of use. *Information Development*. https://doi.org/10.1177/02666669241307024

Jiang, H., Yang, J., & Gai, J. (2023). How digital platform capability affects the innovation performance of SMEs—Evidence from China. *Technology in Society*, *72*. https://doi.org/10.1016/j.techsoc.2022.102187

Karltorp, K., & Perez Vico, E. (2025). Factors influencing incumbent energy firms' radical innovations implementation – A review. In *Renewable and Sustainable Energy Reviews* (Vol. 210). Elsevier Ltd. https://doi.org/10.1016/j.rser.2024.115256

Kazantsev, N., Pishchulov, G., Mehandjiev, N., Sampaio, P., & Zolkiewski, J. (2022). Investigating barriers to demand-driven SME collaboration in low-volume high-variability manufacturing. *Supply Chain Management*, *27*(2), 265–282. https://doi.org/10.1108/SCM-10-2021-0486

Kero, C. A., & Bogale, A. T. (2023). A Systematic Review of Resource-Based View and Dynamic Capabilities of Firms and Future Research Avenues. In *International Journal of Sustainable Development and Planning* (Vol. 18, Number 10, pp. 3137–3154). International Information and Engineering Technology Association. https://doi.org/10.18280/ijsdp.181016

Khin, S., & Ho, T. C. F. (2019). Digital technology, digital capability and organizational performance: A mediating role of digital innovation. *International Journal of Innovation Science*, *11*(2), 177–195. https://doi.org/10.1108/IJIS-08-2018-0083

Khuntia, J., Saldanha, T., Kathuria, A., & Tanniru, M. R. (2024). Digital service flexibility: a conceptual framework and roadmap for digital business transformation. *European Journal of Information Systems*, *33*(1), 61–79. https://doi.org/10.1080/0960085X.2022.2115410

Kraaijenbrink, J., Spender, J. C., & Groen, A. J. (2010). The Resource-based view: A review and assessment of its critiques. *Journal of Management*, *36*(1), 349–372. https://doi.org/10.1177/0149206309350775

Larabi, C. (2025). The role of innovation capability and strategic orientation to achieve competitive advantage: the mediating effect of strategic renewal in SMEs. *Journal of Strategy and Management*, 1–28. https://doi.org/10.1108/JSMA-07-2025-0287

Lee, C. C., Fang, L., Zhao, J., Yu, C. H., & Zhang, J. (2025). How does FinTech development drive corporate innovation? Fresh evidence from the perspective of financial supply. *Technological and Economic Development of Economy*, *31*(1), 244–279. https://doi.org/10.3846/tede.2024.22192

Li, S., Gao, L., Han, C., Gupta, B., Alhalabi, W., & Almakdi, S. (2023). Exploring the effect of digital transformation on Firms' innovation performance. *Journal of Innovation and Knowledge*, *8*(1). https://doi.org/10.1016/j.jik.2023.100317

Liu, H., Cong, R., Liu, L., Li, P., & Ma, S. (2025). The impact of digital transformation on innovation efficiency in construction enterprises under the dual carbon background. *Journal of Asian Architecture and Building Engineering*. https://doi.org/10.1080/13467581.2025.2499723

Mastilo, Z., Barić, F. & Puška, A. (2025). Challenges and Opportunities of Implementing Digital Payment Systems in Southeast European Countries. *Journal of Central Banking Theory and Practice*, 14(2), 5-28. https://doi.org/10.2478/jcbtp-2025-0011

Meena G, & Santhanalakshmi, K. (2025). Deconstructing Digital Transformation: A Multidimensional Analysis of Digital Literacy's Role in Shaping Human Capital and Driving Organizational Success. *Economics - Innovative and Economic Research Journal,* 13(1), 405-430. https://doi.org/10.2478/eoik-2025-0018

Motamedimoghadam, M., Mira da Silva, M., & Amaral, M. (2025). Organizational capabilities for digital innovation: a systematic literature review. *European Journal of Innovation Management*, *28*(7), 3024–3048. https://doi.org/10.1108/EJIM-02-2024-0227

Naimi-Sadigh, A., Asgari, T., & Rabiei, M. (2022). Digital Transformation in the Value Chain Disruption of Banking Services. *Journal of the Knowledge Economy*, *13*(2), 1212–1242. https://doi.org/10.1007/s13132-021-00759-0

Nehrebecka, N. (2025). Short- and long-term effects of environmental factors on credit risk: evidence from polish publicly listed firms. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-025-06608-3

Nosike, C. J., Ojobor, O. S. N., & Nosike, C. U. (2024). Enhancing business resilience: Innovation and adaptation during and after the global pandemic. *International Journal of Financial, Accounting, and Management*, *6*(2), 217–229. https://doi.org/10.35912/ijfam.v6i2.1891

Park, I., Kim, D., Moon, J., Kim, S., Kang, Y., & Bae, S. (2022). Searching for New Technology Acceptance Model under Social Context: Analyzing the Determinants of Acceptance of Intelligent Information Technology in Digital Transformation and Implications for the Requisites of Digital Sustainability. *Sustainability (Switzerland)*, *14*(1). https://doi.org/10.3390/su14010579

Paul, J., Ueno, A., Dennis, C., Alamanos, E., Curtis, L., Foroudi, P., Kacprzak, A., Kunz, W. H., Liu, J., Marvi, R., Nair, S. L. S., Ozdemir, O., Pantano, E., Papadopoulos, T., Petit, O., Tyagi, S., & Wirtz, J. (2024). Digital transformation: A multidisciplinary perspective and future research agenda. *International Journal of Consumer Studies*, *48*(2). https://doi.org/10.1111/ijcs.13015

Perotti, F. A., Troise, C., Ferraris, A., & Hirwani Wan Hussain, W. M. (2025). Bridging Innovation Management and Circular Economy: An Empirical Assessment of Green Innovation and Open Innovation. *Creativity and Innovation Management*, *34*(2), 466–485. https://doi.org/10.1111/caim.12647

Qiu, P., & Chang, B. (2025). The impact of digital transformation on open innovation performance: The intermediary role of digital innovation dynamic capability. *PLoS ONE*, *20*(3 March). https://doi.org/10.1371/journal.pone.0317785

Reyes-Gómez, J. D., López, P., & Rialp, J. (2025). The relationship between strategic orientations and firm performance and the role of innovation: a meta-analytic assessment of theoretical models. *International Journal of Entrepreneurial Behaviour and Research*, *31*(2–3), 810–845. https://doi.org/10.1108/IJEBR-02-2022-0200

Rialti, R., & Filieri, R. (2024). Leaders, let's get agile! Observing agile leadership in successful digital transformation projects. *Business Horizons*, *67*(4), 439–452. https://doi.org/10.1016/j.bushor.2024.04.003

Rosienkiewicz, M., Helman, J., Cholewa, M., Molasy, M., Górecka, A., Kohen-Vacs, D., Winokur, M., Amador Nelke, S., Levi, A., Gómez-González, J. F., Bourgain, M., Sagar, A., Berselli, G., & Benis, A. (2024). Enhancing Technology-Focused Entrepreneurship in Higher Education Institutions Ecosystem: Implementing Innovation Models in International Projects. *Education Sciences*, *14*(7). https://doi.org/10.3390/educsci14070797

Rubio-Andrés, M., Linuesa-Langreo, J., Gutiérrez-Broncano, S., & Sastre-Castillo, M. Á. (2025). Tackling digital transformation strategy: how it affects firm innovation and organizational effectiveness. *Journal of Technology Transfer*, *50*(5), 1893–1918. https://doi.org/10.1007/s10961-024-10164-9

Sagala, G. H., & Őri, D. (2024). Toward SMEs digital transformation success: a systematic literature review. *Information Systems and E-Business Management*, *22*(4), 667–719. https://doi.org/10.1007/s10257-024-00682-2

Shehadeh, M. (2025). Disclosures on digital transformation strategy and financial technology in Jordanian banks: innovations, challenges and opportunities. *Journal of Financial Reporting and Accounting*. https://doi.org/10.1108/JFRA-12-2024-0972

Shehadeh, M., Almohtaseb, A., Aldehayyat, J., & Abu-AlSondos, I. A. (2023). Digital Transformation and Competitive Advantage in the Service Sector: A Moderated-Mediation Model. *Sustainability (Switzerland)*, *15*(3). https://doi.org/10.3390/su15032077

Stergiou, G., Kavakli, E., & Kotis, K. (2023). Towards a technology acceptance methodology for Industry 4.0. *Procedia Computer Science*, *219*, 832–839. https://doi.org/10.1016/j.procs.2023.01.357

Torres de Oliveira, R., Gentile-Lüdecke, S., & Figueira, S. (2022). Barriers to innovation and innovation performance: the mediating role of external knowledge search in emerging economies. *Small Business Economics*, *58*(4), 1953–1974. https://doi.org/10.1007/s11187-021-00491-8

Tsindeliani, I. A., Proshunin, M. M., Sadovskaya, T. D., Popkova, Z. G., Davydova, M. A., & Babayan, O. A. (2022). Digital transformation of the banking system in the context of sustainable development. *Journal of Money Laundering Control*, *25*(1), 165–180. https://doi.org/10.1108/JMLC-02-2021-0011

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, *122*, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003

Vo, D. H., Vo, A. T., Dinh, C. T. H., & Tran, N. P. (2024). Corporate restructuring and firm performance in Vietnam: The moderating role of digital transformation. *PLoS ONE*, *19*(5 May). https://doi.org/10.1371/journal.pone.0303491

Xia, H., Liu, M., Wang, P., & Tan, X. (2024). Strategies to enhance the corporate innovation resilience in digital era: A cross-organizational collaboration perspective. *Heliyon*, *10*(20). https://doi.org/10.1016/j.heliyon.2024.e39132

Xu, M., Zhang, Y., Sun, H., Tang, Y., & Li, J. (2024). How digital transformation enhances corporate innovation performance: The mediating roles of big data capabilities and organizational agility. *Heliyon*, *10*(14). https://doi.org/10.1016/j.heliyon.2024.e34905

Yıldız, E. B., Dabić, M., Stojčić, N., Dindaroğlu, Y., & Temel, S. (2021). Scrutinizing innovation performance of family firms in efficiency-driven environment. *Journal of Business Research*, *129*, 260–270. https://doi.org/10.1016/j.jbusres.2021.02.022

Zhang, G., & Ravishankar, M. N. (2024). The role of capabilities in digital service development and delivery: the case of start-up organisations. *Information Technology and People*, *37*(3), 1156–1184. https://doi.org/10.1108/ITP-05-2021-0404

Zhang, M., Chen, X., Xie, H., Esposito, L., Parziale, A., Taneja, S., & Siraj, A. (2024). Top of tide: Nexus between organization agility, digital capability and top management support in SME digital transformation. *Heliyon*, *10*(10). https://doi.org/10.1016/j.heliyon.2024.e31579

Zheng, J., Zhang, J. Z., Kamal, M. M., Wang, H., Yang, Y., Dey, B., & Apostolidis, C. (2025). Empowering Radical Innovation: How Digital Technologies Drive Knowledge Transfer and Co-Creation in Innovation Ecosystems. *R and D Management*, *55*(5), 1444–1458. https://doi.org/10.1111/radm.12764