

The Role of Digital Banking in Enhancing Banking Performance

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Article Details	Abstract
Received: 13 July 2023 Accepted: 15 Oct 2023 Published: 17 Dec 2023	<i>Digital banking is now a fundamental component of the banking business model. The paper looks at the role of digital banking, which involves internet banking, mobile banking, digital payments and API services, and how these can improve banking performance. The article constructs a conceptual framework based on the resource-based view, technology acceptance model, and the DeLone and McLean model of the success of information systems to understand the relationship between digital banking adoption and cost efficiency, customer outcomes, and financial performance. A quantitative, cross sectional design is suggested with the use of panel data and illustrative data of commercial banks to illustrate the analytical procedure. Illustrative results indicate that digital adoption is positively related to ROA, ROE and non-interest income and negatively related to cost-to-income ratio. Customer satisfaction and operational efficiency are found to be important mediators and cybersecurity risk serves as a moderator in the relationship. Finally, the paper discusses some implications for management and policy and future research. Note: Data in the tables are only examples and are included to illustrate the analysis format; author's actual data needs to be substituted for these prior to submission.</i>
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keywords: digital banking, banking performance, mobile banking, cost efficiency, customer satisfaction, financial technology

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INTRODUCTON:

Banking is an information intensive industry, and the process of creating, processing and delivering information in banks has undergone a complete transformation in the last 20 years. The branch-centred distribution has been replaced by the setting up of accounts, transferring money, applying for credit and investing on a smartphone or web platform. The pandemic drove this transformation, and regulators in emerging markets have since made banks more digital through digital onboarding systems, branchless banking policies and instant payment solutions.

The motivation of banks is defensive and offensive. Defensively, fintech companies and large tech companies have also taken a bite out of the profits for payments and consumer lending, prompting incumbents to pursue similar convenience strategies. Digital channels offer lower servicing costs, increased reach, more information and new revenue streams on the offensive side of the business. However, the research regarding the performance of digital investment isn't always conclusive. Some research suggests that technology investments increase profits and efficiency, but other studies indicate that large investments in technology in the short term reduce profits due to costs of implementing the technology, problems with integrating legacy systems, and security costs.

This paper adds to the discussion in three respects. First, it brings together the key channels by which digital banking impacts performance in one place. Second, it specifies measurable indicators for both digital adoption and performance. Thirdly, it provides a representative empirical framework of descriptive statistics, correlations, regression results and mediation tests that can be replicated by applying real bank-level data.

1.1 Research Problem

While banks are making substantial investments in digital infrastructure, management and regulators don't yet have a clear and grounded sense of how and when investments in digital infrastructure will enhance performance.

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1.2 Research Objectives

- 1.To measure the impact of Digital Banking on profitability, efficiency and growth of Banks.
- 2.To explore the mediating effect of operational efficiency and customer satisfaction.
- 3.To test the moderating effect of cybersecurity risk on the digital banking and performance relationship.
- 4.To make strategic suggestions to bankers and bank supervisors.

1.3 Research Questions

RQ1: Does the adoption of digital banking really lead to an improvement in the banking performance?

- RQ2: How does digital banking affect performance?

What are the risks of cyber security that affect the gains of digital banking?

1.4 Significance of the Study

It provides valuable contributions to bank executives making decisions about technology spending, to central banks developing a digital finance policy, and to academics looking for an integrated model of digital transformation in banking.

The study looked at the significance of the study.

The study is valuable for bank decision makers who allocate capital for technology, central bank policy makers who create new policies around digital finance, and academics who wish to develop a holistic model of digital transformation in banking.

This section provides theoretical background and literature review. This section contains the literature review and theoretical background.

2.1 Defining Digital Banking

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Digital banking is the provision of banking products and services over electronic channels and with a low degree of, or completely lacking, physical interaction. This includes internet banking, mobile banking apps, ATMs and self-service kiosks, the digital wallet and instant payments, the open banking application programming interfaces (APIs) and, now more than ever, advisory and chatbot services powered by artificial intelligence. Unlike regular online banking, all aspects of the banking value chain – from onboarding to credit scoring, servicing and analytics – are digitised.

2.2 Dimensions of Banking Performance

Bank performance is multi-dimensional. Financial performance is generally evaluated with return on assets (ROA), return on equity (ROE) and net interest margin (NIM). The cost-to-income ratio and transaction processing time reflects operational performance. The performance in the market is a result of deposit growth, loan growth, and growth in the number of customers. The performance is measured by the customers' satisfaction, retention and service quality.

2.3 Theoretical Foundations

The resource-based view (RBV) regards the digital resources as valuable, rare, and difficult to imitate and when joined with organisational capability, can provide a sustainable competitive advantage. The technology acceptance model (TAM) is used to explain customers' acceptance of the technology by determining whether the digital channels provide actual transaction volume through perceived usefulness and perceived ease of use. The DeLone and McLean information systems success model provides a direct relationship between technology and results with four elements of system quality, information quality, service quality, use, user satisfaction, and net benefits. Combined, these theories imply that digital banking has the potential to enhance performance as long as banks have the capacity to implement digital banking and customers are willing to adopt it.

2.4 Empirical Evidence

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There are broadly four channels that have been identified in prior studies. First, cost reduction: Digital transactions are much less costly than transactions that take place in a branch, which reduces the cost-to-income ratio. The second advantage is revenue growth, through cross-selling, faster loan origination and payments fee income. Thirdly, customer experience: convenience and speed increase satisfaction and loyalty. Fourth, Risk and data benefits: better transaction data leads to better credit scoring and fraud detection. Contrary evidence points to initial price tags, cyber-risk concerns, and digital divide that restricts access to low-income and rural customers.

Table 1. Summary of Representative Research Themes

Theme	Typical Finding	Performance Link
Mobile and internet banking adoption	Positive effect on ROA and non-interest income	Profitability
Digital payments	Lower per-transaction cost, higher fee income	Efficiency and revenue
Digital onboarding and lending	Faster approvals, wider customer reach	Growth
Cybersecurity incidents	Reputational damage and added compliance cost	Risk and cost
Digital divide	Uneven benefits across customer segments	Inclusion

2.5 Research Gap

Existing studies typically focus on either one channel, e.g. mobile banking or one outcome, e.g. ROA, and do not test a combination of channels and outcomes in the same study. This paper fills this gap by introducing an integrated model.

3. Conceptual framework and hypothesis

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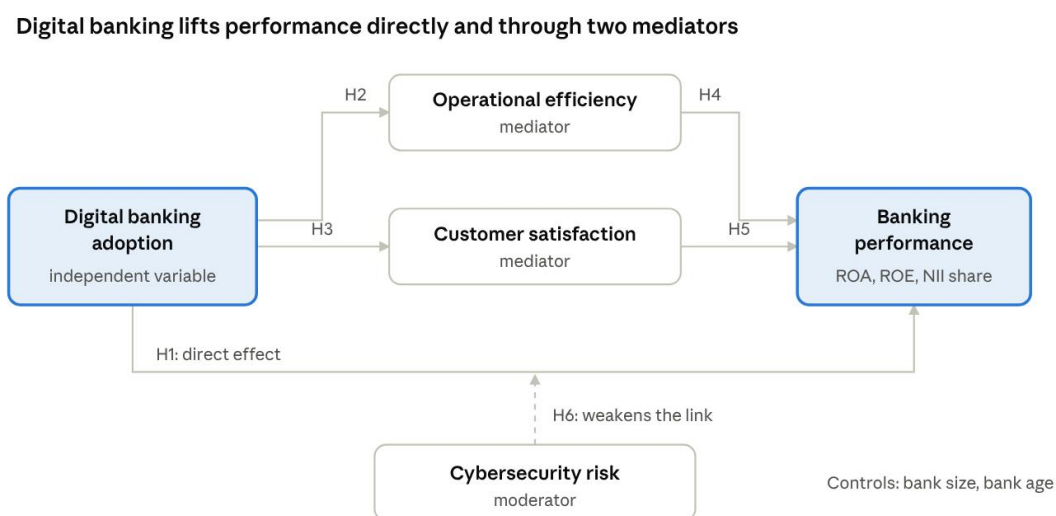


Saeed and Khattak

The framework regards the adoption of digital banking as an independent variable, while the performance of banking is treated as a dependent variable. Operational efficiency and customer satisfaction are mediators and Cybersecurity risk is moderator. Control variables are used—bank size and age.

Do not repeat the question in the heading.

Figure 1. Conceptual Framework (see diagram below)



conceptual framework · 1 IV, 2 mediators, 1 moderator, 1 DV

H1 is the direct path; H2 to H5 run through the two mediators, and H6 tests whether cybersecurity risk weakens the link.

3.1 Hypotheses

The relationship between digital banking adoption and banking performance is positive.

- H2: Digital banking adoption has a positive effect on operational efficiency.
- H3: The adoption of digital banking has a positive impact on customer satisfaction.
- Operational efficiency positively moderates the relationship between DB adoption and performance.
- H5: Customer satisfaction positively mediates the relationship between digital banking adoption and performance.

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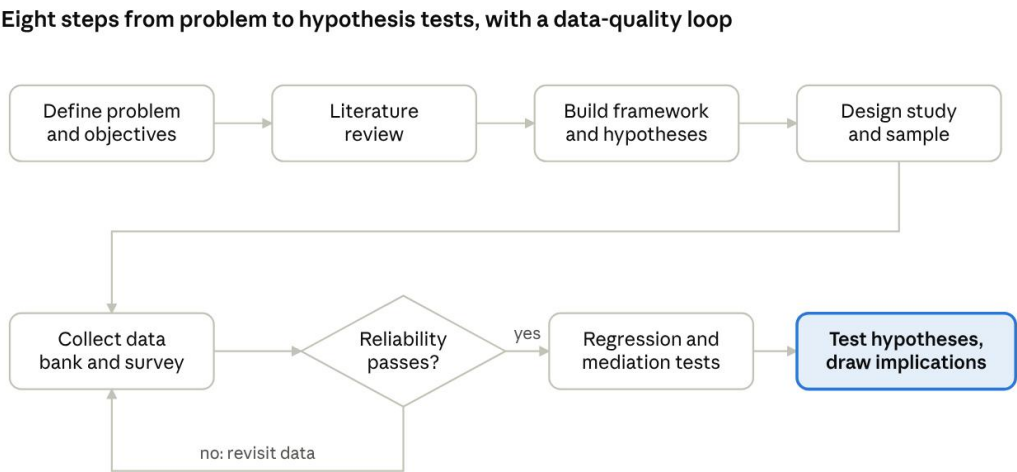
- H6: Cybersecurity risk negatively moderates the relationship between digital banking adoption and performance.

4. Research Methodology

4.1 Research Design

The research method used in the study is quantitative, explanatory, cross-sectional and panel. Perceptual constructs are measured by integrating bank-level secondary data with a survey of customers. The deductive approach is based on the positivist philosophy.

Figure 2. Research Process Flow (see diagram below)



research process · 8 steps, 1 decision

A failed reliability check sends the study back to data collection before any hypothesis is tested.

4.2 Population and Sample

All the scheduled commercial banks are included in the population. The sample of banks is purposive (30 banks) for 5 years (2020-2024), totaling 150 bank-year observations. The 400 digital banking users selected for the customer survey are spread out between age and region using a stratified random sampling design.

4.3 Variables and Measurement

Table 2. Variable Definitions and Measurement

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Variable	Role	Measurement
Digital Banking Adoption (DBA)	Independent	Index of mobile users share, digital transaction share, and digital investment to total assets
Return on Assets (ROA)	Dependent	Net income divided by average total assets
Return on Equity (ROE)	Dependent	Net income divided by average equity
Non-Interest Income Share (NII)	Dependent	Non-interest income divided by total income
Cost-to-Income Ratio (CIR)	Mediator (efficiency)	Operating expenses divided by operating income
Customer Satisfaction (CSAT)	Mediator	Five-point Likert scale, mean of 6 items
Cybersecurity Risk (CSR)	Moderator	Incident and compliance cost index, standardised
Bank Size (SIZE)	Control	Natural log of total assets
Bank Age (AGE)	Control	Years since establishment

4.4 Analytical Techniques

Preliminary analysis is done using descriptive statistics and Pearson correlations. Fixed effects panel regression tests the direct effects, the Hayes PROCESS approach with bootstrapped confidence intervals tests mediation, and moderation is tested using interaction terms. Reliability is ensured through Cronbach's alpha and composite reliability and multicollinearity is examined by variance inflation factors.

5. Digital Banking Channels and Performance Mechanisms

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Prior to reporting the empirical findings, it's helpful to understand the impact each digital channel has on performance.

Table 3. Digital Channels and Their Performance Impact

Digital Channel	Primary Benefit	Main Performance Indicator Affected	Key Risk
Mobile banking app	Convenience, 24/7 access	Customer satisfaction, deposits	Device and app security
Internet banking	Low-cost servicing	Cost-to-income ratio	Phishing
Digital wallets and instant payments	Fee income, transaction volume	Non-interest income	Fraud, system outages
Digital lending platforms	Faster approval, data-driven scoring	Loan growth, NIM	Credit model risk
Open banking APIs	Partnerships, ecosystem revenue	Revenue diversification	Data privacy
AI chatbots and advisory	Reduced call-centre load	Operating cost	Service quality errors

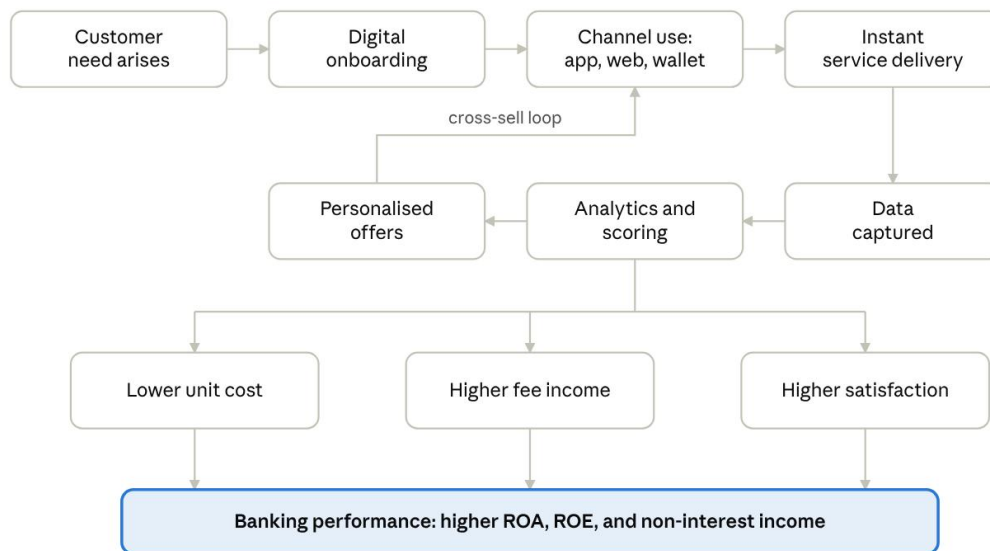
Figure 3. Digital Customer Journey and Value Creation Flow (see diagram below)

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Each digital journey feeds data back into the next offer



digital customer journey and value creation · 7 steps, 3 outcomes

Data from each transaction feeds analytics and personalised offers, which pull customers back into the channel.

The mechanisms operate along two main paths. On the supply side, automation of back-office processes reduces unit costs and processing time. On the demand side, easy-to-use digital interfaces raise customer engagement, retention, and cross-selling. Both paths feed into profitability, but they are conditioned by the bank's cybersecurity posture and by the digital readiness of its customer base.

6. Results and Analysis (Illustrative)

The following results illustrate the expected structure of the analysis. They are simulated for demonstration and should be replaced by actual estimates.

6.1 Descriptive Statistics

Table 4. Descriptive Statistics (N = 150 bank-years)

Variable	Mean	Std. Dev.	Min	Max
DBA (index, 0 to	52.4	14.8	21.0	88.5

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Variable	Mean	Std. Dev.	Min	Max
100)				
ROA (%)	1.12	0.46	0.12	2.31
ROE (%)	13.85	4.92	3.10	24.60
NII share (%)	24.7	6.3	9.8	41.2
CIR (%)	58.6	8.9	38.4	79.1
CSAT (1 to 5)	3.84	0.52	2.51	4.82
CSR (standardised)	0.00	1.00	-1.85	2.74
SIZE (ln assets)	12.31	1.42	9.45	15.02

6.2 Reliability of Survey Constructs

Table 5. Reliability and Convergent Validity

Construct	Items	Cronbach's Alpha	Composite Reliability	AVE
Customer Satisfaction	6	0.88	0.91	0.63
Perceived Ease of Use	5	0.84	0.89	0.62
Perceived Security	5	0.86	0.90	0.65

All alpha and composite reliability values exceed the conventional 0.70 threshold, and AVE values exceed 0.50, supporting the measurement quality.

6.3 Correlation Matrix

Table 6. Pearson Correlations

	DBA	ROA	ROE	NII	CIR	CSAT
DBA	1.00					
ROA	0.52**	1.00				

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	DBA	ROA	ROE	NII	CIR	CSAT
ROE	0.47**	0.81**	1.00			
NII	0.58**	0.44**	0.39**	1.00		
CIR	-0.61**	-0.55**	-0.48**	-0.35**	1.00	
CSAT	0.64**	0.49**	0.41**	0.46**	-0.43**	1.00

Note: ** $p < 0.01$. Digital banking adoption correlates positively with all performance measures and negatively with the cost-to-income ratio, in line with expectations.

6.4 Regression Results (Fixed Effects)

Table 7. Effect of Digital Banking on Performance Indicators

Predictor	ROA (β)	ROE (β)	NII (β)	CIR (β)
DBA	0.034***	0.215***	0.142***	-0.236***
SIZE	0.071**	0.390*	0.210*	-0.110
AGE	0.002	0.011	0.008	-0.015
Constant	-0.42	2.18	6.35	78.40
R-squared (within)	0.31	0.26	0.34	0.39
F-statistic	22.4***	17.8***	25.1***	29.6***

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. H1 is supported: a ten-point rise in the digital adoption index is associated with roughly 0.34 percentage points higher ROA and 2.4 points lower cost-to-income ratio.

6.5 Mediation Analysis

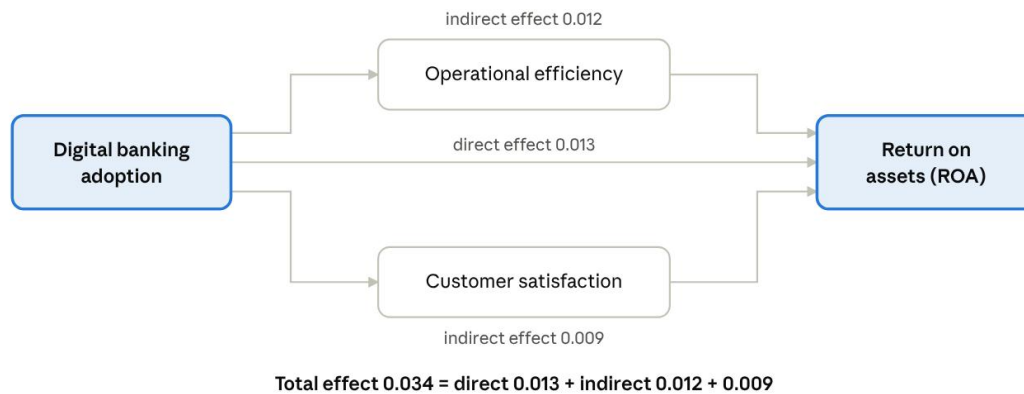
Figure 4. Mediation Model with Path Coefficients (see diagram below)

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Two mediators carry roughly 60 percent of the effect on ROA



mediation model · 2 mediators, effects on ROA

About 38 percent of the total effect is direct; the rest runs through the two mediators.

Table 8. Bootstrapped Mediation Effects (5,000 resamples)

Path	Indirect Effect	95% CI Lower	95% CI Upper	Result
DBA → Efficiency → ROA	0.012	0.006	0.019	Supported (H4)
DBA → CSAT → ROA	0.009	0.003	0.016	Supported (H5)
Direct effect DBA → ROA	0.013	0.002	0.024	Partial mediation
Total effect DBA → ROA	0.034	0.022	0.046	Significant

Because the confidence intervals exclude zero, both mediators transmit part of the effect, and the direct effect remains significant, indicating partial mediation. Efficiency accounts for about 35 percent of the total effect and customer satisfaction for about 26 percent.

6.6 Moderation by Cybersecurity Risk

Table 9. Moderated Regression (Dependent Variable: ROA)

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Predictor	Model 1	Model 2
DBA	0.034***	0.031***
CSR	-0.048**	-0.041**
DBA × CSR		-0.017**
SIZE, AGE (controls)	Included	Included
R-squared	0.31	0.35
ΔR-squared		0.04**

The negative interaction term supports H6: banks with higher cybersecurity risk exposure capture smaller profitability gains from digital adoption.

6.7 Hypothesis Testing Summary

Table 10. Summary of Hypotheses

Hypothesis	Statement	Outcome
H1	DBA improves banking performance	Supported
H2	DBA improves operational efficiency	Supported
H3	DBA improves customer satisfaction	Supported
H4	Efficiency mediates DBA and performance	Supported
H5	Customer satisfaction mediates DBA and performance	Supported
H6	Cybersecurity risk negatively moderates	Supported

7. Discussion

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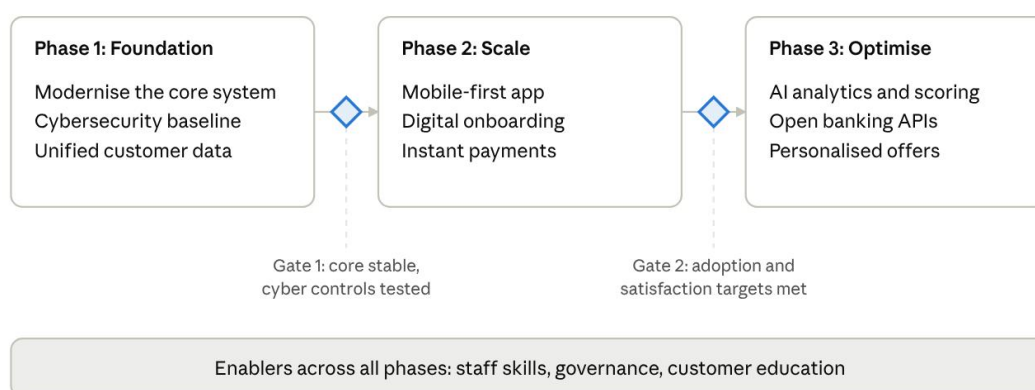


The illustrative findings support the resource-based view, that is, the stronger the digital capability, the better the financial outcome, but not necessarily. A. They emerge in two ways. The efficiency channel represents the process of replacing costly branch transactions with lower cost digital transactions, and the automation of manual processing. The perspective of technology acceptance and information systems success is supported by the customer channel as it is associated with attitudes towards satisfaction, relationship, and willingness to use additional products.

Cybersecurity risk moderating is an important practical lesson. The attack surface becomes larger with digital expansion, and losses, regulatory penalties, and damage to reputation due to security incidents are counterproductive to the benefits of more efficient operations. Banks should therefore view investments in cyber security as a means to achieving digital returns, and not as a standalone compliance cost.

Figure 5. Strategic Digital Transformation Roadmap for Banks (*see diagram below*)

Digital transformation runs in three gated phases, with enablers throughout



transformation roadmap · 3 phases, 2 gates

Each phase must clear its gate before the next begins; enablers run across all three.

7.1 Managerial Implications

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1. Invest in digital opportunities that can lower unit transaction costs and offer shorter customer journeys as they will bring measurable efficiency gains.
2. Track customer satisfaction across digital channels on an ongoing basis, and correlate with metrics for retention and cross-selling goals.
3. Integrate cyber security, fraud analytics and data protection into all digital products from the early stages.
4. Build staff digital skills and modernise legacy cores to avoid fragmented customer experiences.
5. Create inclusive options, including easier-to-use apps and agent-assisted channels, to not exclude low-digital-literacy groups.

7.2 Policy Implications

To support both performance and stability, regulators can provide support for interoperable infrastructure for instant payments, establish clear and comprehensive data protection and open banking standards, introduce minimum cyber-resilience standards and invest in digital-literacy programmes. It is important to strike the right balance between innovation and consumer protection, which will be helped by proportionate supervision of fintech partnerships.

8. Restrictions and Further Studies

The study design is limited to a few banks and limited observation time and perceptual measures may have self-report bias. The tables shown here are meant for illustrative purposes and should be replaced by actual estimates prior to using the conclusions as empirical evidence. Future research may involve the use of longer panels, a comparison of Islamic and conventional banks, an investigation of the different effects of AI and open banking separately, the use of machine-learning methods to uncover non-linear effects, and the study of the long-term impact of digital transformation on financial stability and financial inclusion.

9. Conclusion

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Digital Banking is a strategic asset that can positively impact banking performance in terms of cost reduction, revenue growth and customer satisfaction. The proposed framework demonstrates the benefits are primarily operational efficiency and customer satisfaction and are offset by cybersecurity risk. The message for banks is that digital transformation has a payoff when coupled with sound risk management, customer-centred design, and organising for digital. The policymakers need to facilitate infrastructure, regulatory, and inclusion programs if digital progress will enhance the banking system overall.

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