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ASSESSING THE EFFECTS OF DIGITAL TRANSFORMATION DIMENSIONS ON PERFORMANCE OUTCOMES: A MEDIATION–MODERATION APPROACH

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Abstract

Digital Transformation (DT) has become a strategic imperative for organizations worldwide, particularly in the financial sector, where rapid technological advances are reformulating operational structures, customer expectations and competitive dynamics. This research investigates the influence of digital transformation dimensions including strategy, barriers, challenges, outcomes, digital performance and DT implementation steps on the financial performance of Pakistani banks. The study incorporates risk management as a mediating variable and the perceived usefulness of financial technology (FinTech) as a moderating variable, thus providing a comprehensive mediation-moderation structure.

Grounded in theories such as Diffusion of Innovation (DOI), Resource-Based View (RBV), Technology-Organization-Environment (TOE) framework, Stakeholder Theory, and the Theory of Planned Behavior (TPB), this study addresses the gap in the empirical understanding of digital transformation for the best performance results. Using a quantitative research project, the data were collected through structured questionnaires of senior professionals in the Pakistani banking sector. Structural Equation Modeling (SEM) was used to test hypothetical relationships using SmartPLS.

The findings of this study confirm that various dimensions of digital transformation significantly affect the banks' financial performance. Risk management mediates the relationship between digital transformation and performance, while FinTech's perceived utility positively moderates this relationship. The findings emphasize the strategic importance of aligning digital transformation efforts with robust risk management systems and leveraging FinTech client-centered solutions to optimize organizational performance.

This research contributes to theory and practice, extending the performance discourse of digital transformation through mediation and moderation mechanisms. It provides actionable information for banks' executives, IT policy makers and strategist formulators to create integrated digital strategies, improve risk governance, and facilitate FinTech's adoption structures. Recommendations for future research and study limitations are also discussed.

INTRODUCTION

Digital transformation is "a process that "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019).Currently, digital transformation is considered an important area in the strategic research (Piccinini, 2015). Facing the digital transformation challenge and acquire the competitive edge, business leaders need to formulate as well as execute the digital strategies which improve the operational performance (Hess et al., 2016).Digital transformation leads to economic growth that depends on the use of information technologies. Due to globalization, transformations in consumer behavior and information availability are the trends in this time. Digital technologies are gradually modifying economic systems in the word. Digital sector is the core of the digital economy and digital economy can be defined as the economic outcomes derived from the digital technologies in the business with digital goods and services. The Use of ICT is increasing progressively in all sectors of economies and is referred to as the digital economy (Kravchenko, 2019). The digital economy affects all the sectors' activity including banks and financial sectors. Digitalization is the new concept in banks through which transition take place digitally. One side, banks and financial sector are undergoing the vast changes, and on the other side, this is shaping the traditional banking system (Marăcine et al, 2020). Digital transformation strategy in banking sector empowers banks to offer new service channels and reduce operating cost, therefore, investment in the banking industry is three times more than any other sector. Digitalization and adding new technology in the business changes business models and its process. It is important for banks to adapt business model to describe how to interact with customer, provide competitive services in the market and manage its back-office operations and to ready for the future challenges (Kitsios & Kamariotou, 2021).The industrial expansion demands the development and implementation of new policies that can transform the social institutions and operational processes. Banking regulation is the part of policies to improve the financial stability. Due to the technological progress in banking, digitalization has contributed towards the strong financial system. To smoothly carryout the process of digitalization in the banking system, there is a need of devising the relevant regulations and their implementation (Tsindeliani et al., 2022).Considering the huge potential to improve the operations and stimulate growth, the digital transformation has captured substantial attention of firms all over the world. However, limited research has viewed the organizational performance impact of the digital transformation highlighting the undertaking of pertinent research studies in this direction (Guo & Xu, 2021).The existing literature regarding the impact of digital transformation on the firm performance is still controversial and it mainly investigates this impact through the channels such as alleviating the financing constraints, reducing the agency problems and overhead costs calling for probing the effect of intervening variables as how the digital transformation influences the level of firm performance through the different mediating and moderating mechanisms (Luo, 2023). Therefore, this study intends to fill the underlying gaps by investigating the effect of digital transformation on the firm financial performance with mediating role of risk management and moderating effect of perceived usefulness of fintech. The objectives of the study is to examine the effect of digital transformation various dimensions on the firm financial performance with mediating role of risk management and moderating role of perceived usefulness of fintech.Findings of this research study added towards the existing knowledge base on the digital transformation dimensions and its organizational outcome, the firm financial performance and whether or not and how the risk management mediate and perceived usefulness moderate the digital transformation-firm financial performance relationship. Findings is beneficial in terms of improving the understanding the concept of digital transformation in the organizational settings and may allow the banks' management and regulators to devise policies and implement the conducive policies to promote the digital transformation practices in order to positively affect the firm performance and accordingly cater these polices in light of selected mediating and moderating variables. Moreover, the findings generated can also be beneficial to identify related potential research areas for the future research studies.

Literature Review

Davydova and Babayan (2022) investigated the digital transformation of banking system in the context of sustainable development. The main objective of this study was to find out the state of Russian banking sector in terms of digital economy development, the need of legal regulations related to it and potential possibilities considering the implementation of prudential rules (Tsindeliani et al, 2022).

Kima et al. (2022) examined the adoption and usage of digital transformation in the financial sector and analyzed the process and outcomes of digitization and digitalization in the finance industry of South Korea and overseas in order to determine both the strategic and managerial implications of digital transformation. The study found that successful digital transformation is important for the active and systematic use of advanced online and digital technologies.

Theiri and Alareeni (2023) probed the digital transformation perception as a strategic advantage during the Covid-19. Their results illustrated that digitalization is necessary as strategic planning both in short and long term, it is a sign of innovation and sustainable development and this strategic planning should be used for the business survival (Theiri et al., 2023). While Yu and Yan (2022) documented that the digital financial development increases the implementation of enterprises' digital merger and acquisition. In this respect, high development increases the enterprises' tendency to engage in merger and acquisition.

Related Theories

1) Diffusion of Innovation Theory: According to Roger (1983), diffusion of innovation is the process of innovation in communication through different channels over time among the members of social system. This theory explains the basic approach of analyzing the new technology diffusion and how innovation process can occur through the communication channels. As businesses were badly affected due to covid-19 pandemic so it is necessary to investigate the technological shift like digital transformation (Subagja et al., 2022).

2) Resource based theory: Resource base theory views unique firm specific assets as a resources or capabilities to maintain the competitive advantage. In recent years, digitalization reshaped ways of the businesses and has brought under attention the reassessment of economic organization and its drivers. This focuses on the firm level resources that which value added activities should continue and which one should be outsourced (Giustiziero et al., 2023).

3) Technology Organization Environment Framework (TOE): It is organizational based theory that explains the three dimensions of a firm context which have effect on the adoption decision, these three dimensions are technological context, the organizational context, and the environmental context (Baker, J. (2012).

4) Theory of planned behavior: Jaz (1991) explained the psychological and social dimensions of individual behavior. Theory of planned behavior focuses on the intention formation towards a particular behavior and it consist of three elements, perceived behavioral control by individual, their attitude towards the behavior and subjective norms. This theory provides the appropriate behavioral perspective of digital transformation (Sadeghi at all (2023).

5) Risk Management Theory

Corporations mitigate risk through two distinct approaches: they may address individual risks sequentially or manage all risks concurrently utilizing a more effective system. The alternative method is commonly referred to as enterprise risk management (ERM). Organizations employing Enterprise Risk Management (ERM) possess a sustained competitive edge compared to those that address and oversee risks in isolation. Enterprise Risk Management generates value for the organization at both the micro and macro levels. At the micro level, Enterprise Risk Management (ERM) is integral to corporate culture, while at the macro level, it allows organizations to quantify and justify the risk-return trade-off (Nocco et al., 2022).

Digital Transformation and the Firm Performance

The existing literature has differences of opinion on the effect of digital transformation on the firm performance. Jardak and Ben (2022) found the negative effect of digital transformation on the firm ROE and ROA, though it positively affected the Tobin's Q ratio. They based the negative effect on the argument that investment in the information technology (IT) and digital transformation takes

long time to be materialized and captured by the firm performance indicators. Moreover, the ROA will negatively be affected as high values of IT assets are not amortized. However, in the long run, the firm performance can be improved as favorable impact on the Tobin's Q depicts the long-term digital transformation effect.

On the other hand, digital transformation at times also notably improves the firm performance and can fuel the momentum of firm innovation. Increasing revenue and efficiency, reducing costs, and encouraging the innovation are the foremost channels of digital transformation that ensures the enterprise development among which policy impact of enterprise innovation is utmost significant (Peng & Tao, 2022). Digital transformation optimizes the firm structure and fosters technology innovation and hence efficiency which is an important element of the firm financial performance (Wang & Xia, 2023). Resource based theory implies that a firm unique resources and capabilities provide competitive advantage over competitors (Zvarimwa et al., 2022).Thus RBV recognize digital transformation technologies as a strategic resource (Fujita et al.2025). On one hand, digital transformation optimizes the efficiency of organizations' operational resource allocation. Conversely, it mitigates significant uncertainty arising from external environmental changes, facilitating efficient, quick, and precise decision-making, swiftly adapting to fluctuating market demands, hence improving the firm's financial performance. In conclusion, digital transformation facilitates value creation and enhances financial performance efficiency (Wang et al., 2024). A robust digital transformation implementation strategy enables banks to attract more consumers, enhance their reputation, connect effectively with clients, and manage risks and service quality more efficiently, hence optimizing operational efficiency and overall performance (Nguyen-Thi-Huong et al., 2023). The preceding analysis results in the subsequent hypothesis.

H1a: Digital transformation strategy significantly affects the banks' financial performance.

H1 b: High digital transformation barriers have negative impact on banks' financial performance.

H1 c: High digital transformation challenges lead to low banks' financial performance.

H1 d: Digital transformation Outcomes significantly improves banks' financial performance

H1 e: Digital performance significantly enhances the banks' financial performance.

H1 f: Digital transformation steps favorably affect the banks' financial performance.

Mediating Effect of Risk Management on the Relationship between Digital Transformation and Firm Performance

Risk Management Theory explains that effective risk management is important for business performance and maintains its stability, especially in a highly volatile environment (Kaplan et al., 2012). The implementation of digitization in banks provides a chance to evaluate credit risk in a comprehensive manner that positively influences creditworthiness assessment. Furthermore, the utilization of new technology supplants the intricate and disorganized manual system, enhancing the assessment of credit risk and concurrently improving the operations of banks (Baskerville et al., 2020). Ullah et al. (2025) reveals that people are attracted more when the financial services are social and environment friendly.

Digital revolution markedly diminishes the risk-taking of banks. In this context, bank profitability is the principal component in risk mitigation facilitated by digital transformation (Chen et al., 2023). In a dynamic and intricate market landscape characterized by sluggish economic growth and cross-industry integration, commercial banks, as the primary catalysts of digital advancement, must delineate the impact of digital transformation on their risks to maintain operational efficiency and ensure sustained growth (Yang & Masron, 2023).

Digital technologies enhance marketing efforts and improve banks' risk management processes, including fraud detection. Risk management professionals collaborate with FinTech companies, enabling banks to develop their risk management systems through the expertise of data, artificial intelligence, and big data technology. Consequently, through the implementation of digital technology, banks may automate numerous procedures, thereby enhancing performance in terms of time and cost efficiency (Khanchel, 2019). Pupentsova et al. (2021) examined the impact of e-service innovation on actuarial risk management and organizational performance. Their findings validated the correlation between actuarial risk management and e-service innovation. Moreover, e-service facilitated the connection between actuarial risk management and corporate performance, so

informing the innovation strategy of insurance firms during the pandemic.

Tien et al. (2023) examined the risks and benefits of digital transformation at the organizational level, identifying five associated risks: integration challenges, security vulnerabilities, employee resistance, skills gap, and regulatory compliance. The benefits of digital transformation include improved business efficiency and productivity, heightened customer satisfaction, and data-driven decision-making. Their study additionally advocated for the implementation of several measures for an effective digital transformation strategy, including a security-first approach, thorough assessment, change management, employee engagement, compliance design, customer-centric approach, scalability and flexibility, data-driven decision-making, collaboration with experts, pilot projects, and iterative implementation.

The introduction and proper implementation of digitalization in banks provide an opportunity to evaluate credit risk in a comprehensive manner that positively influences creditworthiness assessment. Furthermore, the implementation of modern technology supplants the intricate and disorganized manual system, enhancing the evaluation of credit risk and consequently improving the operations of banks (Baskerville et al., 2020).

Abdurrahman et al. (2024) determined that Governance, Risk, and Compliance (GRC) elements substantially impact digital transformation and serve as intermediaries between GRC activities and organizational performance. Wu et al. (2024) contribute to the literature by demonstrating that digital transformation techniques considerably improve corporate risk performance. The aforementioned discussion underscores the function of risk management as an intermediary between digital transformation and organizational success. Consequently, the pertinent hypothesis is as follows:

H2 a: Risk management mediates the relationship between DT Strategy and banks' financial performance.

H2 b: Risk management mediates the relationship between DT Barriers and banks' financial performance.

H2 c: Risk management mediates the relationship between DT Challenges and banks' financial performance.

H2 d: Risk management mediates the relationship between DT Outcomes and banks' financial performance.

H2 e: Risk management mediates the relationship between Digital performance and banks' financial performance

H2 f: Risk management mediates the relationship between DT Steps and banks' financial performance.

Moderating Effect of Perceived Usefulness of Financial Technology (Fin Tech) on the Relationship between Digital Transformation and Firm Performance

According to Theory of Planned Behavior,

positive behavior towards digital tools strongly forecast Fintech adaptation. Additionally, customers perceive Fintech as accessible, efficient and time saving compared to traditional banking (**Zhang, et al.,** 2020). The perceived utility of digitization enhances the efficacy of digital banking. Perceived usefulness denotes the customer's perspective regarding the ability to improve job efficiency, such as time savings and access to services through various means. The Technology Acceptance Model (TAM) posits that perceived usefulness can assess users' beliefs regarding an application's enhancement of work performance (Ghani et al., 2022).

The advancement of FinTech can enhance the affordability and accessibility of financial services while effectively mitigating the adverse impacts of the digital divide (Zhang et al., 2020). Customers regard FinTech as superior to traditional payment methods due to an enhanced user experience. The TAM model is considered the preferred framework for FinTech uptake. Concerning FinTech, the primary criteria from the customers' viewpoint are trust, perceived ease of use, perceived benefit, perceived risk, performance, compatibility, and effort expectations. Consequently, this significantly impacts the conventional business models of organizations, compelling them to leverage digitization to deliver exceptional and distinctive customer service, thereby enhancing overall company performance (Rajan, 2022).

Perwitasari, A. W. (2022) argued that the behavioral intention towards FinTech is driven both collectively and partially by perceived usefulness and considered simplicity of use.

Their research demonstrated that Indonesian MSMEs consistently integrate FinTech services into their business operations due to their user-friendliness and advantages for the sector. Consequently, organizations that adapt their products to technological advancements might optimize the objectives of Fin-tech Micro, Small, and Medium Enterprises (MSMEs) to utilize financial technology. The research study further contributed to the literature by indicating that perceived usefulness has a greater impact on behavioral intention than perceived ease of use. Alsmadi et al. (2023) assert that the utilization of FinTech significantly influences the relationship between a bank's digital initiatives and its performance. Technological growth is becoming lucrative due to FinTech advancements. Furthermore, FinTech leverages available technological infrastructure to expedite bank performance enhancement. Economically favorable indicators, such as technology adoption, positive cash flow, and technological infrastructure, are pivotal in the development of FinTech. Their findings also demonstrated that Fin Tech enhances customer satisfaction and optimizes organizational processes in a more environmentally sustainable way.

The perceived utility of digitization enhances the efficacy of digital banking. Perceived usefulness denotes the user's perspective about the ability to improve job efficiency, conserve time, and facilitate access to services in many manners. The Technology Acceptance Model (TAM) posits that perceived usefulness can assess users' beliefs regarding an application's enhancement of work performance (Ghani et al., 2022). Marei et al. (2023) established a favorable and strong correlation between fin-tech adoption and organizational performance. The study of Amimakmur et al. (2024) suggests that IT innovation considerably moderates the association between business size and firm performance. Raza et al. (2025) contributed to the literature by demonstrating that FinTech adoption and knowledge management greatly influence corporate performance.

H3 a: Perceived usefulness moderates the relationship between DT Strategy and banks' financial performance.

H3 b: Perceived usefulness moderates the relationship between DT Barriers and banks' financial performance.

H3 c: Perceived usefulness moderates the relationship between DT Challenges and banks' financial performance.

H3 d: Perceived usefulness moderates the relationship between DT Outcomes and banks' financial performance.

H3 e: Perceived usefulness moderates the relationship between Digital Performance and banks' financial performance.

H3 f: Perceived usefulness moderates the relationship between DT steps and banks' financial performance.

Research Methodology

In the current study, the positivism philosophy is adopted with quantitative research design to provide credible data (Saunders et al.).This philosophy assumes the deductive stance in terms of hypothesis development and testing based on a theoretical stance. In this study, hypotheses are developed established on the related theories.while data collected through questionnaire

related to variables of the study measured through the numerical scales adapted from the different sources and collected data through a survey. The population size of the research is managers working in the customers care departments of banks located in five cities (Mardan, Peshawer, Swat, Swabi and Kohat) Khyber Pakhtunkhwa.

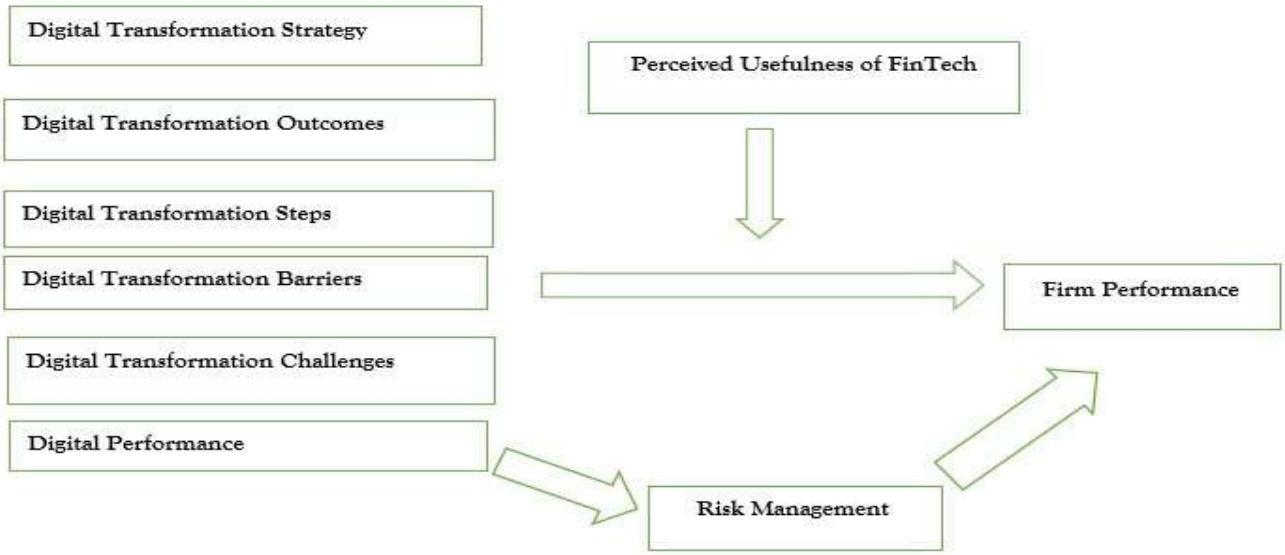
This research employed non-probability purposive sampling, also known as judgment sampling, to select participants from the Khyber Pakhtunkhwa, Pakistan's banking sector..

The population includes multiple commercial banks with different operational models and organizational sizes. Respondents were aged between 25-50, holding roles as Customer Service Officers, Operation Managers and Relationship Managers.

A total of 340 valid responses were collected and analyzed.

Conceptual Framework

Figure 1: Conceptual Framework



Source: Author

Results

4.2 Demographic Data

Table 4.1 delineates the demographic data of the study participants. The table presents frequencies and percentages for various demographic factors. Concerning age the distribution indicates that the predominant age group among participants is 30–40 years (45.23%), followed by the 40–50 age group (30%). A significant percentage of participants belong to the 25–30 age group (24.70%). The gender distribution of participants reveals a predominance of males (80%) over females (20%). The bulk of participants possess a Master's or Bachelor's degree (16 years of education), comprising 78.82%, followed by MS/M.Phil graduates (18 years of education) at 18.23%. Bachelor's degree holders constitute 2.35% of participants, while those with a Ph.D. account for 0.58%. Participants with 5-10 years of experience constitute the predominant group at 55%, while those with less than 5 years of experience account for 22.35%. Individuals with 10-15 years of experience represent 16.76%, and those with 15-20 years of experience comprise 5.88% of the sample. The table offers a detailed summary of the demographic attributes of the study participants, enabling an understanding of the sample's makeup.

Table 1: Demographic Data

	Frequency	%
Gender		
Male	272	80
Female	68	20
Age		
Below 25 Years	0	0
25-30 Years	84	24.70
30-40 years	154	45.29
40-50 years	102	30
More than 50 years	0	0

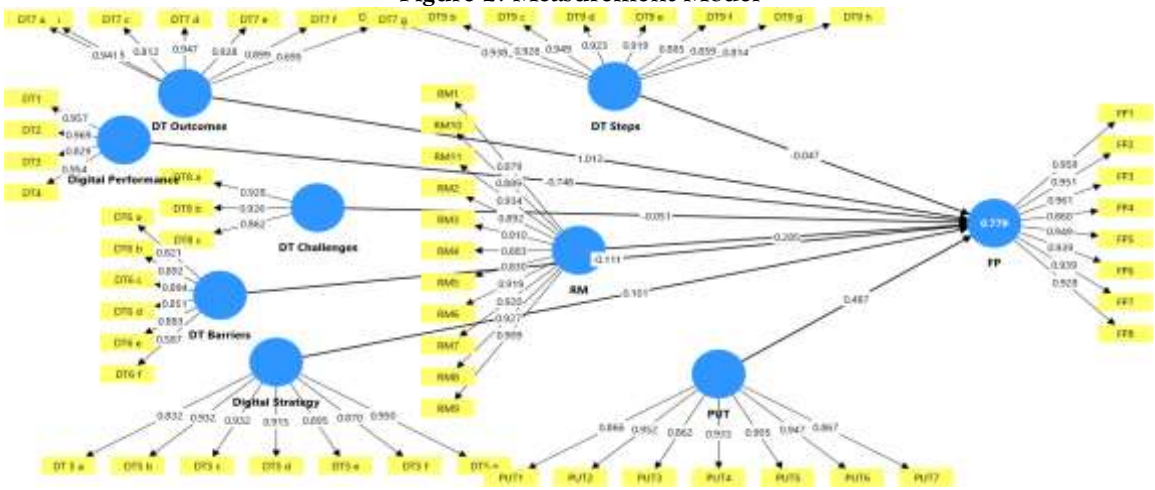
Education Level		
Matric/SSC	0	0
Intermediate/HSSC	0	0
Bachelor (14 years of education)	08	2.35
Master/Bachelor (16 years of education)	268	78.82
MS/M.Phil (18 years of education).	62	18.23
Ph.D.	2	0.58
Experience		
3-5 years	76	22.35
5-10 years	187	55
10-15 years	57	16.76
15-20 years	20	5.88
More than 20 years	0	0

Number of Participants =340

Measurement Model Evaluation

The composite reliability, convergent validity, and reliability of the measurement model were examined. The majority of items exhibiting high loadings with Cronbach's alpha surpassing the standard threshold of 0.7, hence showing robust internal consistency. The composite reliability (rho_a) and (rho_c) further corroborate all constructs reliability, while the average variance extracted (AVE) of all construct above the recommended threshold of 0.5, indicating strong convergent validity. The discriminant validity established through HTMT ratio and Fornell-Lacker criteria assessment as the square root of all AVE values maximum to inter constructs correlations and HTMT values below the threshold value 0.85.R2 value

Figure 2: Measurement Model



Source: Author

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Table 4 Reliability and Validity

Variables	Indicator	loading	Weights	CA	CR (rho_a)	CR (rho_c)	AVE
Digital Performance	DT1	**0.957**	0.277	**0.946**	**0.964**	**0.96**	**0.86**
	DT2	**0.967**	0.284				
	DT3	**0.829**	0.208				
	DT4	**0.954**	0.301				
DT Strategy	DT5a	**0.832**	0.13	**0.963**	**0.969**	**0.97**	**0.82**
	DT5b	**0.932**	0.16				
	DT5c	**0.932**	0.168				
	DT5d	**0.915**	0.172				
	DT5e	**0.895**	0.129				
	DT5f	**0.87**	0.178				
	DT5g	**0.95**	0.167				
DT Barriers	DT6a	**0.821**	0.179	0.909	0.94	0.93	0.69
	DT6b	**0.892**	0.24				
	DT6c	**0.894**	0.222				
	DT6d	**0.851**	0.266				
	DT6e	**0.883**	0.212				
	DT6f	**0.587**	0.046				
DT Outcomes	DT7a	**0.941**	0.169	0.954	0.971	0.96	0.79
	DT7b	**0.965**	0.173				
	DT7c	**0.812**	0.127				
	DT7d	**0.947**	0.184				
	DT7e	**0.928**	0.176				
	DT7f	**0.899**	0.181				
	DT7g	**0.695**	0.1				
DT Challenges	DT8a	**0.928**	0.456	0.893	0.945	0.93	0.82
	DT8b	**0.926**	0.371				
	DT8c	**0.862**	0.271				
DT Steps	DT9a	**0.938**	0.165	0.968	0.976	0.97	0.82
	DT9b	**0.928**	0.159				
	DT9c	**0.949**	0.153				

	DT9d	0.923	0.141				
	DT9e	0.919	0.132				
	DT9f	0.885	0.125				
	DT9g	0.859	0.123				
	DT9h	0.814	0.104				
Financial Performance	FP1	0.959	0.141	0.98	0.981	0.98	0.88
	FP2	0.951	0.144				
	FP3	0.961	0.138				
	FP4	0.86	0.12				
	FP5	0.949	0.13				
	FP6	0.939	0.131				
	FP7	0.939	0.135				
	FP8	0.928	0.128				
Perceived Usefulness of FinTech	PUT1	0.866	0.169	0.963	0.965	0.97	0.82
	PUT2	0.952	0.167				
	PUT3	0.862	0.143				
	PUT4	0.933	0.162				
	PUT5	0.905	0.156				
	PUT6	0.947	0.163				
	PUT7	0.867	0.143				
Risk Management	RM1	0.879	0.105	0.976	0.977	0.98	0.81
	RM10	0.889	0.096				
	RM11	0.934	0.106				
	RM2	0.892	0.104				
	RM3	0.91	0.104				
	RM4	0.883	0.108				
	RM5	0.83	0.093				
	RM6	0.919	0.097				
	RM7	0.92	0.1				
	RM8	0.927	0.104				
	RM9	0.909	0.093				

Structural Model

In table 4.14 indicates that DT Challenges (H1c) and DT Steps (H1f) did not have a significant effect on FP, suggesting that not all elements of digital transformation have equally impact. The path from **DT Strategy** to **Firm Performance** was **significant** with a path coefficient of **β** =0.127, **t** =2.208**,** and **p** = **0.027**. This result **supports** Hypothesis H1a.

The positive coefficient indicates a **positive** relationship between DT Strategy and FP. While the path from **DT Barriers** to Firm Performance was **significant,** with a path coefficient of **β** = -0.109, **t** = 2.697, and **p** =0.007. This result supports Hypothesis H1b. The negative coefficient indicates a **negative** relationship DT Barriers and FP.

The path from DT Challenges to **Firm Performance** was **not significant**, with a path coefficient of **β** = -0.04, **t** =0.610**,** and **p** =0.542. This **does not support** Hypothesis H1c. The negative coefficient indicates a **negative** relationship between DT Challenges and FP. However the path from DT Outcomes to **Firm Performance** was **significant,** with a path

coefficient of **β** =0.725**, t** 3.791and **p = 0.000**. This result **supports** Hypothesis H1d. The positive coefficient indicates a **positive** relationship between DT Outcomes and FP.

The path from Digital Performance to **Firm Performance** was **not significant**, with a path coefficient of **β** = -0.499, **t** =2.805, and **p** =0.005. This **does not support** Hypothesis H1e.

The negative coefficient indicates a **negative** relationship between DT Performance and FP.

The path from **DT Steps** to **Firm Performance** was **significant**, with a path coefficient of **β** = -0.022**, t** =0.284**,** and **p = 0.000**. This result **does not support** Hypothesis H1f. The negative coefficient indicates a **negative** relationship DT Steps and FP.

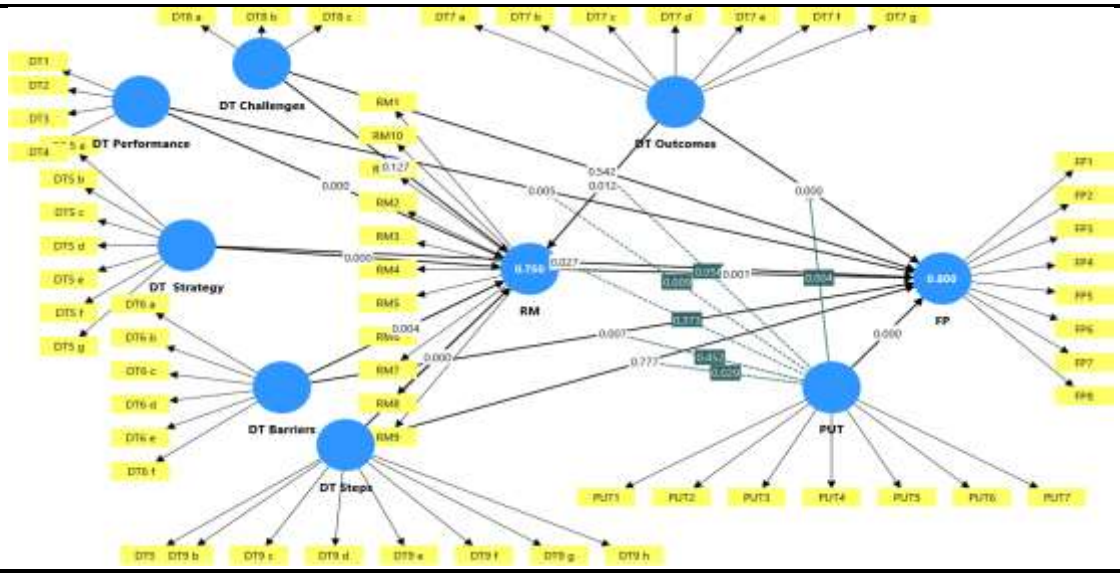
Hypothesis testing revealed that DT Strategy (H1a), DT Barriers (H2b), DT Outcomes (H4d), and Digital Performance (H5e) have a statistically significant impact on Firm Performance (FP). Specifically, DT Outcomes emerged as the most influential positive factor (β = 0.725, p < 0.001), while DT Barriers and Digital Performance showed significant negative relationships.

Table 2 Direct Relationship Results

Hypothesis	Relationship	Path Coefficient (β)	Standard deviation (STDEV)	t-values	p-values	Result
H1a	DT Strategy -> FP	0.127	0.058	2.208	0.027	Supported
H1b	DT Barriers -> FP	-0.109	0.040	2.697	0.007	Supported
H1c	DT Challenges -> FP	-0.041	0.068	0.610	0.542	Not Supported
H1d	DT Outcomes -> FP	0.725	0.191	3.791	0.000	Supported
H1e	DT Performance -> FP	-0.499	0.178	2.805	0.005	Supported
H1f	DT Steps -> FP	-0.022	0.079	0.284	0.777	Not Supported

Significance levels:
p < 0.05 → significant
p < 0.01 → highly significant

Figure 3: Structural Model



Source: Author

The Moderating Role of Perceived Usefulness of Financial Technology (Fin Tech)

In this study, on one hand perceived usefulness of Fintech significantly and positively 0.339 (p=0.000) influence the firm performance, but negatively and significantly -0.063 (p=0.008) moderate the relationship between digital transformation dimensions and firm performance.

These results recommend on one side positive and significant direct effect on firm performance indicates that it recognizes FinTech trend value to experience operational and financial benefits. On other sides negative moderation shows when financial technology is highly perceived more useful, digital transformation benefits typically derived weak firm performance. Additionally high investment in FinTech may divert focus on resources from more integrated digital transformation benefits. This result supports the H3e, H3f and H3g hypothesis that the perceived usefulness moderates the relationship between digital transformation dimensions (DT Outcomes, Digital Performance, and Digital Steps) and firm financial performance. These results also supported the previous study that perceived usefulness positively affect financial technology usage (Pirdayanti et al., 2021).However the PUT interaction with digital transformation dimensions (DT Strategy, DT Barriers, DT Challenges) did not significantly influence these relationships. Although environmental factors and strategic

factors may be not sufficient to enhance organizational performance. These findings support (Zuboff, 1998) that merely technological and environmental factors do not enhance organizational performance.

The table (3) summarizes **moderation (interaction effects)** in a model where different digital transformation (DT) variables interact with **PUT** (Perceived Usefulness of Technology) to predict **FP** (Firm Performance). The direct effect of PUT → FP has a **strong, positive, and significant effect** on FP (β = 0.493, p < .001), suggesting that as PUT increases, FP also increases. The relationship of Digital Outcomes with the Financial Performance was negatively and significantly moderated by PUT (β = -0.836, p = .004), whereas PUT positively and significantly moderated the relationship of Digital Performance (β = 0.753,p =.009) and Digital Steps (β = 0.144, p = .029) with the Financial Performance. Interaction of PUT with various independent variable like DT Strategy, DT Barriers, and DT Challenges were not statistically significant, indicating no significant moderation, though DT Challenges approached significance (p = .056) illustrating a level of moderation.

Table 3 Moderating Effects

Hypothesis	Relationship	Path Coefficient **(β)**	Standard deviation (STDEV)	t-values	p-values	Result
H3 a	PUT -> FP	0.493	0.066	7.433	0.000	Supported
H3 b	DT Strategy x PUT -> FP	0.044	0.05	0.89	0.373	Not Supported
H3 c	DT Barriers x PUT -> FP	-0.033	0.044	0.753	0.452	Not Supported
H3 d	DT Challenges x PUT -> FP	-0.144	0.075	1.913	0.056	Not Supported
H3 e	DT Outcomes x PUT -> FP	-0.836	0.291	2.876	0.004	Supported
H3 f	Digital Performance x PUT -> FP	0.753	0.289	2.604	0.009	Supported
H3 g	DT Steps x PUT -> FP	0.144	0.066	2.178	0.029	Supported

Significance levels:

p < 0.05 → significant

p < 0.01 → highly significant

The Mediating Role of Risk Management

H2 a: Mediation of DT Outcomes → FP through Risk Management (RM)

Mediation analysis was conducted to examine whether RM mediates the relationship between Digital Transformation Dimensions and Firm Performance (FP). Mediation analysis was performed to access the mediating role of Risk Management on the linkage between DT Outcomes and Firm Performance. The results revealed that the total effect of DT Outcomes on FP was significant (H2 a: β =0.588, t= 3.035, p= 0.002). After the inclusion of the mediating variable (RM), the impact of DT Outcomes on FP also is significant (β = 0.725, t=3.791, p= 0.000). The indirect effect of DT Outcomes on FM through RM was found insignificant (β =-0.137,t= 1.857,p= 0.063), indicating that **no mediation** is supported.

H2 b: Mediation of DT Performance → FP through RM

The total effect of Digital Performance on FP was insignificant (H2 b: β =-0.299, t= 1.639, p= 0.101). However with the inclusion of the mediating variable (RM), the impact of Digital Performance on firm performance became significant (β = -0.499, t=2.805,p= 0.005).The indirect effect of Digital Performance on Firm Performance through RM was also found significant (β =0.200,t= 2.355,p= 0.019), indicating that Risk Management partially mediate the relationship between Digital performance and firm performance.

H2c: Mediation of DT Steps → FP through RM

The total effect of DT Steps on FP was insignificant (H2 c:β =0.067 ,t=0.973 ,p= 0.330),and the direct effect remained insignificant after including RM (β = -0.022 ,t=0.284,p= 0.777). However the indirect effect through RM was found significant (β =0.089,t= 3.342,p= 0.001) suggesting full mediation. This implies that DT Steps influence FP **only through** Risk Management

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H2d: Mediation of DT Strategy → FP through RM

The total effect of DT Strategy on FP was significant (H2 d: β =0.182, t= 3.401, p= 0.001). With the inclusion of the mediating variable (RM), the impact of DT Strategy on FM remained significant (β =0.127, t=2.208, p= 0.027). The indirect effect of DT Strategy on FP through RM was also significant (β =0.055, t= 2.752, p= 0.006), indicating that **RM partially mediates** the relationship between DT Strategy and FP.

H2e: Mediation of DT Barriers → FP through RM

The total effect of DT Barriers on DV was significant (H2 e: β =-0.89, t=2.267, p= 0.023).With the inclusion of the mediating variable (RM), the impact of DT Barriers on firm performance remained significant (β = -0.109, t=2.696, p= 0.007). The indirect effect of DT Barriers on FP through RM was found significant (β =0.020, t= 2.319, p= 0.020), indicating **partial mediation** by Risk Management.

H2 f: Mediation of DT Challenges → FP through RM

The total effect of DT Challenges on FP was insignificant (H2 f: β =-0.057, t= 0.850, p= 0.396). The direct effect also remained non-significant after adding RM (β = -0.041, t=0.610, p= 0.542). The indirect effect of DT Challenges on Firm Performance through RM was found also insignificant (β =-0.016,t= 1.517,p= 0.129), indicating that **no mediation** is present.

Discussion and Conclusion

Discussion of the Research Findings

This study sought to examine the influence of diverse digital transformation (DT) elements—namely DT strategy, barriers, challenges, outcomes, performance, and steps—on firm performance (FP), while also invetigating the mediating role of risk management (RM) and

the moderating role of perceived usefulness of financial technology (PUT) in these dynamics. The study's findings, derived from structural equation modeling using SmartPLS, illuminate the characteristics of digital transformation (digital barriers, digital strategy, digital steps, digital challenges, digital outcomes, digital performance) and their impact on firm performance.

The analysis revealed a substantial positive relationship between digital transformation outcomes and organizational performance (H1d). The findings suggest that firms experiencing digital transformation exhibit elevated levels of innovative behavior, showing that the use of digital technologies positively influences the production of new ideas and solutions within the corporate setting. Digital transformation enhances processes, improves customer experiences, fosters innovation, reduces costs, and enables quicker market responses; these aspects are significant drivers of superior performance. There is ample empirical evidence confirming the beneficial correlation between digital transformation outcomes and corporate performance. Research conducted by Ullah et al. (2025) and Baroma (2025) has established a positive correlation between digital transformation outcomes and organizational performance. Furthermore, Darathi et al. (2024) emphasized the beneficial correlation between the utilization of digital technology and improvements in decision-making, scalability, productivity, quality assurance, and overall company performance. The validation of Hypothesis 1 in our study enhances the existing evidence, demonstrating that digital transformation outcomes favorably affect business performance.

Table 4 Mediation Analysis

Total effect		Direct effect			Indirect effect				
Coefficient	p-value	Coefficient	p-value		Coefficient	SD	T value	P values	BI [2.5%,97.5]
0.588	0.002	0.725	0.000	DT Outcomes -> RM -> FP	-0.137	0.074	1.857	0.063	0.307-0.019
-0.299	0.101	-0.499	0.005	DT Performance -> RM -> FP	0.2	0.085	2.355	0.019	0.067-0.425
0.067	0.33	-0.022	0.777	DT Steps -> RM -> FP	0.089	0.027	3.342	0.001	0.028 -0.135
0.182	0.001	0.127	0.027	DT Strategy -> RM -> FP	0.055	0.02	2.752	0.006	0.023- 0.105
-0.057	0.396	-0.109	0.007	DT Barriers -> RM -> FP	0.02	0.009	2.319	0.02	0.007- 0.044
-0.074	0.127	-0.041	0.542	DT Challenges -> RM -> FP	-0.016	0.01	1.517	0.129	-0.040- 0.000

Significance levels:
p < 0.05 → significant
p < 0.01 → highly significant

Table 5 Moderating Effects

Hypothesis	Relationship	Path Coefficient (β)	Standard deviation (STDEV)	t-values	p -values	Result
H3 a	PUT -> FP	0.493	0.066	7.433	0.000	Supported
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H3 c	DT Barriers x PUT -> FP	-0.033	0.044	0.753	0.452	Not Supported
H4 d	DT Challenges x PUT -> FP	-0.144	0.075	1.913	0.056	Not Supported
H5 e	DT Outcomes x PUT -> FP	-0.836	0.291	2.876	0.004	Supported
H6 f	Digital Performance x PUT -> FP	0.753	0.289	2.604	0.009	Supported
H7 g	DT Steps x PUT -> FP	0.144	0.066	2.178	0.029	Supported

Significance levels:
p < 0.05 → significant
p < 0.01 → highly significant

Secondly, the study revealed that DT challenging practices indicated negative and insignificant effect on the banks' performance (H1c). This suggests that when organizations adopt digital transformation projects, problems such as cultural opposition, internal processes, and insufficient digital skills adversely impact firm performance, though not to a statistically significant degree. Empirical research has demonstrated the influence of digital transformation problems on corporate performance. Mustafa et al. (2018) indicate that problems associated with digital transformation adversely impact corporate performance. The findings of our study further substantiate these assertions, showing that organizations undergoing digital transformation are likely to encounter obstacles that result in low performance, particularly in the banking sector.

The analysis similarly confirms the favorable and significant impact of digital transformation strategy on banks' performance, providing robust evidence to generalize this relationship within the population (H1a). The likely rationale for these results is that the DT strategy, when implemented in isolation, is likely to enhance company performance. Tangible results such as customer-centric innovation, operational efficiency, and improved digital capabilities arise from the successful integration and implementation of digital transformation initiatives. This indicates that organizations implementing a digital transformation plan are likely to promote supporting firm performance consistently across the banking sector. These findings align with prior research by Wei and Shen (2025), which suggested that digital transformation improves short-term financial performance, operational efficiencies, and cost reductions.

Furthermore, the analysis revealed a negative and significant impact of DT Barriers on firm performance (H1b). The study further indicates that elevated DT Barriers result in diminished banking performance. Furthermore, additional digital transformation barriers, such as a lack of comprehension of digital technologies, insignificant investment in technology infrastructure, software, and training, a scarcity of experienced workers, and regulatory constraints, contribute to suboptimal company performance. These findings correspond with the research conducted by Vogelsang et al. (2019), which emphasizes that DT Barriers result in a deceleration or total cessation of digital transformation within businesses.

Moreover, results demonstrated the negative and insignificant effect of DT steps (H1f) on the banks' financial performance. Despite the negative coefficient associating digital transformation processes with banks' financial performance, the association is statistically negligible. This indicates that the analyzed data does not provide substantial evidence that digital transformation initiatives (steps) adversely affect corporate performance. Potential reasons encompass nascent transformation, delayed impacts, discrepancies in execution quality, or extraneous influences obscuring the relationship. These results contradict the prior study by Cheng et al. (2024), which suggested that stages of digital transformation greatly affect firm control. Digital performance demonstrates substantial negative and significant effect on banks' financial performance. The adverse and substantial impact of digital performance on financial performance within the banking sector may indicate the immediate costs, disruptions, and execution risks linked to digital transformation. Although digitalization is essential for sustained competitiveness, numerous banks encounter obstacles like cyber-security threats, regulatory limitations, workforce deficiencies, and strategic misalignment. These challenges may negate potential benefits and, in certain instances, result in performance decline during the transformation phase. This indicates that a transformative approach enhances innovation inside a business. This study corroborates the research findings by Kim et al. (2024) who indicate that Digital Capabilities significantly improve enterprises performance.

The interaction effect among dimensions of digital transformation on firm performance is identified mixed as negative and significant. This indicates that the relationship between digital transformation outcomes and organizational performance is strongly affected by perceived usefulness of FinTech. The results reveal a considerable negative moderating effect. A perceived usefulness of FinTech diminishes or inverts the correlation between digital dimensions and firm performance.

The intensity and direction of the association between the dimensions of digital transformation and firm performance vary according to the perceived usefulness of FinTech. The perceived utility of financial technology also positively impacts the relationship of DT Steps, Digital performance and organizational performance. Digital transformation can enhance organizational performance by facilitating production standardization, augmenting operational efficiency, and increasing product value through technical advancements. Insufficient technological adoption may hinder innovation within the firm, hence diminishing its performance. This research finding corroborates the conclusions of Agustia et al. (2022) that technological capability moderates the association between product innovation and business success. While perceived usefulness of fintech insignificantly moderates the relationship between DT Barriers, DT Challenges and DT Strategy and organizational performance. These results indicate that not all digital transformation components equally interact with PUT to influence organizational performance.

Additionally environmental factors or strategic factors may be not sufficient to enhance organizational performance. These findings support (Zuboff, 1998) that merely technological and environmental factors do not enhance organizational performance. While Byrd and Turner (2001) assert that integration and management of IT resources are more vital for organizational performance than technological assets possession.

This study examines the mediating role of risk management in the relationship between aspects of digital transformation and banks' financial performance, revealing strong mediation effects. This shows that risk management support plays a crucial intermediary role in converting digital transformation initiatives into organizational performance (H3). This indicates that risk management support is essential in converting the effects of digital transformation activities into measurable enhancements in organizational performance. The mediating effect of risk management between the dimensions of digital transformation (DT Barriers, Digital Performance, DT Steps, DT Strategy) and firm performance is positive and substantial, with the exception of DT Challenges and DT Outcomes. These findings indicate that risk management solutions in the banking sector can anticipate and mitigate transformation-related risks, hence achieving performance advantages. The mediation effect of risk management diminishes when faced with significant digital challenges and DT outcomes. In such circumstances, risk management is inadequate to attain desired objectives due to inherent structural resistance to adaptive change. Overall, these results are in line with Shah et al. (2025) who documented a substantial positive correlation between enterprise risk management and a firm's digital transformation. The study's findings corroborate current empirical research that underscores the significance of digital transformation aspects and risk management techniques in improving corporate performance. The findings highlight the necessity for enterprises to invest in digital technology and foster a receptive culture.

Conclusion

The results indicate that digital transformation strategy, digital transformation outcomes, and digital performance significantly impact corporate performance. Among these, digital transformation outcomes exhibited the most significant positive impact, indicating that companies achieving tangible benefits from digital initiatives (such as innovation, efficiency, or enhancements in customer experience) are more likely to attain superior performance. Digital transformation outcomes underscore the significance of firms using technological advancements to foster creativity. Furthermore, the digital strategy positively influenced performance outcomes, suggesting that a well-defined digital roadmap aligned with company objectives boosts effectiveness.The study emphasizes that not all digital transformation initiatives yield equivalent advantages. Success hinges on strategy clarity, achievement of outcomes, and the surmounting of organizational obstacles.While Risk management support is identified as the principal mediating element that translates digital transformation initiatives into tangible results,

highlighting the significance of business practices in facilitating change throughout digital transformation.

Results further strengthen the PUT–FP link, indicating that the PUT has conducive effect on the corporate performance. The PUT did not moderate the effect of DT Strategy, Barriers, and Challenges on the banks' financial performance, indicating that PUT may not influence the effect of these dimensions on the corporate performance.

These findings hold significant significance for both theoretical and practical applications. The study elucidated the mechanisms by which digital transformation initiatives influence firm performance, providing empirical support for the Diffusion of Innovation Theory, Stockholder Theory, Resource-Based Theory, TOE Framework, Theory of Planned Behavior, and Enterprise Risk Management Theory. By synthesizing various theoretical frameworks, the research study offers an extensive understanding of the interplay among individual, organizational, and environmental factors in enhancing corporate performance within the realm of digital transformation. The research study contributes to the existing literature on digital transformation by providing a novel perspective on how risk management might facilitate performance in banks.

This study contributes to the growing body of research on digital transformation and corporate performance by offering empirical evidence of the mechanisms that connect them. The study emphasizes the importance of digital transformation and company performance in promoting innovative behavior, offering critical implications for organizational management and strategic decision-making within the realm of digitalization. Further empirical researches are recommended for an in-depth investigation of other dimensions of digital transformation and risk management in relation to the corporate performance. Qualitative research may yield additional insights into the efficacy of digital transformation strategies for the firm. Addressing these shortcomings will augment the usefulness and reinforce the academic foundations of this study domain.

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