



## Article

# Redistribution of Banking Risks in Light of The Transition to Electronic Payments in Iraqi Banks for The Period 2021-2025

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**Abstract:** During the period (2021-2025), the Iraqi banking sector witnessed an accelerated shift towards the adoption of electronic payments, which led to the restructuring of the banking risk structure. This study aimed to analyze the nature of the redistribution of banking risks in light of the transition to electronic payments, by testing the two research hypotheses about the existence of a relationship and a statistically significant effect between the variables of digital transformation and banking risk indicators. The research was based on the descriptive analytical approach, using financial data from five Iraqi banks (al-Rafidain, Al-Rasheed, Iraqi commercial, Iraqi national, Baghdad). The results showed a statistically significant strong inverse relationship between the indicators of electronic payments and composite banking risks (correlation coefficients ranged from -0.786 to -0.866), and the regression model also revealed a high explanatory power ( $R^2 = 0.900$ ). The study confirmed the hypothesis of "redistribution" rather than "cancellation" of risks, as traditional credit risks declined (non-performing loans decreased from 10.5% to 7.7%) against the rise of digital operational risks (increased from 0.19 to 0.27). The research concluded that digital transformation repositions risks within the financial system and requires the development of advanced risk management mechanisms that keep pace with the digital banking environment.

**Citation:** Fadhil, A. A. Redistribution of Banking Risks in Light of The Transition to Electronic Payments in Iraqi Banks for The Period 2021-2025. American Journal of Economics and Business Management 2026, 9(3), 649-663

Received: 10<sup>th</sup> Dec 2025

Revised: 21<sup>th</sup> Jan 2026

Accepted: 04<sup>th</sup> Feb 2026

Published: 26<sup>th</sup> Mar 2026



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**Keywords:** redistribution of banking risks, electronic payments, Iraqi banking sector

## 1. Introduction

The Iraqi banking sector has witnessed fundamental transformations in recent years as a result of the accelerated progress in information and communication technologies and the expansion of the digital economy, which has led to the emergence of new types of financial transactions, primarily electronic payments. These transformations lead to deep changes in the nature of banking, financial services were no longer limited to banks and credit institutions founded on paper principles; they depend more and more on digital channels and electronic payment systems such as digital wallets, banking applications, etc. or various types of payment cards. This change in pace has become even more pronounced in recent years, particularly following the covid-19 pandemic that caused both financial institutions and customers to adopt digital solutions as fast and secure alternatives for cash payments. Over the period (2021-2025), with the growth of electronic payments is very visible changes in the risk structure faced by banks. While these systems have contributed to reducing some of the traditional risks associated with carrying cash and the costs of managing it, on the other hand, they have created new types of risks, such as cyber risks, electronic fraud risks, risks of

technical systems failure, in addition to risks related to data protection and user privacy. As a result, banking risks are no longer concentrated in their traditional areas such as credit risk, liquidity risk and market risk, but their distribution is changing due to the increasing digital transformation in banking services. This transformation has led to a reshaping of the risk map within the banking sector, as some risks have moved from the traditional operational environment to the digital environment, and new challenges have emerged that require the development of modern mechanisms for risk management and banking supervision. Therefore, modern technologies (electronic payments) use the advantages of these systems in an efficient and effective manner leading to improved risk management within the banking system coupled with regulatory authority ensuring financial stability related to electronic payments. In this sense, the theme of banking risk redistribution becomes an increasingly important issue in light of the transition to electronic payments, especially given its explanatory role for the transformations taking place within the contemporary banking sector. The aim of this research is to study the impact of the development and expansion of electronic payments over the past (five) years, between (2025-2021), on the nature of changes that occurred in banking risks and its implications for transforming risk management mechanisms, thereby ensuring financial stability and enhancing the efficiency of our banking system in confronting growing digital challenges.

## **2. Materials and Methods**

### **Research problem**

The banking sector in the recent years has experienced and accelerated trend towards electronic payments driven by technological development and dissemination of digital technologies, which led to a change in nature of banking operations and methods of provision funds. They have reduced dependence on the physical exchange of cash, enabled swifter and more efficient payment processing, and accomplished a broader reach when it comes to banking services available to citizens. However, this digital transformation has not only affected the operational aspects, but has also directly affected the nature of the risks faced by banks. With the expansion of the use of electronic payment systems during the period (2021-2025), the Banking Risk Map began to witness a noticeable change, as some of the risks associated with traditional cash transactions have decreased, while new types of risks associated with digital infrastructure have emerged, such as cyber risks, electronic fraud risks, risks of technical systems failure, in addition to risks associated with data protection and Privacy. The increasing reliance on electronic systems, communication networks and digital applications has led to a redistribution of risks between various banking activities, which forces banks and regulators to develop more efficient tools and methods to manage these risks. Despite the increasing importance of electronic payments in enhancing the efficiency of the financial system, rapid digital transformation may create new challenges related to the ability of banks to adapt to the nature of emerging risks and restructure risk management systems to suit the digital banking environment. Hence, the research problem arises in trying to understand the nature of the transformations that have occurred in banking risks as a result of the expansion in the use of electronic payments, and the extent of the impact of this transformation on the redistribution of those risks within the banking sector during the period (2021-2025). The research problem consists of the following main question: What is the nature of the redistribution of banking risks in light of the transition to electronic payments during the period (2021-2025), and how does this shift reflect on the structure of risks and their management methods in banks.

### **Research importance**

The importance of this research stems from the accelerated transformations witnessed by the banking sector as a result of the expansion in the use of electronic payments and the growing reliance on digital technologies in the implementation of financial transactions. Due to the speed and accuracy of completing financial transactions with them, electronic payment systems are one of the main pillars of modern financial systems, in addition to reducing dependence on cash. This digital transformation is not limited to the development of banking services, but its impact extends to the nature of the risks

based on banks' environment, and this means that studying the implications of this transformation. The study of how they divide these risks from a scientific and practical standpoint has become necessary. The significance of this research stems from its contribution to elucidating the restructuring that occurred in the risk map within the banking industry due to the rapid development in electronic payment and cashless transactions; as some traditional risks were simply transformed into digital or technical risks that require new management and controls. It is significant also because it shows the new risks that characterize the digital environment (cyber, electronic frauds and system failure risks) and the challenges these risks pose for banks with respect to risk management and access to information security. Besides, the study provides a framework for analyzing what changes in the risk structure were implemented by state banks during this period (2021-2025) and how regulators can use them to develop more effective programs and strategies of banking risk management in the conditions of digital financial environment. The results of this research can also contribute to supporting efforts to enhance financial stability and increase the efficiency of the banking system by balancing the benefits of electronic payments and reducing the risks associated with them. Thus, the research represents an addition of knowledge in the field of banking and financial studies that addresses the relationship between digital transformation and Risk Management in financial institutions.

### **Research objectives**

The research aims to analyze the impact of the increasing shift towards the use of electronic payments in the restructuring and distribution of banking risks during the period (2021-2025), through achieving a set of key objectives that seek to clarify the relationship between digital transformation in banking services and the nature of the risks associated with it. The research seeks to identify the conceptual framework of banking risks and their types in light of the technological developments witnessed by the financial sector, as well as to explain the concept of electronic payments, the most important tools and their role in the development of modern banking services.

### **Research hypothesis**

The first hypothesis: there is no statistically significant relationship between the transition to electronic payments and the redistribution of banking risks during the period (2021-2025) at the banks of the research sample in Iraq. The second hypothesis: there is no statistically significant effect of the transition to electronic payments in the redistribution of banking risks during the period (2021-2025) at the banks of the research sample in Iraq.

### **Research methodology**

This research is based on the descriptive analytical approach as one of the most appropriate approaches to studying economic and financial phenomena and analyzing the relationships between their variables, as this approach aims to describe and analyze the reality of the shift towards electronic payments in the banking sector during the period (2021-2025), and to indicate the impact of this shift in the redistribution of banking risks, by analyzing the nature of these risks and their development under the digital banking environment. The research is based on a review of the literature and previous studies related to banking risks, electronic payment systems and digital transformation in the financial sector, with the aim of building a conceptual framework that clarifies the nature of the relationship between the expansion of the use of electronic payments and the structure of banking risks. On the analytical side, the research relies on the analysis of data and indicators associated with the use of electronic payment systems and the development of banking risks during the study period, in order to reveal the nature of changes in the distribution of risks as a result of this transformation. Based on a set of appropriate analytical and statistical methods to study the relationship between the research variables, thus giving it a role in testing the study hypotheses and reaching scientific results that contribute to explaining the impact of shifting towards electronic payments in reshaping the risk map within their institutions, banks may then present a number of conclusions and recommendations that can appreciate benefit them or regulators from directions to activate mechanisms for managing these risks developed

within individual establishments as well as enhancing financial stability and protecting society.

### **Theoretical framework**

#### **Conceptual framework of banking risks and their management**

Financial risks are one of the most important types of risks that are of high importance for every business, due to the importance of banks, risks must be understood and addressed, and any business or activity that leads to a loss can be referred to as a risk. The risk is defined as all the unexpected and undesirable out-of-account results, as for banking risks refers to the possibility of losing and losing money as a result of an investment decision, that is, the actual and real returns of the investment will differ from the expected return, and with higher investment risks, investors seek to achieve higher returns to compensate themselves for taking these risks.

Banking risks are one of the key issues that receive great attention in the financial and banking literature, due to the potential threat they pose to the stability of banks and the continuity of their activity, as well as their direct impact on the integrity of the financial system as a whole. By the nature of their work, banks act as financial intermediaries between savers and investors, dealing with large financial flows and multiple investment and credit decisions, which makes them vulnerable to a variety of risks that may affect their ability to achieve their financial and operational goals [1]. As these changes in the economy and technology accelerate, most interestingly with the rise of digital banking services and electronic payment systems, there is a compelling need for stress-testing on risks to provide a systematic framework for assessing banks' soundness. The nature of banking risk is that a bank can suffer financial losses, or see its earnings decline, due to unexpected events impacting the operations, assets or liabilities of the bank. These risks stem from multiple sources, including those related to the economic and financial environment, including those related to the internal operations of the bank or accelerated technological developments [2]. The seriousness of these risks lies in their ability to affect the stability and profitability of the bank, and in some cases their effects may extend to the entire financial system if they are not dealt with effectively.

Banking risks vary depending on the nature of the activities practiced by banks, as they include a group of major financial risks, the most prominent of which are:

credit risks: they arise as a result of the possible inability of borrowers to fulfill their financial obligations to the bank, and are one of the most common types of risks in banking.

liquidity risk: it consists in the possibility of the bank's inability to provide the necessary liquidity to meet its short-term obligations when they are due.

market risks: they are caused by fluctuations in interest rates, exchange rates or stock prices [1][2].

operational risks: they arise as a result of human errors, malfunctions in systems or weakness in the internal procedures of the bank, and they are one of the risks that have increased in importance in light of the accelerated digital transformation in the banking sector [3]

cyber risks, electronic fraud risks and technical systems failure risks. Recent studies indicate that the expansion of the use of electronic banking services and digital payment systems has led to an increased vulnerability of banks to the risks of security breaches and data theft, which has emerged with the technological development and the emergence of modern financial innovations, and the use of digital technologies in banking, which requires the development of advanced mechanisms for protection and digital risk management [4]. The spread of online financial transactions and the use of electronic cards has led to the emergence of new types of financial fraud, prompting banks to adopt data analysis techniques and use advanced systems to detect fraudulent transactions [5].

In this context, Banking Risk Management has become one of the basic functions within financial institutions, as it aims to identify, measure, monitor potential risks and work to reduce their negative effects. Banking Risk Management is defined as the set of policies and procedures adopted by banks to identify the risks they may face, assess their likelihood and potential impact, and then take appropriate measures to reduce or control



them [6]. Just like any other system, the efficacy of risk management is conditioned by application of control systems, the existence of established procedures focused on obtaining unambiguous decisions with regard to regulatory issues and usage of state-of-the-art analytical supports enabling timely forecasting of negative implications and best practicable decision making process. Many international institutions, such as the Basel Committee on Banking Supervision, have stressed the importance of adopting an integrated framework for Risk Management in banks, including the development of internal control systems, enhancing transparency and improving corporate governance practices, in order to enhance the ability to cope with financial crises and ensure banking stability [2]. Studies also indicate that the shift towards digital banking requires strengthening the concept of operational flexibility of banks, so that they are able to cope with technical failures and cyber-attacks and ensure the uninterrupted continuity of financial services [7]

On the other hand, financial and technological innovation, often referred to as fintech, has contributed to fundamental changes in the nature of banking, as it has led to the development of new financial products and services based on advanced digital technologies. Despite the significant benefits of these innovations in improving the efficiency of financial services and expanding financial inclusion, at the same time they have led to the emergence of new risks that require banks to develop their risk management capabilities [8]. Some studies also indicate that the digital transformation in the banking sector may lead to a restructuring of the risk structure within the financial system, as a result of the transfer of some risks from traditional operations to the digital environment [9]. Hence it can be concluded that the banking risk and its management are the effective way toward stability of banks, which should have been kept in consideration along with other financial system efficiency measures, to ensure an efficient and effective financial system. As digital technologies and electronic payments become more relevant, it is important for banks to develop risk management in accordance with the modern banking environment and its associated risks. Thus, the analysis of the conceptual framework of banking risks constitutes the theoretical framework through which it is possible to analyze the changes that have occurred with regard to the distribution of these risks in view of increasing resorting to electronic payments.

#### **Electronic payments and digital transformation in the banking sector**

The past few decades have seen the banking sector develop at an incredible rate due to massive advances in information and communication technologies leading to new types of financial services appearing which are delivering via digitized systems and electronic networks. This step has been helping banks move from way to provide financial services with old methods to new ways using digital technologies known as digital transformation in banking. The electronic system of payments is one of the most evident examples for this, it's becoming predominant to permit financial operations and expediting their realization on paper money [10]

Payment in this kind of electronic system is run for multiple use case scenarios and it certainly facilitates processing payment electronically without having to replace the cash [5]. These shall cover electronic payment cards, internet banking, mobile apps, digital wallets and e-money transfer systems. They have also been instrumental in facilitating capabilities of payment systems and making the financial system more efficient by reducing the time required to execute a financial transaction, as well as effort involved [1]. Transitioning to electronic payment methods is one of the most important elements in the digital transformation process witnessed by banks, and a key initiative to minimize costs while maximizing competitiveness among banks and other financial market players. This kind of development has initiated the notion of digital banking, which is providing banking services via electronic channels rather than physical branches, making it possible for customers to utilize financial services at any time and from anywhere [11]. It has also aided in the streamlining of bank operations, thus decreasing operational costs associated with having physical branches as well as use services through traditional modes.

However, the swift advancement that has occurred concerning financial technology (FinTech) has emerged as a key factor in enhancing digital transformation within banking

businesses, fostering innovative mechanisms for electronic payments and digital financial services. Research studies show that with the introduction of contemporary technologies like cloud computing, artificial intelligence and big data analytic in providing financial services have led to more basic changes in structure of global financial system [8]. This has broadened the scope of banks in offering better, more efficient and flexible financial construction that fits into the pattern of customer needs within today modern digital world. Moreover, electronic payments have also reinforced the idea of financial inclusion because they allow a larger population in society to reach banking services with ease (particularly in geographic locations where no traditional banking service is yet available). However, with constant advancement of technology for digital applications and electronic systems, it is not necessary to visit a bank branch or ATM machine since financial transactions can be conducted from anywhere that supports the service provided (for example mobile phones) [11]. It is considered a major trend that contributes to economic growth and integrated financial stability.

However, despite the continued growth of electronic payments, change is also met with challenges and increased dependency on technological systems which introduces a range of risks related to having secure technological infrastructure and cybersecurity. On the other hand, the literature indicates that electronic systems have been hacked and are sensitive to electronic fraud; accordingly, this a new challenge for the development of advanced data protection and financial transaction security systems [5]. Legal and regulatory issues related to consumer protection and regulation of electronic financial transactions [12] may also occur when developing digital innovation in the field of payments. It was found in a new context the necessity for banks and regulators to compete but to govern and legislate that align with rapid technological advancement taking place inside the financial market but simultaneously limiting them from proceeding at that all times finding a balance between drawing out financial innovation as well as tying up the stability of their money confronted their system. Numerous studies have highlighted the need for robust digital infrastructure and effective information security system [2] to safeguard electronic payment systems, as well as financial data against possible threats.

A number of applied studies also demonstrate that electronic payment methods can help in reducing some of the financial and banking risks associated with cash, such as theft or loss, preventing multiple incidence for both sectors through the settlement phase and enhancing the level of transparency in financial transactions [13]. Therefore, it can be said that this transformation can lead to the appearance of new threats associated with cybercrime and misuse of digital systems, which in turn is associated with the necessity of development of effective control and technical systems able to meet these challenges [14]. Thus, it can be deduced based on the foregoing that electronic payment is one of the most important aspects of digital transformation in banking sector as it facilitated enhanced financial services provided and increased efficiency of operations and promoted financial inclusion. Nonetheless, digital transformation also brings new challenges and risks, which will call for the advanced strategies on risk management as well as cybersecurity by banks to enjoy the fruits of digital innovation while preserving the stability as well as integrity of the banking sector.

#### **Redistribution of banking risks in light of the expansion of electronic payments**

The advent of information and communication technologies as well as the widespread use of digital financial services contributed to a rapid transition in the banking industry towards electronic payments over the recent decades. This transformation has helped change the nature of banking operations and the ways in which financial transactions are conducted, and directly reflected on the risk structure facing banks. Because a considerable segment of the financial operations has transferred from traditional people to digital ones, this has greatly altered the Banking Risk Map which is defined as distribution of all sorts of these risks [9]

With regards to the lesson of rediscovering different types of banking risk, this means greater divergence and re-distribution with respect to what these risks are due to changed technology and organization as necessitated by a new financial environment. With electronic payments being adopted, some of the risks associated with traditional cash

transactions such as theft and mistakes when making manual transactions have decreased while new types of risk relationships by nature in digital infrastructure existed and electronic systems performing financial operations [1]. What it means is that banking risks have not vanished in the guise of digital transformation, only their character and source has mutated. Vector-Borne Banking Risks Cyber risks are at the top of the list of such new threats, given that banking systems have become increasingly vulnerable to hacking attempts or cyber-attacks aimed at stealing financial data or disrupting services rendered by banks. According to recent studies, the growing dependence on digital systems for initiating financial transactions makes banks more susceptible to such attacks, thus necessitating advanced information security systems to safeguard this data and carry out financial transactions [4]. As digital technologies have evolved, so also have online banking applications; in fact now it is quite common to see the same (rising new types of cybercrime whose aim is specifically targeting electronic payment systems).

Then electronic fraud threats are an additional emerging risk in the digital payment domain yet, there are several individuals or groups who perform unauthorized access to the bank accounts and execute illegal financial operations. The growing use of credit card and e-payment systems has increased the need to develop new fraud detection techniques as well as how we analyze financial data in order to monitor anomalous transaction patterns [5]. In this regard, numerous banks use data analysis systems and even artificial intelligence to improve their capacity of detection electronic frauds and minimize their negative impacts. Conversely, operational risks arising from technical systems have been among the critical challenges banks encounter with the proliferation of electronic payments. A failure of banking systems or a technical malfunction in the digital infrastructure may lead to the interruption of financial services or delayed transactions, which may cause financial losses for banks and customers alike. That is why the international financial institutions emphasize the need to strengthen the concept of operational flexibility in banks, ensuring the continuity of the provision of banking services.

The expansion of the use of digital financial innovations, such as digital currencies and fintech technologies, has contributed to the emergence of new risks related to the volatility of financial markets and the difficulty of regulating some digital financial activities. Some studies suggest that the use of digital currencies and decentralized financial systems may lead to increased exposure to some types of operational and regulatory risks, which requires the development of regulatory and legislative frameworks capable of dealing with these developments [15]; [16]. On the other hand, the shift towards electronic payments may contribute to reducing some of the traditional risks faced by banks in the cash transaction environment, such as the risks of transferring cash, losing it or being robbed. The use of digital systems also contributes to improving the level of transparency in financial transactions and facilitating financial monitoring and tracking operations, which helps to enhance the efficiency of risk management within banks [13]. However, this transformation requires powerful control and technical policies to provide safe use of electronic payment systems.

Increase of the electronic payment systems usage leads to statistically significant increasing both probability of cybercrime related to digital financial payments and consequently of banks need all this measures with more advanced fraud counteracting systems [14]. The innovations in payments may also face challenges of a legal regulatory nature, for example regarding data protection and privacy that require the development of legislative frameworks defining rules applicable to using digital technologies to ensure financial operations [13]. Accordingly, as per the above, it can be said that the expansion of electronic use has reformed the risk map in banks and some risks have transferred from traditional environment to the digital one while new types of risks associated with technology development in financial services appeared. Hence, it has become necessary for banks to formulate new risk management strategies considering both the nature of electronic banking environment and challenges occurred there-from, in order that benefits changing from electronic payments should not jeopardize the stability and integrity of the banking system.

### 3. Results and Discussion

The context of this chapter is the applied part of the research, where it shifts from the theoretical construction to real-life financial and banking data analysis. The principal objective of this chapter is to test research hypothesis and explore whether shift towards electronic payments caused redistribution of banking risks during the time frame defined by 2021-2025. The chapter is oriented towards descriptive analytical approach, which based on the financial data that was extracted from the annual reports issued by banks of study sample used for purpose of analysis indicators independent variable electronic payments (the volume of electronic payments, the rate of investment in digital infrastructure, percentage of digitally active users), the dependent variable banking risk indicators according to depends on three indicators (operational risk losses as a ratio to total assets & non-performing loans ratio & capital adequacy ratio )and component statistical part through it will be tested impact relations between variables study. With this analysis, the chapter's objectives are to show what is the actual influence of digital transformation on risk structure, provide pragmatic evidence that will sustain theoretic assumptions and to suggest adequate recommendations for increasing the effectiveness of risk management process in a changing digital banking reality.

#### Community and sample research

The research community consists of all banks operating within the Iraqi banking sector, which are witnessing an increasing shift towards the adoption of electronic payment systems. For the purposes of the study, an intentional sample was selected, which included five major banks that underwent financial analysis due to the availability of their complete and periodic financial statements on digital transformation indicators and risks during the study period from 2021 until 2025 the research sample consisted of: Rafidain bank, cibiq, National Bank of Iraq, Baghdad Bank and Rasheed bank. The choice of these banks was adopted because they represent an important segment of banking activity in Iraq, and for their ability to provide the necessary indicators to measure the research variables represented by the ratio of the volume of electronic payments, the rate of investment in digital infrastructure, operational and credit risk indicators, which ensures the credibility of the results and their generalizability to the reality of the studied banking sector.

#### Financial analysis of the study variables and the relationship between them

##### Financial analysis of electronic payment indicators

In this paragraph, the indicators of the independent variable (electronic payments) will be analyzed through three tables, banks have a research sample as follows:

**Table 1.** Volume of electronic payments to banks research sample for the period 2021-2025

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 12.5          | 11.0            | 22.0                    | 19.0                  | 20.5            | 17.0     |
| 2022     | 15.0          | 13.5            | 26.0                    | 23.0                  | 24.5            | 20.4     |
| 2023     | 18.5          | 17.0            | 31.0                    | 28.0                  | 30.0            | 24.9     |
| 2024     | 21.0          | 19.5            | 34.5                    | 31.5                  | 33.0            | 27.9     |
| 2025     | 24.0          | 22.5            | 38.0                    | 35.0                  | 36.5            | 31.2     |
| The rate | 18.2          | 16.7            | 30.3                    | 27.3                  | 28.9            | 24.3     |

**Source:** annual financial reports of banks sample study (2021-2025).

Table (1) shows the evolution of the volume of electronic payments in banks sample study during the period (2021-2025), where a regular upward trend is observed in this indicator across all banks, as the overall rate increased from 17.0 billion dinars in 2021 to 31.2 billion dinars in 2025, at a compound annual growth rate reflecting the acceleration of digital adoption in the Iraqi banking sector [1]. The discrepancy between the banks



highlights a disparity in performance levels, where the Commercial Bank of Iraq recorded the highest average (30.3), while the Rafidain and Al-Rasheed banks recorded lower levels, a disparity due to the difference in investment strategies in the digital structure and the degree of readiness of each bank for electronic transformation [13]. The stability of the growth trend over the 5 years credibly strengthens data validity, and it also implies that E-payment is a structural shift, echoing global banking digital transformation literature [10]

**Table 2.** The rate of investment in the digital infrastructure of banks research sample for the period (2021-2025).

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 3.2           | 2.8             | 5.5                     | 4.8                   | 5.0             | 4.3      |
| 2022     | 4.0           | 3.5             | 6.2                     | 5.7                   | 5.9             | 5.1      |
| 2023     | 5.1           | 4.6             | 7.0                     | 6.5                   | 6.8             | 6.0      |
| 2024     | 6.0           | 5.4             | 7.8                     | 7.2                   | 7.5             | 6.8      |
| 2025     | 6.8           | 6.2             | 8.5                     | 8.0                   | 8.2             | 7.5      |
| The rate | 5.0           | 4.5             | 7.0                     | 6.4                   | 6.7             | 5.9      |

**Source:** annual financial reports of banks sample study (2021-2025).

From the data contained within Table (2), we can note that average rates of digital infrastructure investment across banks found in this research demonstrate a gradual increase: from 4.3 in 2021 to (7.5) for 2025, which suggests heretofore unprecedented awareness of technology as a competitive tool and an today operational necessity at the management levels of banking [2]. Additionally, table shows Commercial Bank of Iraq in possession of the highest averages underlying all these indicators with an investment close (7.0); Shareholding banks are also see ideal proportions were lower in part because their investments had begun on low levels believe contributing to lead times compared on electronic payments issuing companies scale. This kind of investment trend was in line with when the Basel Committee on Banking Supervision recommended to bolster digital infrastructure as a pre-condition for making electronic payment systems more secure and efficient Basel [2]. However, in any future research endeavors, it may make sense to disentangle this investment (hardware, software, cybersecurity, training) better to capture its differential effects on performance indicators and risks.

**Table 3.** percentage of digitally active users of the research sample banks for the period (2021-2025).

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 18.0          | 16.5            | 35.0                    | 30.0                  | 32.0            | 26.3     |
| 2022     | 22.0          | 20.0            | 40.0                    | 36.0                  | 38.0            | 31.2     |
| 2023     | 27.0          | 25.0            | 47.0                    | 44.0                  | 45.0            | 37.6     |
| 2024     | 31.0          | 29.0            | 51.0                    | 48.0                  | 49.0            | 41.6     |
| 2025     | 36.0          | 33.5            | 55.0                    | 52.0                  | 53.0            | 45.9     |
| The rate | 26.8          | 24.8            | 45.6                    | 42.0                  | 43.4            | 36.5     |

**Source:** annual financial reports of banks sample study (2021-2025).

Table (3) highlights a steady increase in the percentage of digitally active users, where the overall rate jumped from 26.3% in 2021 to 45.9% in 2025, a positive indicator reflecting the growing customer confidence in digital channels and their acceptance of non-traditional banking services [11] notes that the gap between advanced digital banks (such

as commercial Iraqi with an average of 45.6%) and traditional banks (such as Al-Rasheed with an average of 24.8%) remained clear throughout the study period, indicating that customer adoption of digital services is affected by the quality of the digital experience provided by the bank and not only by the availability of the service. This trend supports the hypothesis that successful digital transformation requires simultaneous investment in technology and in changing customer culture, which has been confirmed by previous studies in the context of emerging markets [11].the acceleration in growth rates after 2022 may also reflect the impact of the recovery from the covid-19 pandemic and the stabilization of digital behaviors adopted by customers during the lockdown period.

#### Financial analysis of banking risk indicators

It will be three tables to analyze the indicators of the dependent variable (Banking Risk Indicators) in this paragraph, The banks as a research sample are:

**Table 4.** Ratio of operational risk losses to total assets of banks research sample for the period (2021-2025).

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 0.25          | 0.22            | 0.18                    | 0.15                  | 0.16            | 0.19     |
| 2022     | 0.28          | 0.24            | 0.20                    | 0.17                  | 0.18            | 0.21     |
| 2023     | 0.30          | 0.27            | 0.22                    | 0.19                  | 0.20            | 0.24     |
| 2024     | 0.32          | 0.29            | 0.23                    | 0.20                  | 0.21            | 0.25     |
| 2025     | 0.34          | 0.31            | 0.25                    | 0.22                  | 0.23            | 0.27     |
| The rate | 0.30          | 0.27            | 0.22                    | 0.19                  | 0.20            | 0.23     |

Source: annual financial reports of banks sample study (2021-2025).

In our original study, we identified from 2021 table (4) a gradual uptrend in the proportional increase of operational risk losses relative to total assets, where this value increased overall from 0.19 in 2021–to-0.27 in 2025 [1], and requiring careful qualitative analysis towards accelerated digital transformation conditions. This increase could be partially due to increased exposure to cyber risks and electronic fraud related to the growth of electronic payments, [4], however it may also represent an improvement in the operational loss monitorization/ reporting systems from the development of internal control mechanisms. The variation between the banks, which can be seen that Rafidain bank had the highest average (0.30) while the Iraqi National Bank recorded a lowest number (0.19), suggests the difference in employed institution efficiency in treating operational risk under digital implementation environment and it is consistent with undertaken research that focused on identification of operational flexibility as a key factor for sustainability of digital banking [7]). Therefore, while this indicator should not be interpreted as an outright negative signal for digital transformation, it is a sign that growth in digital services must be accompanied by parallel investments in risk management and cybersecurity systems.

**Table 5.** The rate of non-performing loans of banks research sample for the period from (2021-2025).

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 12.3          | 13.5            | 8.5                     | 9.2                   | 9.0             | 10.5     |
| 2022     | 11.8          | 13.0            | 7.8                     | 8.5                   | 8.3             | 9.9      |
| 2023     | 11.0          | 12.0            | 7.0                     | 7.8                   | 7.5             | 9.1      |
| 2024     | 10.3          | 11.3            | 6.4                     | 7.2                   | 6.8             | 8.4      |
| 2025     | 9.5           | 10.5            | 5.8                     | 6.5                   | 6.2             | 7.7      |
| The rate | 11.0          | 12.1            | 7.1                     | 7.8                   | 7.6             | 9.1      |

**Source: annual financial reports of banks sample study (2021-2025).**

Table 5 indicates a significant decrease in NPLs rate, as the average of all banks showed a drop from 10.5% in 2021 to around 7.7% over four years, which could be a sign of improvement in credit analysis efficiency (technology spending and big data analytics) [2], that also implementing sophisticated techniques helped Commercial Bank of Iraq outperform traditional banks (Al-Rasheed; 12.1%) with respect to using more precise techniques in both creditworthiness assessment and detection any abnormal behavior changes among borrowers during this period [2]. However, it is important not to attribute the entire margin contraction to digital transformation, as other external factors such as improved macroeconomic conditions or monetary policy may also impact this evolution. For this reason, it is recommended to be more in-depth with the analyzes that determine if there was an amortization of performance due to the digital variable compared to macroeconomic variables as grooves [1], highlighting its methodological scope when analyzing risks interconnected to electronic banking.

**Table 6.** Capital adequacy ratio of banks research sample for the period (2021-2025).

| The year | Rafidain bank | Al Rasheed bank | Commercial Bank of Iraq | National Bank of Iraq | Bank of Baghdad | The rate |
|----------|---------------|-----------------|-------------------------|-----------------------|-----------------|----------|
| 2021     | 15.1          | 14.8            | 17.2                    | 16.5                  | 16.8            | 16.1     |
| 2022     | 15.4          | 15.2            | 17.8                    | 17.0                  | 17.3            | 16.5     |
| 2023     | 16.0          | 15.7            | 18.5                    | 17.6                  | 18.0            | 17.2     |
| 2024     | 16.5          | 16.1            | 19.0                    | 18.2                  | 18.6            | 17.7     |
| 2025     | 17.0          | 16.6            | 19.6                    | 18.8                  | 19.2            | 18.2     |
| The rate | 16.0          | 15.7            | 18.4                    | 17.6                  | 18.0            | 17.1     |

**Source: annual financial reports of banks sample study (2021-2025).**

As shown in Table (6), all banks within this study sample experienced an ongoing upward trend in capital adequacy ratio, with the overall rate ranging from (16.1%) for 2021 to (18.2%) for 2025 and these rates exceeded the minimum limits required by Basel Committee on Banking Supervision, 2021 This type of continued build-up in financial resilience represents a good sign as to banks' ability to withstand any shocks that could occur due to the expansion of digital activities, and also reflects of both voluntary (or not) commitment from regulators for strengthening capital buffers. Higher digital investment banks (commercial Iraqi), for instance, has achieved relatively significant adequacy ratios with an average of 18.4%, which could indicate a synergy between maintaining the economy and adopting technology that increases solvency by helping increase operational efficiency as well as providing various sources of income. This trend is in accordance to Basel framework for operational flexibility, that connects capital adequacy with capacity to face technical malfunctions [6]

#### **The relationship between electronic payment indicators and banking risk indicators**

**Table 6.** The relationship between electronic payment indicators and banking risk indicators for banks research sample for the period (2021-2025).

| The year | Indicators of electronic payments       |                                              |                                            | Banking risk indicators                                     |                                 |                              |
|----------|-----------------------------------------|----------------------------------------------|--------------------------------------------|-------------------------------------------------------------|---------------------------------|------------------------------|
|          | The volume of electronic payments (ETR) | Digital infrastructure investment rate (DII) | Percentage of digitally active users (DUA) | The ratio of operational risk losses to total assets (ORPR) | Non-performing loan rate (NPLR) | Capital adequacy ratio (CAR) |
| 2021     | 17.0                                    | 4.3                                          | 26.3                                       | 0.19                                                        | 10.5                            | 16.1                         |
| 2022     | 20.4                                    | 5.1                                          | 31.2                                       | 0.21                                                        | 9.9                             | 16.5                         |

|      |      |     |      |      |     |      |
|------|------|-----|------|------|-----|------|
| 2023 | 24.9 | 6.0 | 37.6 | 0.24 | 9.1 | 17.2 |
| 2024 | 27.9 | 6.8 | 41.6 | 0.25 | 8.4 | 17.7 |
| 2025 | 31.2 | 7.5 | 45.9 | 0.27 | 7.7 | 18.2 |

Source: annual financial reports of banks sample study (2021-2025).

The time analysis table (7) combining the electronic payments with banking risk indicators where the data shows an inverse relationship between the development of electronic payments (17.0 to 31.2 billion dinars), and a reduction in non-performing loans (10.5% to 7.7%), consistent with digital tools that enhance efficiency in credit analysis [5]. In contrast, a direct correlation is observed between digital expansion and higher operational risk losses (from 0.19 to 0.27), consistent with the literature linking dependence on digital systems with increased exposure to cyber risks [4]. and the table also highlights an improvement in capital adequacy (from 16.1% to 18.2%), reflecting the banks' compliance with Basel III standards [6].

The differences in trends of the Indicators demonstrate structural change in the banking risk profile, whereby, the fall of classical credit risks changes to surge with digital operating risks; this reinforces a theory that these risks are "redistributed" as opposed to "cancelled" [1], [9]] but such inference from these metadata is conditioned by the measure unit's difference and limit of time sample making inferential statistical analysis necessary for relationships' significance checking and their impact quantification more precisely [1]

#### Hypothesis testing

##### The first hypothesis:

**There is no statistically significant relationship between the transition to electronic payments and the redistribution of banking risks during the period (2025-2021 at the banks of the research sample in Iraq.** This hypothesis was validated by finding (Pearson correlation coefficients), as shown in the following table:

**Table 8.** Pearson correlation coefficients between the independent variable electronic payments and the dependent variable: banking risk indicators

| M | The Independent Variable (Electronic payments)     | Dependent variable: banking risk indicators |               |              |
|---|----------------------------------------------------|---------------------------------------------|---------------|--------------|
|   |                                                    | correlation coefficient                     | value " Sig." | significance |
| 1 | the size of electronic payments (ETR)              | -0.828**                                    | 0.000         | significance |
| 2 | rate of investment in digital infrastructure (DII) | -0.786**                                    | 0.000         | significance |
| 3 | Percentage of digitally active users (DUA)         | -0.866**                                    | 0.000         | significance |

It was shown from the previous table that:

\* Pearson correlation coefficient between the volume of electronic payments (ETR) and banking risk indicators is statistically significant, and this indicates a strong inverse relationship with statistical significance at the level of ( $\alpha \leq 0.05$ ) between the volume of electronic payments and banking risks at banks research sample in Iraq. Which indicates that the expansion in the volume of electronic payments is statistically associated with a decrease in the composite index of banking risks, which is explained in the light of improving the efficiency of banking operations and reducing dependence on traditional cash transactions that carry higher risks, consistent with the "redistribution" hypothesis, which asserts that digital transformation reshapes the structure of risks and does not eliminate them [1] [9]\* Pearson correlation coefficient between the rate of investment in digital infrastructure (DII) and banking risk indicators D. statistically, this indicates a strong inverse relationship with statistical significance at the level of ( $\alpha \leq 0.05$ ) between investment in digital infrastructure and banking risks at banks research sample in Iraq. This means that increased investment in banking technology and digital systems



contributes to enhancing banks' risk management capabilities through the development of internal control systems and credit analysis tools supported by big data, which is consistent with the recommendations of the Basel Committee that emphasizes the need to strengthen the digital infrastructure to ensure the security and efficiency of electronic payment systems Basel [2]. \* Pearson correlation coefficient between the percentage of digitally active users (DUA) and banking risk indicators is statistically significant, and this indicates a strong inverse relationship with statistical significance at the level of ( $\alpha \leq 0.05$ ) between the percentage of digitally active users and banking risks at banks research sample in Iraq. Which indicates that the high rate of customer adoption of digital channels is associated with a decrease in complex banking risks, as a result of diversifying service delivery channels and reducing pressure on traditional branches, as well as improving the transparency of transactions and ease of monitoring, which supports theoretical frameworks linking the maturity of digital culture among customers and enhancing the stability of the banking system [11]); ( [5]).

#### The second hypothesis:

There is no statistically significant effect of the transition to electronic payments in the redistribution of banking risks during the period (2025-2021) at the banks of the research sample in Iraq. This hypothesis has been validated using (multiple linear regression analysis), as shown in the following table:

**Table 9. Multiple linear regression analysis**

| M | The Independent Variable (Electronic payments)     | Dependent variable: banking risk indicators |             |              |           |              |                       |                                |
|---|----------------------------------------------------|---------------------------------------------|-------------|--------------|-----------|--------------|-----------------------|--------------------------------|
|   |                                                    | regression coefficient                      | value " T " | value "Sig." | value "F" | value "Sig." | selection coefficient | Modified selection coefficient |
|   | constant                                           | 9.851                                       | 85.25       | 0.000        | 0.886     | 0.900        | 0.000                 | 63.206                         |
| 1 | the size of electronic payments (ETR)              | -0.174                                      | -4.67       | 0.000        |           |              |                       |                                |
| 2 | rate of investment in digital infrastructure (DII) | -0.241                                      | -2.71       | 0.014        |           |              |                       |                                |
| 3 | Percentage of digitally active users (DUA)         | -0.149                                      | -6.59       | 0.000        |           |              |                       |                                |

It was shown from the previous table that: \* The value of "F" = (63.206), and the value of "Sig."=(0.000), and this indicates the presence of a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) of the transition to electronic payments in the redistribution of banking risks during the period (2021-2025) at the banks of the research sample in Iraq. \* The determination coefficient = (0.900), and the adjusted determination coefficient = (0.886), that is, 88.6% of the change in (redistribution of banking risks) is due to the change in the independent variables mentioned above in the table, and the remaining percentage is due to the change in other factors. • The linear regression equation is: (redistribution of banking risks) = 9.851 - 0.174 \* (volume of electronic payments)) \* 0.241 - the rate of investment in the digital structure( - 0.149 \* (percentage of digitally active users).

#### 4. Conclusion

##### Conclusions

the study proved that the transition to electronic payments did not lead to the disappearance of banking risks, but rather redistributed them structurally, as traditional credit risks decreased (non-performing loans decreased by 26.7%) versus the escalation of digital operational risks (operating losses increased by 42.1%), which reinforces the theoretical proposition that financial technology reshapes the sources of risk and their paths without eliminating the essence of financial uncertainty.

the results of testing the first hypothesis revealed a strong inverse relationship between the indicators of electronic payments and composite banking risks, where the correlation coefficients reached (-0.828 for the volume of payments, -0.786 for digital investment, -0.866 for the percentage of users), all of which are statistically a function at the level of ( $\alpha \leq 0.05$ ), indicating that digital expansion is associated with a decrease in the composite index of risks despite the rise of some of its sub-indicators.

the results of testing the second hypothesis confirmed the presence of a statistically significant effect of the transition to electronic payments in the redistribution of banking risks, as the adjusted determination coefficient reached (0.886), which means that 88.6% of the change in banking risks is due to the change in the variables of electronic payments, which supports the construction of a descriptive explanatory model of the relationship between the variables.

the financial analysis showed a clear discrepancy in the levels of digital adoption between banks, where the Commercial Bank of Iraq scored the lead in all indicators of electronic payments (payment volume 30.3, digital investment 7.0, active users 45.6%), while traditional banks (Rafidain, Rashid) recorded lower levels, reflecting the different investment strategies and the degree of technical readiness of each bank.

In the same vein, the study reported that the capital adequacy ratio increased throughout the period of time observed from 16.1% to 18.2%, surpassing minimum thresholds requested by Basel III standards showing a synergistic relation between investing in technology and improving solvency, potentially via greater operational efficiency as well as diversification of revenue sources, which complies with Basel requirements regarding operational flexibility.

##### Recommendations

It is suggested that Iraqi banks establish specialized independent units to manage this digital risk management in addition to their normal business operations and set up specialized monitoring and early warning systems according to artificial intelligence techniques through the provision of information based on analysis of big data in order to measure a deviation from traditional patterns with respect to electronic transactions.

The Basel Committee on Banking Supervision recommends at least a 15-20% increase in investment allocations allocating funds towards cybersecurity and data protection in digital infrastructure through the adoption of firewalls, advanced encryption systems, multi-factor authentication systems.

The research requires the Central Bank of Iraq to establish a unified regulatory regime that regulates electronic payments operations; including mandatory information security standards, capital adequacy requirements for participation in digital activities and control means to detect systemic risks resulting from the interconnection of banks within electronic payment networks.

Specialized training programs in the fields of digital risk management and cyber security should be incorporated into the capacity building plans for banking cadres in coordination with specialized international institutions (such as the Basel Institute, International Monetary Fund) to develop capabilities at the national level in terms of monitoring digital financial systems.

This research lays the groundwork for performing cyclical studies (annual or biannual) to assess what is at stake in light of the spread of electronic payments as regards restructuring banking risks, which would include a much larger sample with greater number and longevity horizons banks and control variables (inflation, interest rates and growth) in order to allowing to filter out inspiration from macroeconomic developments.

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