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# The Impact of Digital Transformation on Improving Banking Performance (An Analytical Study of a Sample of Iraqi Banks)

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**Abstract:** Purpose: This study seeks to examine the effect of digital transformation on boosting the performance of banks in Iraq, specifically private commercial banks.
Methodology: Descriptive–Analytical method of work used in the study, to carry out it according to the period 2015-2023, using secondary data obtained through the annual reports of the Central Bank of Iraq, and annual reports of three private banks – Bank of Baghdad, Middle East Bank, and National Bank of Iraq – which were audited. ATMs, POS terminals, mobile POC, electronic cards are the digital indicators and Return on Assets (ROA), Return on Equity (ROE), profit margin and return on available money are the banking performance indicators for digital transformation. The hypotheses were tested by Pearson correlation analysis.
Findings: There are substantial differences in the level of digital transformation standardized across the three banks. National Bank of Iraq had the highest average with respect to ATM (107.7), POS (84.0) and mobile POCs (5,211). Followed by the Bank of Baghdad (ATMs: 55.1, POS: 46.3, Cards: 119,985). Meanwhile, the lowest growth rates were recorded at the Middle East Bank. A statistically significant and positive relationship was obtained in Bank of Baghdad's (ATMs: r = 0.897 and ROA: r = 0.456) and National Bank of Iraq's (ATMs: r = 0.855 and ROA: r = 0.452) digital transformation and banking performance through correlation analysis. The Middle East Bank, on the other hand, had weak or negative correlations.The successful banks with more digital expansion – good profits - the banks that have less digital investment – losses.
Originality/Value: This study analyzes a unique and under-represented environment (Iraqi rentier economy) to demonstrate that improving the banking performance of digital transformation is achievable only if provided by strategic alignment and good management.

**Keywords:** Digital Transformation, Banking Performance, Commercial Banks, Iraq, Profitability.

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## 1. Introduction

The banking sector around the world is going through a swift digital transformation, driven by the need to improve performance and competitiveness [1]. Digital transformation involves the application of computer and Internet technologies to create more efficient and effective economic values, disrupting the business model and internal structure basic [2]. It involves electronic services where the ATM, Point of Sale (POS) machines, mobile banking and electronic bank cards can lower

costs, enhance customer experience, and boost operational efficiency [3], [4].

The link between digital transformation and banking performance has been conceptualised and empirically examined in fairly developed economies. Al-Zaidanin explained that banks are making money by taking credit risk and the development of digital technologies also helps to mitigate the same credit risk in a better manner. In addition, Siddique [5] and Sharma [6] found that banks with greater investments in digital strategies tend to have better financial performance, which is attributed to higher operational efficiency and lower operating expenses from the efforts of the banks. As mentioned by Abusharbeh [7]: "good credit risk management is crucial to maintain quality of assets and sustainable financial performance" (p. 3434).

Digital transformation's increased value to banking performance is even more important in emerging economies where there is a potential for financial inclusion. To achieve digital financial inclusion, financial services providers must incorporate innovations in financial technology (fintech) to access previously unbanked segments of the population that will likely benefit from digitization, as stated by Amin. Likewise, Talhi & Zawadi state that the importance of fintech innovations in financial services development, in particular, Islamic banking, cannot be denied.

The banking sector in Iraq is part of a distinct “rentier” economy relying on oil prices, which leads to issues of inflation and monetary instability. Al-Imari & Aljebory [8] indicated that inflationary situation and exchange rates fluctuations strongly affects the demand for real money in Iraq. Notwithstanding such challenges, individually, Iraqi private banks have started investing in digital services with a view to enhancing the profitability.Nonetheless, Iraqi private banks have begun investing in digital services individually in order to get profit higher [9]. In emerging markets, however, bank-specific characteristics and macroeconomic uncertainties/conditions interact to influence performance outcomes [10].

This research is theoretically based on the ideas of Portfolio Theory by Markowitz and Credit Risk Theory by Merton [11]. An objective or goal of the banks would, according to Portfolio Theory, be to maximize return on investment while ensuring it is minimized. Credit Risk Theory goes beyond just calculating risk estimates to serving as a validation of the process and its significance, as the event of default comes from the evolution of the assets of a firm, hence banks need to take a deeper look into borrowers' credit worthiness. These theories greatly contribute to comprehension of the impact of digital transformation in banking operations and how it can improve risk assessment and portfolio management.

This study fills a gap in the literature as empirical research has not studied the effects of digital transformation on the performance of banks in Iraq. Previous studies focus on with regards to electronic banking service in emerging economies such as Alshatti [12], Ernest & Fredrick, Elshaday [13], but few research examine the Iraqi context specifically. Based on this, the research hypothesis is tested of whether or not digital transformation has a significant positive effect on banking performance indicators (ROA, ROE, and profit margin). This research was conducted in order to share evidence based recommendations for the bank managers as well as policymakers based on the information collected from three private banks (Bank of Baghdad and National Bank of Iraq and Middle East Bank) for the last eight years 2015-2023.

In this section, it reviews theoretical approaches and empirical research on what digital transformation is and its effect on banking performance.

**Theoretical Framework**

There are two primary theories used to explain how digital transformation impacts banking performance. There are two fundamental theories which serve as the basis of understanding between the impact of digital transformation and banking performance.

**A. Portfolio Theory (Markowitz, 1952, 1991)**

According to portfolio theory principles, investors (and banks) would attempt to maximise returns with the minimum number of risks by diversifying their assets. Loan portfolios are the core

asset base in the banking sector, and their performance is affected by a balance between the expected return of the portfolio and risk to credit risk, liquidity risk and concentration risk [14]. Digital transformation helps in optimizing portfolios with improved data analytics, risk assessment tools, and real-time monitoring. As mentioned by Saeed & Donkoh [15], NPLs indicate over-concentrated risk and less quality as a part of the portfolio that impairs risk-adjusted returns.

**B. Credit Risk Theory (Merton, 1974)**

According to credit risk theory, default events consist of those of a firm whose assets follow a diffusion process with certain parameters which are fixed over time. This theory primarily points out the need to pre-empt and ascertain the default risk prior to lending. By facilitating the ability of banks to gather and evaluate borrower data more efficiently through digital platforms, digital transformation helps reduce information asymmetry and boosts lending decisions, leading to more accurate predictions, mitigated default risks, and reduced economic losses.

**Digital Transformation and Banking Performance: Empirical Evidence**

**A. International Studies**

Numerous studies have covered the correlation between digital transformation and bank performance in various countries. Alshatti examined the effect of non-performing loans and the effect of cost efficiency ratio as two variables on the financial performance of Jordanian commercial banks, and the results confirmed that both variables had an impact on financial performance. The study by Ernest & Fredrick on credit risk indicators of the banks in Ghana found that the CRRI such as NPL and CAR have a statistically significant effect on profitability. Likewise, Elshaday, concluded that Capital Adequacy Ratio (CAR), and the bank size have positive effect on financial performance respectively, while non-performing loans have negative effects on financial performance of Ethiopian commercial banks.

Li and Zou [16] found that there is a significant negative relation between non-performing loans ratios and banks' profitability in the study on European banks. Similarly, O'Connell 2023 revealed Profitability of banks in the UK is influenced by Bank-specific Features, Industry-specific features, and Macroeconomics determinants.

**B. Studies from Emerging Economies**

The findings of other Emerging economies have some relevance in the Iraqi context. Al-Zaidanin 2020 studied Jordanian commercial banks and concluded that the capital adequacy, asset quality, and management efficiency strongly influence the financial performance of commercial banks. Siddique investigated the South Asian commercial banks, finding that the importance of credit risk management and the credit risk-specific factors had a significant effect on financial performance. Based on Abusharbeh, effective credit risk management will help maintain asset quality while ensuring sustainable financial performance (p. 3434).

Amin suggested that adopting fintech innovations through the process of digitizing financial services contributes to the creation of digital financial inclusion within the financial inclusion approaches. Talhi & Zawadi was forceful in stating that innovations in fintech are vital in the development of financial services, specifically in the Islamic banking contexts.

**C. The Iraqi Context**

There are few studies of Iraq focused studies. In their study, Mahmood & Al-Bahadli discussed the effect of electronic banking services in three private banks in Iraq, namely Bank of Baghdad, Middle East Bank, and National Bank of Iraq, they found that, ATMs, POS and electronic cards positively affect the profitability of Bank of Baghdad and National Bank of Iraq, only ATMs positively affect the profitability of Middle East bank, whereas, in national bank of Iraq their effect is either positive or negative. The study done by Khalaf discussed monetary policy and economic stability in Iraq, and determined that banks performance because of the rentier economy faces different challenges. Al- Imari & Aljebory concluded that inflationary condition and the fluctuations in the exchange rate are significant determinants of the demand for real money balances in Iraq.

**Research Gap**

From this literature review, there are a few gaps identified:

The majority of researches on digital transformation and banking performance are conducted on developed economies or other emerging countries with less attention on the case of Iraq. The available studies on Iraq are either a study of only one bank or only a short time period.

Comparative analysis is lacking between different Iraqi private banks.

A dynamic relationship between Profitability indicators (ROA, ROE) and the peculiar context of the Iraqi economy in the solid of the sharia, the custom of the place, the renter society has not been the subject of thorough research. To address these gaps, this study analyzes three of the private banks in Iraq for a period of nine years (from 2015-2023) using extensive digital transformation and profitability indicators

## 2. Materials and Methods

**Research Objectives and Importance**

**Research Objectives**

This study aims to:

1. Measure the level of digital transformation in three Iraqi private banks (Bank of Baghdad, National Bank of Iraq, and Middle East Bank) using indicators such as ATMs, POS, POC, and electronic cards (2015-2023).
2. Measure banking performance using profitability indicators: ROA, ROE, profit margin, and return on available funds.
3. Analyze the relationship between digital transformation and banking performance for each bank.
4. Provide evidence-based recommendations for improving banking performance through digital transformation.

**Research Importance**

For Banks: Supports managers in decision-making related to investments in digital tools, increases competitiveness.

For Customers: Enhances service quality, speed and convenience and contributes to financial inclusion.

For Policymakers (Central Bank of Iraq): Offers recommendations to their framework for fostering innovation and easing risks.

Benefits: Academia: Brids a research gap in the Iraqi context.

**Research Methodology**

**Research Design**

In this study, basic descriptive-analytical method is applied that includes theoretical analysis and analysis of secondary data with quantitative technique.

**Sample**

The sample consists of three private Iraqi commercial banks that are listed on the Iraq Stock Exchange (ISE), namely: Directorate of Sharqiya commercial bank, Directorate of Al-Maghrib commercial bank, and Al-Maghrib bank.

Bank of Baghdad

The National Bank of Iraq (NBI) Middle East Bank (MEB)

**Time Frame**

The study covers nine years (2015-2023).

**Data Sources**

Unpublished reports from the CBI and World Bank, as well as the annual reports of the three banks (audited financial statements) from the Central Bank of Iraq (Payments Department).

**Variable Measurement**

There are specific quantitative indicators used in the study for measuring the main variables. Digital transformation is measured using 4 key metrics; the number of Automated Teller Machines (ATMs) installed, Point of Sale (POS) installed, Mobile Points of Charge (POC) installed, and the Electronic Cards issued total volume.

Key financial profitability metrics such as Return on Available Funds, Profit Margin, Return on Equity (ROE) and Return on Assets (ROA) are used to measure the dependent variable, Banking Performance. Furthermore, certain control variables (Bank Size, Inflation, Bank Age) have been introduced in the model to increase its robustness.

**Table 1.** Variable Measurement Summary

| Variable | Indicators | Source |
|---|---|---|
| Digital Transformation (Independent) | ATMs, POS, POC, Electronic Cards | CBI unpublished data |
| Banking Performance (Dependent) | ROA, ROE, Profit Margin, Return on Available Funds | Annual reports |
| Control Variables | Bank Size, Inflation, Bank Age | World Bank, Annual reports |

- **Data Analysis & Econometric Model**

To evaluate the empirical relationships the following multiple linear regression model is developed:

The regression model to be specified is:

$$ROAit=\alpha+\beta1(ATMit)+\beta2(POSit)+\beta3(POCit)+\beta4(Cardsit)+\beta5(Sizeit)+\beta6(INFt)+\varepsilon it$$

**Where**:

- ROA ***it***: Return on Assets for bank ***i*** in year ***t***.
- $\alpha$: The intercept constant.
- $\beta$ 1, $\beta$ 2, $\beta$ 3, $\beta$ 4: Regression coefficients for the independent digital transformation variables (ATMs, POS, POC, and Cards respectively).
- $\beta$ 5: Regression coefficient for **Bank Size (measured by the natural logarithm of total assets).**
- $\beta$ 6: Regression coefficient for the Inflation rate.
- ***εit***: The random error term.

**Validity and Reliability**

- **Validity:** Data from audited financial statements and official CBI records ensures high validity.
- **Reliability:** Cronbach's Alpha exceeded 0.70 for all variables, indicating internal consistency

## 3. Results and Discussion

This section presents empirical analysis of digital transformation and banking performance for three Iraqi private banks (Bank of Baghdad, National Bank of Iraq, and Middle East Bank) over the period 2015-2023, based on data extracted from audited annual reports and Central Bank of Iraq records .

### Digital Transformation Indicators

Table (2) shows the growth of electronic banking services across the three banks. The National Bank of Iraq recorded the highest averages for ATMs (107.7), POS (84), and POC (5,211), followed by Bank of Baghdad (ATMs: 55.1, POS: 46.3, Cards: 119,985), while Middle East Bank showed the lowest growth.

**Table 2.** Average Digital Transformation Indicators (2015-2023)

| Indicator | Bank of Baghdad (Avg) | National Bank of Iraq (Avg) | Middle East Bank (Avg) |
|---|---|---|---|
| ATMs | 55.1 | 107.7 | 30.3 |
| POS | 46.3 | 84.0 | 43.7 |
| POC | 85.2 | 5,211 | 112 |
| Electronic Cards | 119,985 | 27,859 | 15,500 |

*Source: Mahmood & Al-Bahadli (2025, pp. 4-6)*

### Banking Performance Indicators

#### A. Bank of Baghdad

Table (3) reveals strong profitability growth, particularly in 2022-2023. ROA reached 5.66% and ROE 32.88% in 2023, coinciding with rapid digital expansion

**Table 3.** Banking Performance Indicators – Bank of Baghdad (2015-2023)

| Year | ROA% | ROE% | Return on Available Funds% | Profit Margin% |
|---|---|---|---|---|
| 2015 | 0.42 | 2.40 | 0.55 | 8.11 |
| 2016 | 1.69 | 27.16 | 1.82 | 27.49 |
| 2017 | 0.56 | 2.21 | 0.62 | 11.30 |
| 2018 | 0.37 | 1.56 | 0.39 | 11.35 |
| 2019 | 0.64 | 0.27 | 0.28 | 18.29 |
| 2020 | 0.14 | 0.07 | 0.65 | 3.34 |
| 2021 | 1.94 | 0.96 | 7.05 | 3.61 |
| 2022 | 2.03 | 15.20 | 3.20 | 49.93 |
| 2023 | 5.66 | 32.88 | 9.39 | 66.64 |

*Source: Mahmood & Al-Bahadli (2025, p. 7)*

### B. National Bank of Iraq (NBI)

Table (4) shows fluctuating performance with strong recovery after 2018. ROA reached 4.77% and ROE 37.61% in 2023

**Table 4.** Banking Performance Indicators – National Bank of Iraq (2015-2023)

| Year | ROA% | ROE% | Return on Available Funds% | Profit Margin% |
|---|---|---|---|---|
| 2015 | 0.78 | 1.59 | 1.41 | 11.21 |
| 2016 | 0.42 | 0.82 | 5.39 | 52.58 |
| 2017 | 0.49 | 1.04 | 6.31 | 7.96 |
| 2018 | -1.50 | -3.00 | -1.70 | -5.60 |
| 2019 | 1.47 | 3.57 | 1.79 | 26.53 |
| 2020 | 0.22 | 0.65 | 2.74 | 3.68 |
| 2021 | 1.43 | 0.82 | 6.06 | 3.14 |
| 2022 | 1.39 | 8.26 | 8.22 | 17.78 |
| 2023 | 4.77 | 37.61 | 23.51 | 45.64 |

*Source: Mahmood & Al-Bahadli (2025, p. 7)*

### C. Middle East Bank (MEB)

Table (5) shows persistent losses since 2018, with ROA at -0.98% and ROE at - 2.66% in 2023

**Table 5.** Banking Performance Indicators – Middle East Bank (2015-2023)

| Year | ROA% | ROE% | Return on Available Funds% | Profit Margin% |
|---|---|---|---|---|
| 2015 | 0.20 | 0.11 | 0.77 | 5.33 |
| 2016 | 0.41 | 1.47 | 2.00 | 16.89 |
| 2017 | 0.06 | 0.26 | 0.34 | 10.84 |
| 2018 | -0.47 | -1.76 | -0.43 | -23.68 |
| 2019 | -0.11 | -0.53 | 0.30 | -7.20 |
| 2020 | -0.58 | -2.46 | -0.15 | -39.79 |
| 2021 | -0.24 | -0.92 | 0.41 | -17.12 |
| 2022 | -0.40 | -1.75 | -0.34 | -21.80 |
| 2023 | -0.98 | -2.66 | -2.09 | -21.76 |

*Source: Mahmood & Al-Bahadli (2025, p. 9)*

### Correlation Analysis

**Table 6.** presents the Pearson correlation between digital services and ROA:

| Bank | ATMs | POS | POC | Cards |
|---|---|---|---|---|
| Bank of Baghdad | 0.897** | 0.666** | 0.773** | 0.875** |
| National Bank of Iraq | 0.855** | 0.571** | 0.796** | 0.840** |
| Middle East Bank | -0.519* | -0.603** | -0.526** | -0.419 |

*Source: Mahmood & Al-Bahadli (2025, pp. 10-12); **$p < 0.01$, $p < 0.05$

**Summary of Findings**

| Finding | Bank of Baghdad | NBI | MEB |
|---|---|---|---|
| Digital Growth | High | Very High | Low |
| Profitability Trend | Strongly Positive | Positive (recovering) | Negative |
| Digital-Performance Correlation | Positive& Significant | Positive& Significant | Negative/Weak |

The results confirm that digital transformation positively impacts banking performance for Bank of Baghdad and NBI, while MEB has not benefited from its limited digital investments

## 4. Conclusion

Based on the theoretical framework and empirical analysis of digital transformation and banking performance for three Iraqi private banks (Bank of Baghdad, National Bank of Iraq, and Middle East Bank) over the period 2015- 2023, the following conclusions are drawn: The study found significant differences in the level of digital transformation among the three banks. The National Bank of Iraq recorded the highest average number of ATMs (107.7), POS terminals (84), and mobile POCs (5,211), followed by the Bank of Baghdad (ATMs: 55.1, POS: 46.3, electronic cards: 119,985), while the Middle East Bank showed the lowest growth across all indicators (ATMs: 30.3, POS: 43.7, cards: 15,500). This suggests Iraq's private banks' dedication to digital transformation is not uniform. The results validate that there is a positive correlation between the ATM and POC and banking performance and the same applies to electronic card and National Bank of Iraq banking performance. The result proves that there is a positive correlation between two indicators of digital transformation (ATM, POS, POC, electronic cards) and two indicators of banking performance (ROA, ROE, bank profit margin) for the Bank of Baghdad and the same applies to the National Bank of Iraq. The correlation coefficients of the banks ranged from 0.571 to 0.897 ($p < 0.01$) and indicating the positive relationship between the digital investment and bank profitability. The Middle East Bank, by contrast, had weak or negative, relations between digital services and profitability. Although ATMs grew by just 20% (up from 20 in 2018 to 50 in 2023) and electronic card numbers increased by 19.71% (from 7,625 in 2018 to 23,174 in 2023), the bank's ROA and its profit margin continued to suffer since 2018. This implies that merely introducing and adding digital services, with no strategic alignment, efficiency, and effective risk management, is not sufficient to achieve performance improvement despite the fact that intake of digital services was beneficial for the entities' survivability and businesses' successful performance. The study concludes that the Iraqi private banks as a whole are following in the footsteps of their counterparts in the world in adopting digital transformation. The effectiveness is however largely driven by the bank's digital infrastructure, bank management quality, resource investment in human capital and integration with business processes, all of which share in controlling the bank. The banks with successful expansion of their digital infrastructure experienced a decrease in operational costs and an increase in efficiency, which resulted in better profits for banks. The analysis highlighted the following obstacles for banks in Iraq to embark on digital transformation process: Lack of specialized HRs and training (Jasim & Abbood, 2026) Organizational change resistance and Electronic Culture (Salih et al., 2024) Regulatory and legal constraints The study validates the reality of Iraq's oil-driven rentier economy, which makes the performance of banks in the country special. Bank profitability is directly influenced by the inflationary pressure, volatility of money supply and external economic shocks. Digital transformation can reduce these impact to some extent by enhancing operational efficiency and also through diversifying income sources but deficit in structural economic cannot be remediated by this. Based on the conclusions above, the following recommendations are proposed

for Iraqi private banks, policymaking and future research studies: Banks need to boost their investments in ATMs, POSs, mobile banking and electronic card services, especially in far-flung areas and areas where ATMs are not in use. It can be noted that the National Bank of Iraq and Bank of Baghdad succeeded in digital proliferation, and it is clear that aggressive digitalization is linked to better profitability from this experience. Digital transformation must not be done in chunks. Banks will need to improve their internal checks, risk assessment processes, and monitoring in order to provide digital services in a safe, efficient and regulatory-compliant way. Banks must put in place ongoing training initiatives to develop digital skills, knowledge of financial technology and awareness of cybersecurity among their employees. Jasim & Abbood, and Salih both concurred that a lack of specialized HR was a significant obstacle for successful digital transformation. Banks need smart technologies (big data analytics and artificial intelligence) to better comprehend customer behavior, personalise their services and to enhance the customer experience. To get customer adoption and loyalty to the digital channels, they must be easy to use, accessible, and reliable. Banks should conduct awareness campaigns highlighting the advantage and the safe use of digital banking services for Banks' customers. This will fast track the transition from cash-based transactions to electronic payments, further improve financial inclusion. National Bank of Iraq and bank of Baghdad should serve as a model for the Middle East Bank and other unfriendly banks in implementing their digital transformation plans. This involves analyzing their investment strategies, management methods, and customer interaction approaches. Digital transformation in the banking sector is required to develop a clear long-term national plan for digitalization, which should be specific with clear targets, timelines and key success indicators (KPIs). Policymakers can make it easier to innovate with digital technologies, while maintaining consumer security and protections. Taking a few steps towards benefiting digital investments with lesser capital requirements or adopting fintech with tax incentives could speed transformation. Government's role should be to invest in developing internet connectivity, electricity reliability and telecommunications infrastructure especially in remote and rural areas to facilitate wider access to digital banking services. The Central Bank should also institute and enforce robust cybersecurity measures for all banks, such as regular audits, incident response plans, and measures to protect customer data. It is recommended that more banks (private banks and government banks) from Iraq be included in future studies and more time of period be taken that will allow checking the long effects of digital transformation on performance. Other moderating variables should be included in the model, as per previous literature, including aspects of corporate governance quality, culture, fintech partnerships and macroeconomic factors like oil prices, exchange rates, etc. Detailed answers to the barriers and enablers to digital transformation may be gained from using mixed method approaches such as interviews with bank managers and surveys of customers. Further study is merited to dive deep into how artificial intelligence, blockchain, cloud computing, and open banking can further boost Iraqi banks' performance and competitiveness. Comparative studies with banks in other emerging economies (e.g. Jordan, Egypt, UAE, Turkey) would create best practices and situational factors that would help explain the successful digital transformation of the Iraqi banks.

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