ISSN 2723-6471

Applied Data Science for Analyzing the Mediating Role of Digital Transformation Influencing Banking Business Efficiency in Vietnam

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(Received: December 15, 2024; Revised: January 25, 2025; Accepted: April 29, 2025; Available online: July 13, 2025)

Abstract

In the context of accelerated digitalization and growing competitive pressures, commercial banks in emerging economies urgently need to enhance internal capabilities to drive innovation and performance. This study investigates how key organizational factors, including employee engagement, leadership style, corporate culture, financial capacity, and management capacity, influence creative innovation and digital transformation and how these, in turn, impact business efficiency in Vietnamese commercial banks. Grounded in the Resource-Based View and Dynamic Capabilities Theory, the research develops and empirically tests a comprehensive structural model using data collected from 942 banking professionals across 30 commercial banks in Vietnam. A mixed-methods approach was employed, combining expert interviews with a large-scale survey. Structural Equation Modeling (SEM) and bootstrapped mediation analysis were used to test 17 hypotheses. The results reveal that all five internal factors positively influence Creative Innovation (CI) and Digital Transformation (DT). Notably, employee engagement and management capacity emerged as the strongest drivers. Creative innovation exerts the most significant direct effect on business efficiency, while digital transformation plays a complementary but weaker mediating role. The findings validate a multi-layered framework linking organizational dynamics to performance, offering novel insights into how banks can align internal resources with strategic goals. This study contributes to the literature by positioning creative innovation and digital transformation as mediators between organizational capabilities and business outcomes. It also provides actionable recommendations for bank executives seeking to enhance operational efficiency through people-centered, innovation-led strategies tailored to the context of emerging markets. Finally, policymakers and bank leaders should implement digital Key Performance Indicators (KPIs), foster employee-led innovation, invest in managerial training, and align human resource incentives with transformation goals to enhance efficiency and resilience in Vietnam's banking sector.

Keywords: Data Science, Creative Innovation, Digital Transformation, Business Efficiency, Banking Sector

1. Introduction

The banking business is experiencing profound changes in this age of fast technology innovation and changing consumer expectations. There is an increasing need for commercial banks, especially in developing nations like Vietnam, to improve service delivery, stay ahead of the competition, and embrace digital technologies [1]. Digital platforms, automated services, and data-driven decision-making are reshaping traditional banking models traditionally defined by physical infrastructure and manual operations. So, more than ever before, there is a need for creative thinking from the inside, strong management techniques, and an encouraging work environment.

Innovative thinking and digital transformation have become cornerstones of contemporary banking strategies that enhance operational effectiveness. By partnering with creative innovation firms, businesses can better understand their customers' needs, streamline internal operations, and develop innovative products [2]. At the same time, digital transformation promotes operational agility and scalability, acting as a strategic enabler. The internal capabilities of the firm, particularly those about human capital, leadership, culture, financial strength, and management effectiveness, will determine the extent to which these strategic efforts are successful. Despite the growing recognition of innovation and digitalization as performance drivers, the underlying determinants that shape their success remain underexplored, especially within the context of developing economies. In Vietnam, where the banking sector is vital in economic

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DOI: https://doi.org/10.47738/jads.v6i3.807

ISSN 2723-6471

growth and financial inclusion, studies examining the interplay between organizational factors and performance outcomes are still relatively limited. Most existing research focuses on technological adoption or service innovation from a technical or marketing perspective, leaving a gap in understanding how internal organizational dynamics such as employee engagement, leadership style, and corporate culture contribute to innovation and efficiency [3], [4].

This study seeks to fill that gap by referring to an integrated framework that links internal organizational factors to innovation outcomes and, ultimately, to business efficiency. Specifically, we examine how Employee Engagement (EE), Leadership Style (LS), Corporate Culture (CC), Financial Capacity (FC), and Management Capacity (MC) influence Creative Innovation (CI) and Digital Transformation (DT) and how these two strategic drivers, in turn, affect business efficiency (BE) in commercial banks. The study is grounded in organizational behavior theory, innovation management, and strategic capability frameworks, providing a multi-theoretical foundation for analysis.

Theoretical background: The research is inspired by several complementary theoretical perspectives. First, the Resource-Based View (RBV) emphasizes that tangible and intangible organizational resources are crucial for sustaining competitive advantage. Human resources (engagement), leadership, and financial strength are core capabilities that influence organizations to innovate and adapt. Second, Dynamic Capability Theory supports the notion that firms must integrate, build, and reconfigure internal competencies to respond to rapidly changing environments, especially in the digital age. Third, Innovation Diffusion Theory suggests that organizational context plays a key role in adopting and diffusing new ideas and technologies [5], [6]. Together, these frameworks inform the research model and guide hypothesis development.

Research gaps: Although innovation and digital transformation are widely studied topics, prior research presents several limitations: (1) Fragmented focus – Many studies examine innovation or digital transformation separately, rarely exploring how they interact or co-evolve in involving business efficiency. (2) Neglect of soft factors – Empirical research emphasizes technological readiness and external market factors, with less attention paid to organizational behaviors such as employee engagement or leadership style. (3) Lack of contextual research in developing countries – Most literature is dominated by Western or high-income economies studies, with limited insights into transitional markets like Vietnam, where organizational and cultural characteristics may differ significantly. (4) Limited integration of managerial capacity and financial strength as strategic enablers – these internal resources are often treated as control variables rather than central constructs. (5) This study addresses these gaps by developing a comprehensive model that captures the direct and indirect relationships among key organizational factors, creative innovation, digital transformation, and business efficiency, specifically within the Vietnamese commercial banking context.

Research contributions: This research contributes to both theory and practice. Theoretically, it integrates diverse constructs into a single model, offering a holistic view of how innovation and digital transformation are shaped by internal dynamics. It also extends the application of RBV and dynamic capabilities theory in the context of emerging markets. Practically, the findings offer valuable insights for bank leaders, motivated and HR professionals seeking to enhance performance through innovation-driven strategies. Identifying which internal factors matter most and how they can better design training programs, leadership development, cultural transformation, and financial planning aligned with strategic goals.

2. Literature Empirical Review and Hypothesis Development

2.1. Business Efficiency

Business efficiency refers to the organization's ability to optimize resources, reduce waste, and deliver products or services effectively while maintaining or improving quality. It maximizes output relative to input across various operational processes [5]. In banking, efficiency is crucial for reducing costs, improving customer service, and maintaining profitability in a competitive market. Efficient banks can streamline workflows, reduce processing times, and enhance risk management, showing that financial, customer, internal process, and learning perspectives contribute to organizational efficiency. Innovation, leadership, digital adoption, and employee engagement significantly enhance efficiency [6]. Improving business efficiency helps organizations remain agile, scalable, and financially sustainable in dynamic environments.

2.2. Digital Transformation

Digital transformation refers to integrating digital technologies into all areas of an organization, fundamentally changing how it operates and delivers value to customers. It involves more than just adopting new tools. It requires process changes, business models, and organizational culture [7], [8]. In the banking sector, digital transformation includes mobile banking, AI-based customer service, digital payments, and automation of internal processes. Successful digital transformation depends on leadership, employee readiness, financial investment, and a supportive culture [9], [10]. The benefits include increased efficiency, reduced operational costs, and improved customer satisfaction. However, it also presents challenges related to change management, cybersecurity, and workforce reskilling. Therefore, digital transformation is a technological and strategic shift that drives innovation and competitive advantage in modern banking.

2.3. Employee Engagement

The term "employee engagement" describes the level of dedication workers have for their company, personally and professionally [10]. A highly engaged and appreciated workforce is likelier to provide suggestions, participate in meetings, and back workplace improvements. Enthusiastic workers can pitch in when faced with challenges, develop creative solutions, and build strong teams [10], [11]. This passionate and direct involvement lays the groundwork for groundbreaking new ideas. Companies like commercial banks rely on employee involvement to constantly update their offerings and internal processes [12], [13]. This is crucial for producing new ideas. Low engagement levels cause innovation to stall because disengaged or uninterested workers are less likely to take the initiative to improve things [14], [15]. As a result, it stands to reason that employee engagement is crucial for fostering innovation, risk-taking, and constant progress. Thus, the authors gave hypotheses H1, H2, and H3 in figure 1.

H1: EE positively influences CI.
H2: EE positively influences BE.
H3: EE positively influences DT.

2.4. Leadership Style

Leadership style refers to leaders' behavioral patterns and approaches to influence, guide, and motivate their followers toward achieving organizational objectives. It includes decision-making, communication, inspiration, and the ability to support and develop subordinates [16]. Transformational leadership emphasizes vision, charisma, intellectual stimulation, and individualized consideration [17]. This style is especially relevant in dynamic and complex environments such as banking, where leaders must guide employees through uncertainty, promote adaptability, and encourage innovation [18]. Effective leadership is key in shaping organizational culture, managing change, and driving performance [19], [20]. When leadership fosters trust, collaboration, and empowerment, it creates a work environment conducive to employee engagement and innovation, ultimately enhancing business efficiency and competitiveness. Thus, the authors gave hypotheses H4, H5, and H6 in figure 1.

H4: LS positively influences CI.
H5: LS positively influences BE.
H6: LS positively influences DT.

2.5. Corporate Culture

An organization's social and psychological climate comprises its shared values, beliefs, conventions, and practices; this makes up corporate culture [21]. It impacts employees' interactions, decision-making, and responses to challenges. Consistency, engagement, flexibility, and mission alignment are four ways a robust company culture boosts performance [22], [23]. A culture encouraging and supporting innovation is crucial in the banking industry, as it places a premium on trust, compliance, and service quality. Creativity, employee engagement, and change projects like digital transformation may all flourish in an environment that promotes transparency, cooperation, and continuous improvement. On the other hand, creativity and advancement might be stifled by a culture that is either risk-averse or too restrictive. Consequently, attaining strategic objectives and guaranteeing long-term success depends on fostering a robust and optimistic corporate culture. Thus, the authors proposed the final hypotheses, H7, H8, and H9, as shown in figure 1.

 ISSN 2723-6471

H7: CC positively influences CI.
H8: CC positively influences BE.
H9: CC positively influences DT.

2.6. Financial Capacity

An organization's ability to manage and distribute its financial resources to support its operational demands, strategic initiatives, and long-term growth is known as financial capacity [24], [25]. Capacity to plan financially, profitability, liquidity, and access to money are all part of it. Commercial banks with robust financial capacities can better adapt to changing market conditions and economic shocks, increase their service offerings, invest in innovation, and embrace new technology [26], [27]. Maintaining client confidence, meeting regulatory standards, and implementing strategic strategies are all easier for financially healthy banks [28], [29]. In addition, digital transformation, human resource training, and research and development require financial resources [30]. For these reasons, financial capacity is an essential indicator of security and a catalyst for creative problem-solving and operational excellence in companies. Hence, the authors gave hypotheses H10, H11, and H12 in figure 1.

H10: FC positively influences CI.
H11: FC positively influences BE.
H12: FC positively influences DT.

2.7. Management Capacity

The capability of leaders and managers to successfully plan, organize, coordinate, and regulate activities to achieve strategic goals is known as management capacity. Skills in managing human resources, communicating effectively, and solving problems are all part of it [31], [32]. High management capability in commercial banks guarantees departmental alignment, effective operations, and risk mitigation. Adaptability, creativity, and digital transformation are all hallmarks of capable managers [33]. They are crucial in implementing new tactics or technology, motivating people, and allocating money. Effective management provides the structure and leadership necessary to turn creative ideas into practical outcomes and maintain business efficiency in competitive and rapidly changing environments. Thus, management capacity is a core organizational competency that links strategy to execution and contributes directly to long-term performance. Hence, the authors gave hypotheses H13, H14, and H15 in figure 1.

H13: MC positively influences CI.
H14: MC positively influences BE.
H15: MC positively influences DT.

2.8. Impacting CI and DT on BE

Creative innovation improves how organizations operate by introducing better ways of doing things. In banking, innovation can lead to faster services, enhanced products, and more efficient internal processes [34]. When employees and leaders innovate continuously, they find ways to reduce costs and increase productivity. This hypothesis assumes that innovation leads to tangible gains in business performance and operational efficiency [35], [36]. Besides, digital tools help automate routine tasks, improve data accuracy, and enhance customer experience. By digitizing operations, banks can serve customers faster, manage risk more effectively, and reduce manual errors [37]. This leads to better use of resources and higher efficiency. This hypothesis suggests that digital transformation is a powerful driver of business performance in the modern banking sector. Hence, the authors gave hypotheses H16 and H17 in figure 1.

H16: CI positively influences BE.
H17: DT positively influences BE.

This study is grounded in two primary theoretical frameworks: RBV and Dynamic Capabilities Theory (DCT). RBV explains how internal resources such as EE, LS, CC, FC, and MC contribute to sustained competitive advantage. Hypotheses H1–H15 are thus framed to assess how these organizational resources enable innovation and transformation. Meanwhile, DCT emphasizes the firm's ability to adapt, reconfigure, and integrate competencies in dynamic environments. Hypotheses H16 and H17 reflect this by examining how CI and DT act as dynamic capabilities, mediating the impact of resources on BE. Together, the hypotheses test how RBV-based inputs are operationalized through DCT-based mechanisms to enhance performance in a rapidly changing financial landscape.

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These two mediators, in turn, enhance business efficiency. The model includes 17 hypotheses (H1–H17) representing direct and indirect relationships among the constructs. This framework underscores the importance of internal alignment, innovation, and digital readiness in driving performance outcomes, especially in emerging markets undergoing technological transformation. Based on the above analysis, the study proposes and tests 17 hypotheses (H1–H17) linking five internal organizational factors to creative innovation, digital transformation, ultimately, BE. Below is a clear and structured presentation of these hypotheses. The research model is shown in figure 1. This SEM model shows how critical factors influence commercial banks' business efficiency in Vietnam. Based on the information provided, the authors have put forth a particular study model in figure 1.

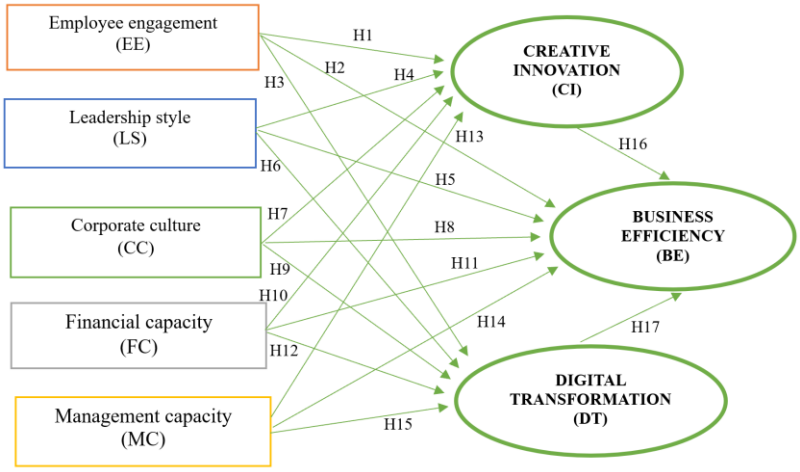

Figure 1. A research model for critical factors influencing the business efficiency of commercial banks in Vietnam

Figure 1 presents a conceptual model illustrating the key internal factors influencing business efficiency in Vietnamese commercial banks. It highlights how five organizations highlight how five organizational capabilities, employee engagement, leadership style, corporate culture, financial capacity, and management capacity, affect two strategic drivers: creative innovation and digital transformation.

3. Methodology and Data

To conduct the research, the authors built a process that included the following steps:

Step 1: Defining the research purpose and scope: The first step in conducting the quantitative research was clearly defining its purpose and scope. The study empirically assessed the impact of internal organizational factors such as employee engagement, leadership style, corporate culture, financial capacity, and management capacity on creative innovation and digital transformation, which affect business efficiency in the banking sector. Grounded in theoretical frameworks such as the Resource-Based View and Dynamic Capabilities Theory, the model incorporates 17 hypotheses (H1–H17) derived from the conceptual framework presented in figure 1. The quantitative phase is designed to statistically test these relationships using data collected from a large sample of banking professionals. This step also involved outlining the geographic and organizational boundaries of the research. The selected study area includes 30 commercial banks across five centrally governed cities and five provinces, ensuring regional diversity and representation of Vietnam’s leading banking institutions.

Step 2: Determining the target population and sample frame: Identifying the intended participants and creating a sampling plan: Thirty commercial banks were chosen for the study, and the participants were bank officers occupying operational, managerial, and supervisorial positions. Customer service, credit, finance, information technology, human resources, and internal control were among the departments represented in the sample. To guarantee a large and representative sample, the sample frame was created in tandem with the HR departments of the participating institutions. The objective was to have regional and corporate-level representatives present. To ensure that people who fill out the survey are familiar with their company's digital and innovation strategy, we set a one-year minimum work experience requirement. The responses were hand-picked to capture diverse job roles and bank sizes, ensuring relevance and reliability.

Step 3: Sampling strategy and sample size: To guarantee representation from various geographical areas, bank sizes, and occupations, a stratified random sampling technique was used. Depending on their size and the number of branches in the identified provinces and cities, each participating bank supplied anywhere from twenty to fifty respondents. Location and position (staff vs. management) were the main factors for classifying workers into different groups. We aimed for a sample size of 1.000 so that we could conduct thorough statistical analyses, such as SEM and Confirmatory Factor Analysis (CFA). With 942 valid responses kept after data cleaning, the effective response rate was 94.2%. With a final sample size higher than the SEM minimum, subgroup analyses were possible according to region, department, and managerial level. This sampling method ensured that all relevant parties were represented, which improved the study's external validity [38].

Step 4: Data collection procedures: Methods for collecting data: We collected data for four months between July 2024 and March 2025. Online and offline approaches were utilized to increase response rates and guarantee flexibility. If customers did not have access to the Internet or if it was more suitable to conduct the survey by personal interaction, printed questionnaires were delivered at the bank's branches. At the same time, with the bank's approval, officials were sent a Google Forms version of the survey. An explanatory letter and consent form were provided to each participant, outlining the study's academic goal and highlighting the need for anonymity. Logistics ran smoothly, and participation was high, thanks to close cooperation with the bank's upper management. We received 1.000 completed surveys in all, and the final analysis relied on 942 that passed screening and cleaning.

Step 5: Data screening and cleaning: Data cleansing and screening: The dataset was ready for analysis after completing the survey. We screened the data for inconsistent responses, response bias, and missing values. We threw out surveys with more than 10% missing information or when all items had the same answer. The remaining responses were analyzed for outliers using Mahalanobis distance to guarantee multivariate normality. Mean substitution was employed to deal with missing values within acceptable ranges. The sample was profiled using descriptive statistics. The 942 responses that comprised the final dataset were thoroughly cleaned to ensure they were legitimate, comprehensive, and ready for advanced statistical modeling.

Step 6: Measurement model evaluation (reliability and validity): Assessment of measurement models (validity and reliability): Using SPSS 20.0 and Amos, we conducted the CFA to evaluate the measurement model. All constructions demonstrated good internal consistency, with Cronbach's Alpha and Composite Reliability values surpassing 0.70. Additionally, each indicator exhibited a standardized factor loading above 0.60. Average Variance Extracted (AVE) values greater than 0.50 demonstrated convergent validity. According to the Fornell-Larcker criterion, discriminant validity was established when the square root of the AVE for each concept was greater than the inter-construct correlations. We may now confidently evaluate structural models based on these findings, which validate and corroborate the measurement scales' reliability.

Step 7: Structural model testing (SEM): the SEM was used to test the relationships among the eight key constructs. The model fit indices indicated a good fit: CFI $\geq$ 0.9, TLI $\geq$ 0.9, RMSEA $\leq$ 0.08, and Chi-square/df $\leq$ 5.0. Path coefficients for all 17 hypotheses were examined. Significant relationships were identified between all independent variables and their respective dependent constructs. Mediation analysis using bootstrapping with 7.000 resamples confirmed the indirect effects of creative innovation and digital transformation on business efficiency [38]. The findings were compared with prior literature to identify theoretical contributions and practical implications. Key conclusions and recommendations were developed for bank executives and policymakers. This comprehensive reporting stage ensures the results are communicated clearly and meaningfully to academic and professional audiences.

4. Empirical Results

4.1. Demographic Information of Respondents Based on the Sample

Gender: The gender distribution among respondents shows a slight female majority, with 58.3% female and 41.7% male participants. This aligns with the workforce composition in Vietnam’s banking sector, where women often occupy frontline service and administrative roles. The balanced representation ensures diversity in perspectives related to organizational practices and innovation. Gender diversity may also influence attitudes toward leadership, engagement, and adaptability in digital transformation, offering a well-rounded dataset for the study's structural model.

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Marital status: Most respondents (62.3%) are married, while 37.7% are single. The dominance of married individuals suggests a workforce primarily composed of mature and settled professionals. This demographic may influence work stability, organizational loyalty, and a measured approach to adopting change. Marital status can also impact emotional engagement and job satisfaction, which is relevant to assessing banking institutions' employee commitment and innovation readiness. Age: The age distribution indicates that most respondents fall between 35 and 45 (52.0%), followed by those above 45 (15.9%). Younger groups (18–25 and 25–35) account for only 32.1% combined. This age profile reflects an experienced workforce with in-depth institutional knowledge and practical exposure to banking operations. Mature employees are often more resilient to pressure and may respond differently to leadership and cultural factors. The age diversity enhances the model's robustness in capturing multigenerational views on digital innovation and business efficiency.

Table 1. Testing of Cronbach's alpha for factors influencing the business efficiency of commercial banks

Items	Cronbach's alpha	Mean	Std. Deviation
EE	0.927	3.048	1.013
LS	0.901	3.320	0.980
CC	0.942	3.075	1.008
FC	0.909	3.045	0.986
MC	0.856	3.399	0.941
CI	0.861	3.288	1.009
DT	0.864	3.294	1.006
BE	0.830	2.385	0.665

Table 1 gives the mean value of all components, which is about 3.0. Moreover, overall insights for reliability based on all factors demonstrate excellent reliability (Cronbach's Alpha > 0.8). The authors conducted a detailed academic analysis of table 1 based on testing Cronbach's Alpha for factors influencing the business efficiency of commercial banks in Vietnam. Besides, the table evaluates the internal consistency and descriptive statistics for items measuring key factors influencing the business efficiency of commercial banks in Vietnam. The analysis uses Cronbach's Alpha to assess reliability, with descriptive statistics (mean and standard deviation) providing insights into respondents' perceptions of each factor. Table 2 indicates that the SEM results highlight the relationships among critical factors affecting Systemic Risk (SR) in Vietnamese commercial banks. This section provides an academic analysis of the relationships, their strengths, and implications based on standardized estimates, Critical Ratios (C.R.), and statistical significance.

Table 2. Testing SEM model for factors influencing the business efficiency of commercial banks

Relationships			Standardized Estimate	Estimate	S.E	C.R	P	Hypothesis	Result
EE	→	DT	0.208	0.172	0.029	5.887	***	H3	Accepted
LS	→	DT	0.047	0.072	0.033	2.222	0.026	H6	Accepted
CC	→	DT	0.116	0.087	0.025	3.447	***	H9	Accepted
FC	→	DT	0.100	0.080	0.028	2.825	0.005	H12	Accepted
MC	→	DT	0.139	0.127	0.033	3.877	***	H15	Accepted
EE	→	CI	0.574	0.501	0.030	16.838	***	H1	Accepted
LS	→	CI	0.044	0.071	0.029	2.437	0.015	H4	Accepted
CC	→	CI	0.090	0.072	0.022	3.201	0.001	H7	Accepted
FC	→	CI	0.086	0.072	0.025	2.867	0.004	H10	Accepted
MC	→	CI	0.142	0.138	0.030	4.658	***	H13	Accepted
EE	→	BE	0.314	0.176	0.023	7.731	***	H2	Accepted
LS	→	BE	0.043	0.045	0.019	2.330	0.020	H5	Accepted
CC	→	BE	0.072	0.037	0.015	2.462	0.014	H8	Accepted

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Relationships			Standardized Estimate	Estimate	S.E	C.R	P	Hypothesis	Result
FC	→	BE	0.101	0.054	0.017	3.173	0.002	H11	Accepted
MC	→	BE	0.085	0.053	0.020	2.694	0.007	H14	Accepted
DT	→	BE	0.068	0.046	0.022	2.120	0.034	H17	Accepted
CI	→	BE	0.349	0.224	0.027	8.345	***	H16	Accepted

Note: *** with 1%.

(1) EE: Employee engagement emerged as the most influential factor in the model, significantly impacting creative innovation ($\beta = 0.574$, $p < 0.001$), digital transformation ($\beta = 0.208$, $p < 0.001$), and business efficiency ($\beta = 0.314$, $p < 0.001$). These results confirm that when employees feel emotionally connected and enthusiastic about their roles, they are more likely to contribute innovative ideas, embrace digital changes, and perform more effectively. (2) LS: Leadership style had significant but relatively modest effects across all three outcomes: creative innovation ($\beta = 0.044$, $p = 0.015$), digital transformation ($\beta = 0.047$, $p = 0.026$), and business efficiency ($\beta = 0.043$, $p = 0.020$). These findings suggest that leadership techniques have an effect, but this effect may be less noticeable or situational. An environment conducive to innovation and change can be created when leaders inspire creativity and stand by their staff when they face problems. (3) CC: Corporate culture demonstrated significant and positive effects on digital transformation ($\beta = 0.116$, $p < 0.001$), creative innovation ($\beta = 0.090$, $p = 0.001$), and business efficiency ($\beta = 0.072$, $p = 0.014$). These results highlight the role of culture as a foundational enabler of change and innovation. A culture that promotes openness, collaboration, and continuous improvement creates the psychological conditions for employees to experiment, adapt, and work toward shared goals.

(4) FC: Financial capacity was shown to have a positive and significant effect on all key outcomes in the model: digital transformation ($\beta = 0.100$, $p = 0.005$), creative innovation ($\beta = 0.086$, $p = 0.004$), and business efficiency ($\beta = 0.101$, $p = 0.002$). These results affirm the critical role of financial resources in enabling organizations to invest in new technologies, support experimentation, and sustain strategic initiatives. Financial strength reduces barriers to change and allows organizations to be more agile in implementing innovative projects. (5) MC: Management capacity was found to be a strong and consistent predictor across all outcomes: creative innovation ($\beta = 0.142$, $p < 0.001$), digital transformation ($\beta = 0.139$, $p < 0.001$), and business efficiency ($\beta = 0.085$, $p = 0.007$). These findings highlight the central role of effective planning, coordination, and performance monitoring in translating strategy into results. Managers who possess strong project leadership skills and can integrate efforts across departments are more likely to drive innovation and ensure the smooth implementation of digital initiatives. The dual impact on innovation and transformation strengthens management's integrative role in enabling systemic change. (6) CI: Creative innovation showed a strong and direct impact on business efficiency ($\beta = 0.349$, $p < 0.001$), making it one of the most critical mediating variables in the model. The findings confirm that when organizations successfully foster and implement new ideas, it leads to measurable improvements in performance. CI links internal capabilities (such as employee engagement, management capacity, and corporate culture) and outcomes like efficiency and transformation. Employee engagement ($\beta = 0.574$) strongly influenced CI, suggesting that engaged employees are a key source of innovative capacity. These results align with contemporary organizational theory, which positions innovation as a strategic priority and a dynamic output of internal enablers. (7) DT: Digital transformation positively influences business efficiency ($\beta = 0.068$, $p = 0.034$), albeit to a lesser extent compared to creative innovation. This modest effect suggests that while technology adoption and digital integration are necessary, they must be coupled with human-centered and strategic factors to yield stronger performance outcomes. The construct itself was significantly shaped by multiple factors - employee engagement ($\beta = 0.208$), management capacity ($\beta = 0.139$), and corporate culture ($\beta = 0.116$) - emphasizing that digital transformation is not solely a technical process but a broader organizational shift. These results reinforce that digital success depends on aligning people, processes, and platforms. (8) Business efficiency (BE): Business efficiency is the ultimate outcome in the proposed model and is influenced by both direct and indirect pathways. Among all predictors, creative innovation ($\beta = 0.349$) and employee engagement ($\beta = 0.314$) had the most potent direct effects, highlighting performance's human and innovation-centric nature in the banking sector. Other contributors, such as financial capacity, management capacity, corporate culture, and digital transformation, also had significant but minor effects.

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(9) Creative innovation (β = 0.349) has a far greater influence on business efficiency in Vietnamese commercial banks than digital transformation (β = 0.068). This outcome is explicable by several cultural, organizational, and infrastructure-related variables. Vietnamese financial organizations often place an emphasis on managerial initiative and problem-solving that is oriented around people. Rather than established digital tools, innovation in this setting is mainly driven by staff participation, leadership adaptability, and internal inventiveness.

Although the LS was significantly significant across all outcomes, it consistently had the smallest standardized path coefficients (e.g., β = 0.044 for CI, β = 0.047 for DT, and β = 0.043 for BE). This finding contrasts with a large body of leadership literature, which suggests that transformational visionary, supportive leadership is a strong predictor of innovation and adaptability in dynamic environments. One possible explanation lies in Vietnam's organizational hierarchy and cultural norms, emphasizing compliance and collectivism over individual leadership influence. In such contexts, leadership may exert influence indirectly by shaping team norms or supporting institutional alignment rather than directly sparking innovation or transformation. Additionally, institutional inertia in the banking sector may limit leaders' ability to affect outcomes without broader structural support. This discrepancy suggests the need for context-sensitive models of leadership impact and further qualitative research to uncover how leadership operates within transitional financial institutions.

The SEM analysis supports all 17 hypothesized relationships. Among the five internal factors, EE had the most substantial direct effect on both CI (β = 0.574) and business efficiency (BE) (β = 0.314), confirming its central role. MC also showed consistent influence across all outcomes, while LS demonstrated the weakest effects. CI was the most powerful mediator (β = 0.349 to BE), compared to a weaker but still significant role for DT (β = 0.068). These results validate the model's structure, confirming that human-centered capabilities (EE, MC) and innovation-driven mechanisms (CI) are the primary levers for enhancing efficiency in Vietnam's commercial banking. Figure 2 depicts the significance threshold of 0.05 for assessing five essential components of the business efficiency of commercial banks in Vietnam. The following statistical metrics measured the model's fit: GFI = 0.932 (>0.900), TLI = 0.955 (>0.900), CFI = 0.964 (> 0.900), and RMSEA = 0.050 (< 0.08).

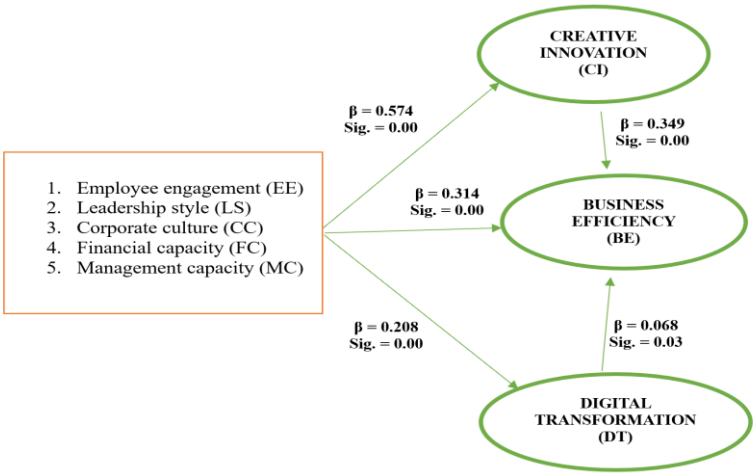

Figure 2. Testing SEM for factors influencing the business efficiency of commercial banks in Vietnam

Figure 2 illustrates the results of the SEM analysis, which was conducted to test the hypothesized relationships among the latent constructs involving the business efficiency of commercial banks in Vietnam. The model includes five independent variables (Employee engagement, leadership style, corporate culture, financial capacity, and management capacity), two mediating variables (Creative innovation and digital transformation), and one dependent variable (Business efficiency). All 17 hypothesized paths (H1–H17) were found to be significantly significant ($p < 0.05$), demonstrating strong empirical support for the theoretical framework.

4.2. Result Discussion

This study examines the key organizational factors influencing business efficiency in Vietnamese commercial banks using a structural equation modeling framework. The findings provide strong empirical support for the proposed model,

 ISSN 2723-6471

confirming the role of internal capabilities, namely employee engagement, leadership style, corporate culture, financial capacity, and management capacity, in enhancing creative innovation, digital transformation, and business efficiency.

(1) The measurement model demonstrates high internal consistency across all constructs. As shown in table 1, Cronbach's alpha values ranged from 0.830 (BE) to 0.942 (CC), indicating excellent reliability. In addition, table 2 confirms the convergent and discriminant validity of the constructs. All composite reliability (CR) scores exceeded 0.80, and AVE values exceeded the 0.50 threshold. Furthermore, the condition AVE > MSV was met for all constructs, affirming discriminant validity [1], [4], [5]. These results establish a solid foundation for the structural analysis. Structural model and direct effects: The SEM results (table 2) confirm the significance of all 17 hypothesized relationships. EE emerged as the most influential factor among these. It had a substantial direct impact on creative innovation (β = 0.574) and business efficiency (β = 0.314), a moderate effect on digital and business efficiency (β = 0.314) performance, and a moderate effect on digital transformation (β = 0.208). These findings highlight the pivotal role of employee motivation and emotional commitment in driving innovation and organizational performance [8], [14], [15].

(2) Likewise, MC significantly influences creative innovation influencing creative innovation (β = 0.142), digital transformation (β = 0.139), and business efficiency (β = 0.085), highlighting the importance of strategic coordination and planning capabilities in implementing organizational change [27], [29], [35]. CC, FC, and FC meaningfully contributed to innovation and transformation outcomes, although with smaller effect sizes also meaningfully contributed to innovation and transformation outcomes, although with smaller effect sizes. LS had the lowest direct effects across all three dependent variables, suggesting that leadership may act more effectively through indirect or contextual mechanisms. CI and DT were both positively associated with business efficiency, with CI (β = 0.349 and DT were both positively associated with business efficiency with CI (β = 0.349) demonstrating a more substantial impact than DT (β = 0.068). This implies that innovation is a more direct pathway to performance improvement, while digital transformation may require more time or complementary factors to produce visible performance gains [34], [35], [37]. Mediation and robustness: The bootstrap analysis using 7.000 samples further confirms the robustness of the SEM estimates. All structural paths remain significant, with minimal standard errors and bias, and all critical ratios (CR) above or equal to 1.00. The consistency between the SEM and bootstrap results strengthens the stability of the proposed model.

(3) Although the study asserts that DT plays a “complementary but weaker” mediating role than CI, this argument is not supported by specific quantitative mediation analysis. Specifically, no mediation analysis results are found in table 2, and indirect effect values or Sobel or bootstrap tests are presented to confirm the comparative influence between the two mediating variables. This reduces the reliability of the conclusion about the mediating role of DT compared to CI. Future studies should supplement the indirect effect table with standard deviations, confidence intervals, and statistical significance to clarify this argument in a rigorous and empirically grounded manner. Although employee engagement continuously emerges as the most influential factor across all outcome variables, the manuscript does not explore why this relationship is powerful in Vietnamese banking. Culturally, Vietnam's workplace environment is shaped by high collectivism, respect for hierarchy, and emotional loyalty to institutions. These values mean that when employees feel engaged through recognition, inclusion, and developmental support, they are more likely to go beyond formal job roles and contribute proactively to innovation and change efforts. In state-influenced sectors like banking, where capitalism and top-down structures persist, engaged employees may serve as vital "bottom-up" change agents. Future research could use interviews or case studies to better explain this cultural dynamic and identify mechanisms that sustain engagement-driven innovation in banks.

(4) Although DT had a significantly significant effect on business efficiency (β = 0.068, $p < 0.05$), its relatively small magnitude suggests that technology adoption alone may not drive performance improvements in the Vietnamese banking sector. Several macro-likely model legacy IT systems, particularly in state-owned banks, hinder the seamless integration of new digital tools. Additionally, regulations such as slow approval processes for digital products, fragmented data governance, and limited regulatory sandboxes impede agile transformation. Moreover, uneven digital literacy among banking staff and customer bases further weakens the operational gains from digitization. In this context, DT must be understood not as a quick efficiency fix but as a long-term, systemic shift that requires institutional readiness, cultural openness, and regulatory alignment to translate into tangible performance gains. While the structural

 ISSN 2723-6471

model demonstrates a strong fit and all hypothesized paths are significantly significant, the study does not conduct competing model comparisons to validate the hypothesized directionality of effects. For example, testing a nested model excluding the mediators (CI and DT) or an alternative model with reversed causality (e.g., BE improving innovation readiness) would help confirm that the proposed model structure is adequate and superior to rival explanations. The absence of such comparison's limits confidence in the model's explanatory precision. Future research should incorporate nested chi-square difference tests, AIC/BIC comparisons, or cross-lagged panel analysis (if longitudinal data are available) to evaluate model hierarchy and causal assumptions rigorously.

5. Conclusions and Policy Recommendations

5.1. Conclusions

This study investigates the critical factors influencing the business efficiency of commercial banks in Vietnam. Using structural equation modeling and data from 1000 banking managers. This study provides comprehensive empirical evidence on the determinants of business efficiency in the context of Vietnamese commercial banks. By employing structural equation modeling and validating through extensive bootstrap analysis, the findings confirm that internal organizational factors, namely employee engagement, leadership style, corporate culture, financial capacity, and management capacity, play a significant role in shaping both creative innovation and digital transformation, which in turn influence business efficiency. Among all the predictors, employee engagement emerged as the most influential variable, directly enhancing creative innovation and business efficiency. Creative innovation is emerging as the most influential variable, directly enhancing creative innovation and business efficiency. Creative innovation was identified as the strongest direct predictor of business efficiency, reinforcing its central role in driving performance outcomes. Meanwhile, digital transformation also contributed positively, though its impact was relatively modest. These also contributed positively, though their impact was relatively modest. These findings highlight the importance of investing in technology and finance and fostering a people-centered, innovation-driven organizational environment. The measurement model demonstrates excellent reliability and validity, ensuring the constructs used are consistently sound and conceptually distinct. The robustness of the SEM results, confirmed via 7.000 bootstrap samples, lends further credibility to the proposed framework of policy recommendations.

5.2. Policy Recommendations

By adopting the abovementioned policies, stakeholders can work toward a banking sector that is less vulnerable to systemic risks and more inventive and competitive globally. A comprehensive approach is necessary to successfully traverse the obstacles an ever-changing financial ecosystem presents, including digital transformation, economic uncertainty, and globalization. The authors suggested five policy implications regarding the systemic risk of Vietnam's commercial banks.

(1) EE – highest priority: Employee engagement emerged as the most influential factor affecting business efficiency in this study ($\beta = 0.314$, $p < 0.001$). These finding highlights that when employees are emotionally connected, motivated, and involved in their work, their contributions significantly enhance organizational performance. In the banking sector, engaged employees are likelier to propose innovations, embrace new technologies, and serve customers with extraordinary dedication. Therefore, managers at financial institutions should make it a top priority to increase staff engagement to retain talented workers. Transparent communication channels, staff participation in decision-making, recognition and career development possibilities, and building ownership in the organization's mission are practical techniques to increase engagement. Banks should embed employee engagement KPIs into performance dashboards, e.g., staff turnover, innovation participation, and internal mobility. Implement pulse surveys Quarterly to monitor engagement levels and use AI-based platforms (e.g., Qualtrics) to analyze sentiment. Integrate these metrics into HR scorecards linked to departmental leadership evaluations.

(2) CI – key mediating driver: Creative innovation played the most powerful mediating role in the model, with a substantial direct impact on business efficiency ($\beta = 0.349$, $p < 0.001$). Innovation enables banks to develop new products, streamline internal processes, and adapt to customer needs more effectively. Its centrality in the SEM model demonstrates that fostering innovation is a competitive advantage and a necessity for survival in the increasingly digital and fast-paced financial sector. Organizations should build structured innovation systems encouraging ideation,

experimentation, and feedback. This includes establishing cross-functional innovation teams, innovation labs, and platforms for employee suggestions. Commercial banks should implement structures aligned with internal capacity and cultural context to enhance employee engagement and foster creative innovation programs. For example, banks can launch employee-led innovation challenges or internal "hackathons" to harness staff creativity in solving operational issues. Embedding recognition systems that reward initiative and collaboration, such as innovation points, peer-voted awards, or inclusion in pilot project teams, can reinforce positive behavior. To sustain engagement, banks should offer career development tracks, regular 360-degree feedback, and transparent communication platforms that include staff in decision-making processes. Creating cross-functional innovation labs and training frontline managers in design thinking and agile leadership can institutionalize creativity as a core performance driver.

(3) MC – operational enabler: Management capacity was shown to have a significant impact on business efficiency ($\beta = 0.085$, $p = 0.007$), as well as strong effects on both creative innovation and digital transformation. This highlights its critical role as an operational enabler. In banking, where complexity and regulation are high, management teams must be equipped to coordinate resources, drive strategic execution, and manage change effectively. Strengthening management capacity involves several levels of intervention. Internally, banks should invest in leadership development, cross-departmental coordination mechanisms, and data-driven decision-making systems.

(4) FC – strategic resource base: Financial capacity also demonstrated a significant impact on business efficiency ($\beta = 0.101$, $p = 0.002$), as well as moderate influence on innovation and digital transformation. This finding underscores that money is not the only driver, but it remains necessary to execute strategic initiatives. With sufficient capital, financial institutions may improve their infrastructure, invest in digital technologies, and maintain innovation over the long term. Banks can improve their financial capability by implementing rigorous financial planning, guaranteeing liquidity buffers, and allocating resources to value-adding operations as efficiently as possible.

(5) CC – enabling environment: Corporate culture had a weaker direct impact on business efficiency ($\beta = 0.072$, $p = 0.014$), but it remains an essential enabling factor, especially in shaping attitudes toward innovation and change. For transformation to take hold, a culture that encourages teamwork, openness, and constant growth must be established. Financial institutions can foster this culture by incorporating cultural norms into hiring, onboarding, and training practices and rewarding employees for working together toward common objectives.

(6) LS – supporting factor: Leadership style had the most negligible standardized effect on business efficiency ($\beta = 0.043$, $p = 0.020$), suggesting that while leadership is essential, its influence may be more indirect or conditional on other factors. While leaders who motivate their people and foster an environment of creativity are crucial, processes, engagement, and resources are often necessary for leadership to be a performance driver. Banks would benefit significantly from adopting transformational leadership styles prioritizing trust, empowerment, and long-term vision instead of more directive styles. Digital literacy, innovative management, and emotional intelligence should be the focal points of leadership development programs.

(7) DT: Although DT showed a significant yet modest direct effect on business efficiency ($\beta = 0.068$, $p = 0.034$), its strategic importance remains critical in the context of modern banking. The relatively low effect size suggests that technology adoption alone does not automatically lead to performance gains. Instead, digital transformation must be aligned with human readiness, managerial systems, and cultural openness to produce meaningful outcomes. The holistic approach is to improve DT effectiveness; banks should go beyond acquiring digital tools.

Limitations and future research: Despite the study's thorough methodology and strong empirical conclusions, numerous limitations exist. This study uses a cross-sectional design to collect data at one point. It cannot prove causality between organizational characteristics, innovation, digital transformation, and business efficiency. Future researchers could better uncover causal pathways and monitor changes over time with longitudinal studies. Geographic and industrial context: The study focused on Vietnamese commercial banks. This provides rich contextual knowledge, but conclusions may not apply to other industries or nations. Different cultural, regulatory, and economic situations may yield different results. Due to the restrictions above, future studies should replicate the healthcare, manufacturing, or education paradigm to test its universality. Comparative studies between Vietnam and other Southeast Asian emergent markets may reveal how organizational dynamics affect innovation and digitalization across cultures. Second, longitudinal and experimental long-term investigations could be tracked. Long-term studies could track innovation and

transformation efforts, especially as digital maturity increases. Leadership training and cultural development programs could be evaluated using experimental or quasi-experimental methods. Future studies may extend this model by incorporating these external or hybrid enablers to provide a more comprehensive system-wide view. Moreover, future research should evaluate model fit improvement via nested comparisons and test multicollinearity diagnostics to ensure robustness and theoretical clarity. Future research should include these variables to enable multi-group SEM or moderation analyses that uncover more profound structural differences in organizational behavior. Future research should review item wording and consider exploratory factor analysis (EFA) or average inter-item correlation inflation to ensure construct clarity without conceptual inflation. This is a key limitation, as uncontrolled method bias may partly account for the observed uniformly significant path coefficients. Future studies should incorporate procedural mechanisms (e.g., psychological separation of items) and statistical diagnostics to ensure the robustness of findings.

6. Declarations

6.1. Author Contributions

Conceptualization: N.Q.H. and P.T.T.; Methodology: P.T.T.; Software: N.Q.H.; Validation: N.Q.H. and P.T.T.; Formal Analysis: N.Q.H. and P.T.T.; Investigation: N.Q.H.; Resources: P.T.T.; Data Curation: P.T.T.; Writing Original Draft Preparation: N.Q.H. and P.T.T.; Writing Review and Editing: P.T.T. and N.Q.H.; Visualization: N.Q.H.; All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] F. Antwi and Y. Kong, "Investigating the impacts of digital finance technology on financial stability of the banking sector: New insights from developing market economies," *Cogent Business and Management*, vol. 10, no. 3, pp. 1–19, 2023.

[2] S. Akhtar, M. Alam, and M. S. Ansari, "Measuring the performance of the Indian banking industry: Data envelopment window analysis approach," *Benchmarking: An International Journal*, vol. 29, no. 9, pp. 2842–2857, 2021.

[3] M. Alam, S. Akhtar, and M. A. S. Al-Faryan, "Do Indian banks perform better in corporate governance than other SAARC countries? An empirical analysis," *Corporate Governance: The International Journal of Business in Society*, vol. 24, no. 4, pp. 799–830, 2024.

[4] F. T. Tefera and S. Abebe, "Impact of strategic planning on the performance of commercial banks: the case of public commercial banks in Eastern Hararghe, Ethiopia," *Cogent Business and Management*, vol. 11, no. 1, pp. 1–17, 2024.

[5] T. Ahmad *et al.*, "Empowering leadership: Role of organizational culture of self-esteem and emotional intelligence on creativity," *Journal of Management Development*, vol. 42, no. 3, pp. 201–214, 2023.

[6] B. Ghimire, B. Rai, and R. K. Dahal, "Corporate culture and organizational performance in the banking industry of Nepal," *Management Dynamics*, vol. 24, no. 2, pp. 1–8, 2021.

[7] H. Banna, M. K. Hassan, and H. Bataineh, "Bank efficiency and fintech-based inclusive finance: evidence from dual banking system," *Journal of Islamic Monetary Economics and Finance*, vol. 9, no. 1, pp. 1–16, 2023.

[8] A. S. Awwad, O. M. A. Ababneh, and M. Karasneh, "The mediating impact of IT capabilities on the association between dynamic capabilities and organizational agility: The case of the Jordanian IT sector," *Global Journal of Flexible Systems Management*, vol. 23, no. 3, pp. 315–330, 2022.

[9] M. J. Alam, M. Shariat Ullah, M. Islam, and T. A Chowdhury, "Human resource management practices and employee engagement: the moderating effect of supervisory role," *Cogent Business and Management*, vol. 11, no. 1, pp. 1–18, 2024.

[10] H. Imam, A. Sahi, and M. Farasat, "The roles of supervisor support, employee engagement and internal communication in performance: A social exchange perspective," *Corporate Communications*, vol. 28, no. 3, pp. 489–505, 2022.

[11] G. Jose, P. Nimmi, and V. Kuriakose, "HRM practices and employee engagement: Role of personal resources—a study among nurses," *International Journal of Productivity and Performance Management*, vol. 73, no. 1, pp. 1–17, 2022.

[12] J. O. Ally, Y. Kulindwa, and L. Mataba, "Bank efficiency in the digital age: The role of financial technology in Tanzanian banks," *Modern Finance*, vol. 3, no. 1, pp. 1–24, 2025.

[13] S. Ullah and S. Azeem, "Digital transformation and work stress impact on employee engagement in the private banking sector," *Global Economics Review*, vol. 9, no. 2, pp. 53–63, 2024.

[14] X. Meng and M. Imran, "The impact of corporate social responsibility on organizational performance with the mediating role of employee engagement and green innovation: evidence from the Malaysian banking sector," *Economic Research-Ekonomska Istraživanja*, vol. 37, no. 1, pp. 1–27, 2024.

[15] H. Fukuyama and Y. Tan, "Implementing strategic disposability for performance evaluation: Innovation, stability, profitability and corporate social responsibility in Chinese banking," *European Journal of Operational Research*, vol. 296, no. 2, pp. 652–668, 2022.

[16] S. Lee, S. Han, G. Byun, and S. Y. Son, "Social exchange relationships and exchange ideologies of employees and supervisors: A three-way interaction toward employee creativity," *Applied Psychology*, vol. 71, no. 2, pp. 539–563, 2022.

[17] J. Park, S. J. Han, J. Kim, and W. Kim, "Structural relationships among transformational leadership, affective organizational commitment, and job performance: The mediating role of employee engagement," *European Journal of Training and Development*, vol. 46, no. 9, pp. 920–936, 2022.

[18] M. Schreieck, Y. Huang, A. Kupfer, and H. Krcmar, "The effect of digital platform strategies on firm value in the banking industry," *Journal of Management Information Systems*, vol. 41, no. 2, pp. 394–421, 2024.

[19] K. Bahl, R. Kiran, and A. Sharma, "Impact of drivers of change (Digitalization, demonetization, and consolidation of banks) with mediating role of nature of training and job enrichment on the banking performance," *SAGE Open*, vol. 12, no. 2, pp. 1–13, 2022.

[20] L. E Valdez-Juárez, E. A Ramos-Escobar, O. E Hernández-Ponce, and J. A. Ruiz-Zamora, "Digital transformation and innovation, dynamic capabilities to strengthen the financial performance of Mexican SMEs: a sustainable approach," *Cogent Business and Management*, vol. 11, no. 1, pp. 1–25, 2024.

[21] S. Tehseen, P. Deng, B. Wu, and Y. Gao, "Culture values and entrepreneurial innovativeness: A comparative study of Malaysian ethnic entrepreneurs," *Journal of Small Business Management*, vol. 61, no. 6, pp. 2622–2655, 2023.

[22] S. Suhandiah, F. Suhariadi, P. Yulianti, and A. Abbas, "Autonomy and feedback on innovative work behavior: The role of resilience as a mediating factor in Indonesian Islamic banks," *Cogent Business and Management*, vol. 10, no. 1, pp. 1–17, 2023.

[23] R. Kaur, S. Pingle, and A. K. Jaiswal, "Effect of organizational culture on employer branding and resulting employee brand equity in the private banking sector," *International Journal of Bank Marketing*, vol. 42, no. 2, pp. 258–300, 2024.

[24] H. H. Khan, S. Khan, and A. Ghafoor, "Fintech adoption, the regulatory environment and bank stability: An empirical investigation from GCC economics," *Borsa Istanbul Review*, vol. 23, no. 6, pp. 1263–1281, 2023.

[25] S. G. Maji and F. Hussain, "Technical efficiency, intellectual capital efficiency and bank performance in emerging markets: The case of India," *Journal of Advances in Management Research*, vol. 18, no. 5, pp. 708–737, 2021.

[26] P. K. Ozili and H. Ndah, "Impact of financial development on bank profitability," *Journal of Economic and Administrative Sciences*, vol. 40, no. 2, pp. 238–262, 2024.

[27] P. Katsiampa, P. B. McGuinness, J. P. Serbera, and K. Zhao, "The financial and prudential performance of Chinese banks and fintech lenders in the era of digitalization," *Review of Quantitative Finance and Accounting*, vol. 58, no. 4, pp. 1451–1503, 2022.

[28] Y. Zhu and S. Jin, "COVID-19, digital transformation of banks, and operational capabilities of commercial banks," *Sustainability*, vol. 15, no. 11, pp. 1–17, 2023.

 ISSN 2723-6471

[29] B. Rakshit, "Assessing the effects of cost, revenue and profit efficiency on bank performance: Empirical evidence from Indian banking," *International Journal of Organizational Analysis*, vol. 31, no. 5, pp. 1867–1898, 2023.

[30] N. Prakash, S. Singh, and S. Sharma, "Contemporaneous or causal? Evaluating the triumvirate of insolvency risk, capitalization and efficiency in Indian commercial banking," *Managerial Finance*, vol. 48, no. 1, pp. 136–157, 2022.

[31] I. Siswanti, H. A. Riyadh, L. C. Nawangsari, Y. M. Yusoff, and M. W. Wibowo, "The impact of digital transformation for sustainable business: the mediating role of corporate governance and financial performance," *Cogent Business and Management*, vol. 11, no. 1, pp. 1–16, 2024.

[32] V. Cieslak and C. Valor, "Moving beyond conventional resistance and resistors: an integrative review of employee resistance to digital transformation," *Cogent Business and Management*, vol. 12, no. 1, pp. 1–31, 2025.

[33] S. Vahdat, "The role of IT-based technologies on the management of human resources in the COVID-19 era," *Kybernetes*, vol. 51, no. 6, pp. 2065–2088, 2022.

[34] I. Ampong, "Assessing the effect of employee welfare and compensation on organizational performance: A case of Sahel Sahara Bank Ghana limited," *Cogent Business and Management*, vol. 11, no. 1, pp. 1–12, 2024.

[35] M. I. Molla, M. S. Islam, and M. K. B. Rahaman, "Corporate governance structure and bank performance: Evidence from an emerging economy," *Journal of Economic and Administrative Sciences*, vol. 39, no. 3, pp. 730–746, 2023.

[36] W. Azmi, Z. Anwer, M. Ali, and S. Mohamad, "Competition, stability, and institutional environment: The case of dual banking economies," *International Journal of Finance and Economics*, vol. 29, no. 1, pp. 609–631, 2024.

[37] X. Li, Q. Zhong, and G. Yang, "Commercial bank digital transformation, information costs, and corporate financial constraints," *China Journal of Accounting Studies*, vol. 12, no. 1, pp. 140–163, 2024.

[38] J. Hair, R. Anderson, R. Tatham, and W. Black, *Multivariate Data Analysis*, Upper Saddle River, NJ, USA: Prentice-Hall, 2010.