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DIGITAL TRANSFORMATION IN BANKING: KEY FEATURES, TRENDS, AND FUTURE PERSPECTIVES

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Abstract
In an era defined by the rapid advancement of digital technologies, the banking sector is undergoing a profound transformation. This evolution is absolutely necessary in order to enhance operational efficiency, ensure high security for financial transactions, and meet the growing expectations of the clientele. However, the changes in banking services and products cannot occur without challenges. While they bring numerous advantages, such as increased accessibility and faster transactions, they also introduce certain risks. These risks include cybersecurity threats, regulatory challenges, and the need for continuous technological adaptation. To address these concerns, banks are actively seeking ways to mitigate potential threats while simultaneously embracing innovation. The constant need to keep up with technological progress has led to the emergence of new trends in the banking sector. Digitalization, automation, and the integration of artificial intelligence are shaping the future of financial services, offering both opportunities and challenges for institutions and consumers alike. In this study we aim to highlight the main characteristics of the transition from traditional to digital banking, the main advantages and risks, as well as the future trends of the digitized banking sector.
Keywords: digitalization, banking sector, key technologies, opportunities and risks, future trends.
JEL Classification: G21, L86

1. INTRODUCTION

Traditionally, banks carry out financial intermediation activities, therefore, playing an important role in the economic development of nations. Nowadays, new technologies, along with the increasing complexity and sophistication of techniques and products, have contributed to redefining the nature of classic bank activities. The global banking sector is facing new challenges arising from the significant increase in the number of customers, as well as the number and, most importantly, the volume of transactions conducted by them. Furthermore, since the beginning of the millennium, with the grand technological progress, customer expectations towards banking products and services have changed. As a result, banks are shifting their focus from administrative functions to technical and commercial aspects in order to better meet the needs of its clientele

(Bădulescu, 2007). On the one hand, digital transformation enhances efficiency, reduces operational costs, and improves customer experience by offering faster, more accessible, and personalized financial services. On the other hand, digitalization comes together with an increased cybersecurity risk, operational risk, and problems related to the digital inclusion of the clientele. Given these factors, banks must adopt a balanced approach, leveraging the benefits of digitalization while proactively addressing potential challenges and ensuring a seamless transition for all stakeholders. Future trends in the digitized banking sector focus on minimizing these risks and benefiting from the emerging innovations, securing a trustful, long-term relationship with its clients.

Our study aims to highlight the main innovations that have shaped the evolution of the banking sector through digitalization, as well as the key characteristics of the new technologies adopted by banks in the transition to digital banking. Moreover, we strive to emphasize the fact that the digitalization process has both advantages and challenges, which banks must carefully consider. The future of the banking sector will be highly digitalized, integrating innovations like artificial intelligence and blockchain while fostering collaborations with FinTechs. Additionally, authors such as Petare et al. (2024) highlight the emergence of Central Bank Digital Currencies (CBDCs) as a key element in the evolving financial landscape.

In order to achieve the research objective, our paper is organized as follows: section 2 provides a description of the main events in the evolution of traditional banking, as well as the key technology features in banks' digitalization; section 3 emphasizes both the benefits and challenges that should be considered, while section 4 highlights the future trends of the bank sector. The paper ends with some conclusions.

2. EVOLUTION OF TRADITIONAL BANKING SERVICES AND KEY TECHNOLOGY FEATURES IN BANKS' DIGITALIZATION

The transformation of traditional banking services has been driven by accelerated technological advancements, reshaping the way financial institutions operate and interact with customers. As banks shift to a new era characterized by digitalization, they integrate key technological innovations that enhance efficiency, security, and customer experience, leading to structural changes in the banking landscape.

The first signs of the technological revolution in the banking sector emerged in the field of payment methods, specifically with the introduction of bank cards back in the 1950s. The advancement of communication channels and calculation methods led to the development of a telematic infrastructure that enables the automated processing of payments. In this way, the term *electronic payment* was born. According to the Romanian legislation, this concept can be defined as ”any payment transaction initiated through electronic payment

instruments" (NBR, Regulation No. 4 / 13.06.2002). Over the years, the value of this type of payment shows an upward trend in the majority of countries. For example, in the European Union, these reached 240 trillion EUR in 2021, compared to 184.2 trillion EUR in 2017 (Meyer and Teppa, 2024). Some authors (for example, Căpraru, 2014) underline a set of main features of electronic payments, such as:

- presenting the encoding / decoding of payment transactions during their execution;
- moving through electronic messages via telecommunication lines between participants;
- high speed of execution, being processed almost in real-time;
- reducing the default risk;
- prevention of human errors in payment processing;
- increasing the bank's operational risk (the probability of system failure or potential fraud).

The *bank card* is an instrument of electronic payment that is considered to be "a success of the modern banking" (Turliuc, 2002). At the same time, it represents an instrument that offers access to a variety of automated banking services. The use of bank cards relies on essential technological infrastructure, including ATMs and POS terminals. These devices enable secure and efficient transactions, allowing customers to access their funds and make payments. Derived from simple magnetic stripe cards that revolutionized the financial industry through the electronic storage of information, *smart cards* represent plastic cards containing semiconductor elements that allow them to store or process information (Patriciu *et al.*, 2001).

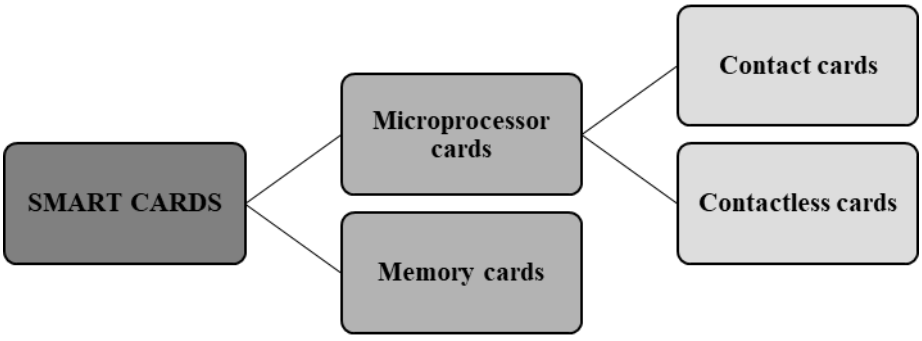

Figure 1. Types of smart cards
Source: authors elaboration based on Patriciu *et al.* (2001, pp. 232-233)

As reflected in Figure 1, these are grouped in two main categories: memory cards (incapable of processing information, serving as storage devices similar to the old magnetic stripe cards) and microprocessor cards (equipped with a large storage capacity and a microprocessor that processes information locally), which are further divided into contact and contactless cards. The difference between the latter consists in how the information is transmitted to the card reader. Contactless technology refers to the ability to make a payment with a card or an electronic device by holding it at a small distance from the merchant's terminal.

The progress of these cards used for electronic payments doesn't stop here, and the concept of *virtual bank cards* marks a new era in the digitalization of the banks' payment instruments. Their operating principle is similar to physical cards, being easy to use for making payments online or through POS terminals with the help of a smartphone and an app, such as Apple Pay or Google Pay. However, the main disadvantage is that they cannot be directly used at ATMs to withdraw cash. The virtual card can exist alongside a physical card and is issued through mobile banking apps. This technology has become an essential element in nowadays' society, being widely accessible to the general public, as highlighted in a recent study by the European Central Bank (2022). The results emphasize that, overall, in the euro area, 94% of respondents have access to a bank card, with the highest values (99%) recorded in Germany and Finland.

Another aspect of the evolution of traditional banking services due to digitization is the transition from classic cashless payment instruments, such as checks and paper payment orders, to similar digital formats known as *eCheck* and *electronic payment orders*. These innovations work according to the same rules, following a similar circuit, but they are distinguished by their digital form, as they are being transmitted as encoded electronic messages and offer a higher level of security compared to paper versions (Kumar and Dalal, 2017). Moreover, those who use eChecks are provided with an electronic checkbook, which stores and provides information about the client's private key and certificate, which are used in the process of generating and signing electronic checks (Băcioi, 2015). Additionally, it should be noted that these instruments employ a two-factor authentication mechanism (in addition to the digital signature, there is also a PIN code), which enhances the security level of the transactions.

Due to the accelerated evolution of technology, the banking sector has undergone a transformation in terms of current services, like deposits, loans, and payment methods, as well as services related to specialized activities, such as those concerning financial markets or international financing. Among the factors that have had a major influence on the transformation of these services is the COVID-19 pandemic. As a result of the imposed restrictions, the banks' customers were forced to use alternative channels for accessing banking services. The use of software apps provides the opportunity to diversify and

multiply banking services, as well as to process banking transactions in real-time. Thus, we can state that the pandemic has acted as a catalyst for the digitalization of the banking sector. Flejterski and Labun (2016) highlight that, due to the digital transformation of banking activities, there is also a change in the functions that banks perform (see Table 1).

Table 1. Banks' activities: past versus present

Bank tasks	Past	Present
Providing a system through which payments can be made	The presence of banknotes and coins, physical bank cards, accompanied by a medium level of security.	Contactless payments and payments made through mobile apps, assuring a higher level of security
Raising funds for financing big projects	Exclusive – a small number of people are capable of making investments while being well informed about the subject in question	Inclusive – a significant number of people can invest through trading platforms and crowdfunding, receiving all the necessary assistance
The transfer of resources over time, between regions and industries	Loans and deposits intermediated by the bank	Direct transfers between agents, low level of intermediation
Risk management	Use of "Big Numbers" theory: portfolio diversification reduces portfolio volatility	Use of Big Data analysis to determine risk pricing with greater accuracy

Source: Flejterski and Labun (2016, pp. 5-15)

Thanks to digital transformation, new key players have emerged in the banking market, significantly altering the competitive landscape. These players, beside FinTech companies, and tech giants, also include digital banks, known as *neobanks*. These are defined by Rybakov (2019) as "branchless banks which offer high quality internet and mobile banking services". Neobanks typically operate with a smaller workforce compared to traditional banks, with most employees focusing on specific tasks such as managing call centers or maintaining the bank's telematics infrastructure. However, these institutions are increasingly adopting advanced technology, such as robo-advisors and chatbots, to interact with customers more efficiently. By relying on artificial intelligence and automation, neobanks can offer 24/7 customer support and personalized financial advice. One of the key characteristics of neobanks is their strong emphasis on creating user-friendly, innovative banking products and services, which are primarily tailored to meet the needs of individual customers, offering a more flexible and accessible alternative to conventional banking. Consequently, digital banks that target businesses and corporate clients have a smaller market share (Evdokimova, 2018). The most popular neobanks in Europe are Wise, Revolut, and Straling Bank,

followed by Lunar, Bunq, N26, and Monese. The number of countries these banks operate in is reflected in Figure 2.

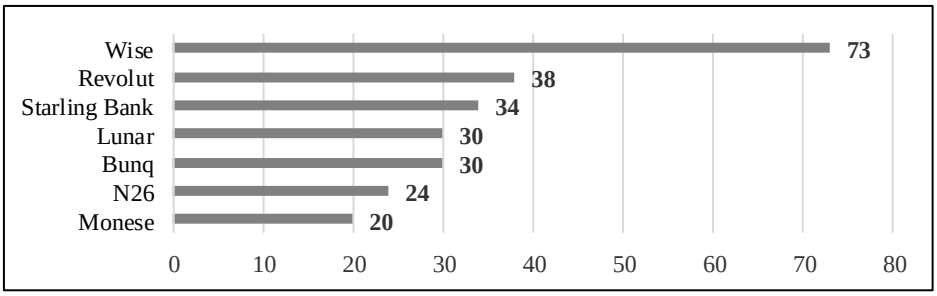

Figure 1. Number of countries of operation for online banks in Europe as of January 2025

Source: Statista, available at: https://www.statista.com/statistics/763970/number-of-countries-of-operation-for-select-online-banks-in-europe/

We also observe that among the competitors of traditional banks are FinTech companies, where the concept of finance merges with technological innovation (Wewege, 2020), benefiting from the significant growth in demand for digital financial services (Papathanassiou, 2024). These companies stand out by focusing on the use of technology to improve various aspects of financial services, while digital banks offer a full range of banking products and services, operating with a banking license but without any branches. A comparative analysis between these is reflected in Table 2.

Table 2. Comparative analysis between digital banks and FinTech companies

	FinTech companies	Digital banks
Description	Start-ups with a high level of technological development, focusing their activities on P2P lending, Forex transactions, cryptocurrencies crowdfunding, and blockchain	Start-ups with a high level of technological development, operating as a bank. They are independent or part of a parent company. They focus their activities on P2P lending, Forex transactions, crowdfunding, and micro crediting
Examples	Ripple, Stripe, WeFinance	Starling, Monzo, Revolut
Strengths	Service quality, attractive prices, accessibility	Service quality, accessibility, attractive prices, bank license
Weaknesses	Low trust from clients, bank expertise, business scalability	Scalability of the business, financing
Perspectives	Service providers for banks and Big Tech companies	Integrated part of the banking ecosystem

Source: Rybakov (2019, p. 27)

The main beneficiaries of the FinTech revolution are the customers. Due to the fact that they are cost-effective, FinTech companies offer a diverse variety of services at a low price. This is the main reason they became competitors of traditional banks. Some of the terms associated with FinTechs and their products are: ”peer-to-peer lending”, ”WealthTech”, and ”crowdfunding”.

P2P lending platforms establish a connection between individuals with financial resources and those experiencing a resource deficit. In its initial form, this type of alternative lending removes financial institutions from the lending process, simplifying the borrowing procedure (Minescu, 2018). This experience is, in fact, 100% digital, which helps reduce the time required for granting loans and, thus, enhances the overall efficiency of the process. Among the factors that led to the emergence of this service are the 2008 financial crisis (which contributed to a decrease in the volume of loans offered by banks, with small and medium-sized enterprises being the most affected), the favorable conditions provided to participants, and, last but not least, advancements in technology and data analysis methods.

Table 3. Key features of different types of crowdfunding

	Form of contribution	**Form of return**	**Motivation of funder**	**Platform examples**
Donation Crowdfunding	Donation	Intangible benefits	Intrinsic and social motivation	GoFundMe, Fundrazr
Reward Crowdfunding	Donation / Pre-purchase	Rewards but also intangible benefits	Combination of intrinsic and social motivation, and desire for reward	Kickstarter, RocketHub
Crowdfunded Lending	Loan	Repayments of loan with interest. Some socially motivated lending is interest free	Combination of intrinsic, social, and financial motivation	Lending Club, Zopa
Equity Crowdfunding	Investment	Return on investment in time if the business does well. Rewards also offered sometimes. Intangible benefits – another factor for many investors	Combination of intrinsic, social, and financial motivation	Equity Net, Crowdcube

Source: Baeck and Collins (2013, p. 13)

The impact of digitalization is clearly evident in financial markets as the Internet has a great contribution to their expansion and globalization. Thus, financial market transactions are carried out much more easily and quickly via the Internet, offering great economic benefits and reduced costs to a vast number of people (Welfens, 2002, p. 67). However, both those with a surplus of resources and those facing financial difficulties can now take advantage of a new tool that facilitates their connection, known as *crowdfunding* – a widely recognized concept in this digital era, which serves as an alternative to capital market or bank financing. This can be described as a process through which various projects or businesses secure funding via small contributions from a large number of sources – in contrast to traditional financing methods where large sums are obtained from a single or limited number of sources (Baek and Collins, 2013). There are different types of crowdfunding which can be categorized on various criteria such as the form of contribution, the type of reward offered to investors, and the motivations driving to participate in this type of financing. A summary of these categories is presented in Table 3.

Traditional client fund management services (such as brokerage and financial advisory services) are provided by a range of institutions, including private banks, insurance companies, and brokerage firms. However, the 2008 financial crisis had a negative impact on this sector, leading to a decline in client trust in such services. This created the premise for the emergence of *WealthTech,* defined by Minescu (2018, p. 107) as a new generation of companies developing financial technologies that offer digital solutions to transform the asset management industry and create alternatives to traditional investments.

The most popular examples of WealthTech are robo-advisors, also referred to as ”automated wealth managers”. These are highly transparent technologies that use automated techniques to create and manage portfolios composed of financial instruments. Robo-advisors have the advantage of eliminating the influence of human decision-making and intuition in the investment process, a factor that is often present in traditional investment banks. On the other hand, since this technology is still relatively young, it cannot yet be definitely stated that it surpasses the capabilities of a human professional. Some examples of robo-advisor platforms are Ellevest, Charles Schwab, Betterment, and TrueWealth.

Due to the fast development of FinTech, as well as the evolution of technology, banks need to develop digital strategies in order to maintain a significant market share and efficiently manage their expenses. Embracing the process of digitalization will contribute to reducing the number of branches as the majority of services will be provided online. In addition to that, the number of bank employees will also be diminished, and their place will be taken by *chatbots*.

Chatbots are defined by Doherty and Curran (2019) as a software instrument that uses natural language processing to ensure the human machine interaction and machine learning. The idea of such a technology emerged in the 1960s and the first chatbot was created in 1995, named A.L.I.C.E. (Artificial Linguistic Internet Computer Entity). The majority of banks benefit from this technology as it contributes to establishing a nice relation with the clients (Mogaji *et al.*, 2021). Therefore, banks are encouraged to adopt chatbots in the digitalization process because they offer the clientele the opportunity of getting fast responses and the communication process, which was traditionally realized through employees, becomes more efficient.

At the core of chatbot technology lies a highly significant technological innovation that is currently a major topic of interest - artificial intelligence, commonly referred to in specialized literature by the acronym AI. Artificial Intelligence has the remarkable potential to accelerate company productivity growth, expand and create new opportunities, enhance consumer well-being, and bring vast benefits to the economy and society as a whole. Although the concept itself dates back to the 1950s, the capabilities of this technology have advanced at an accelerated pace only in recent years, making it a subject of deep interest for industry developers, investors, regulators, and society as a whole. Due to the vast volume of available data, advanced computing algorithms, and rich infrastructure, AI has become an omnipresent technology in various forms, including virtual assistants, robots, and self-driving vehicles.

Real-time data analysis is a crucial element in the operations of financial institutions (Ashta and Herrmann, 2021), and artificial intelligence, alongside machine learning, creates a vast range of opportunities for banks, which must, however, understand and effectively manage the risks that this technology may generate. Some key characteristics that have led to AI's impact on the banking sector include fast information processing, lower-cost data storage, advanced and well-developed algorithms, and complex, detailed datasets made possible by the ongoing digitalization of society (Financial Stability Board, 2017, p. 55). AI is particularly emphasized in detecting and preventing banking fraud. Another key application of artificial intelligence in the banking sector is credit scoring - a method used by banks to assess a client's ability to repay a loan. Goh *et al.* (2020) illustrate AI's role in credit scoring through two techniques: Support Vector Machines (SVM) and Random Forest (RF), which are highly attractive due to their flexibility in handling a wide range of data templates. Apsilyam, Shamsudinova and Yakhshiboyev (2024) emphasize the most common areas of AI application in the banking sector:

- robo-advisor, used by banks in financial consulting services;
- Natural Language Processing (NLP), used for chatbots and virtual assistants for the clientele;

- automatized lending, with the help of techniques specific to credit scoring and credit risk management;
- fraud prevention, realized by algorithms which find anomalies and suspicious activities;
- identification of market trends, AI being used in complex data analysis offering useful information for the banks.

A recent topic among the key technologies driving the digital development of the banking sector is cryptocurrencies. These are defined as virtual or digital currencies that use computing and economic principles, and cryptography to ensure information security, making them more difficult to counterfeit (Constantinescu, 2020, p. 11). The primary motivation behind their creation was the desire to develop a payment instrument that ensures anonymity and remains unaffected by a state's financial policies, unlike traditional currencies (Nakamoto, 2008). From an economic perspective, cryptocurrencies do not fully fulfill all the functions of money (such as serving as a store of value), which raises debates about their promotion as an alternative to national currencies. However, they can still be used as a means of payment, increasing public interest in using them for various activities such as investments or transactions. For example, a survey conducted by the European Central Bank (2024) found that approximately 9% of respondents in the euro area held crypto assets, compared to 4% in 2022. The primary reason for holding cryptocurrencies was investment purposes, accounting for 64% of responses, as highlighted in Figure 3.

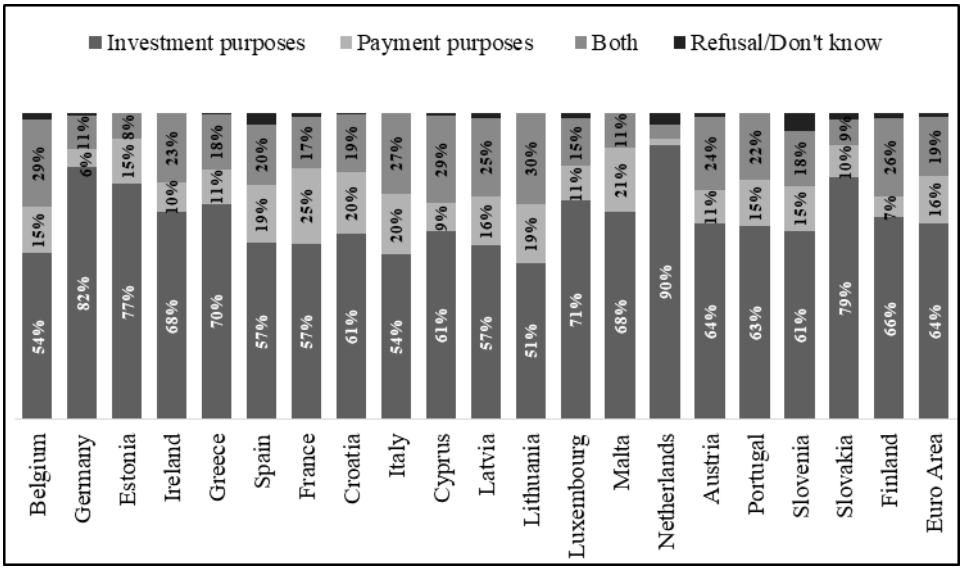

Figure 3. Use of crypto assets in the Euro Area, breakdown by country (December 2024)

Source: European Central Bank (2024, p. 66)

Cryptocurrencies represent an important innovation in the digitalization of the banking sector, particularly because they have contributed to shaping the concept of *blockchain*. This technology underpins the operation of crypto assets and has become a topic of interest for banks. It is defined as a transaction database with multiple copies, divided into blocks of validated information that are added to a chain of previous transactions by the entire network (Minescu, 2018, p. 156). The term "blockchain" derives from this grouping of data into blocks, which are interconnected, forming a chain (Constantinescu, 2020). This technology enables more efficient tracking of transactions and updates within the database while reducing network overload. Its implications in the banking sector are diverse, including intra and interbank transfers, auditing processes, and the Know Your Customer (KYC) procedure which improves the efficiency of customer identity verification in terms of cost and time by leveraging data from the interbank SWIFT registry (UniCredit, 2016).

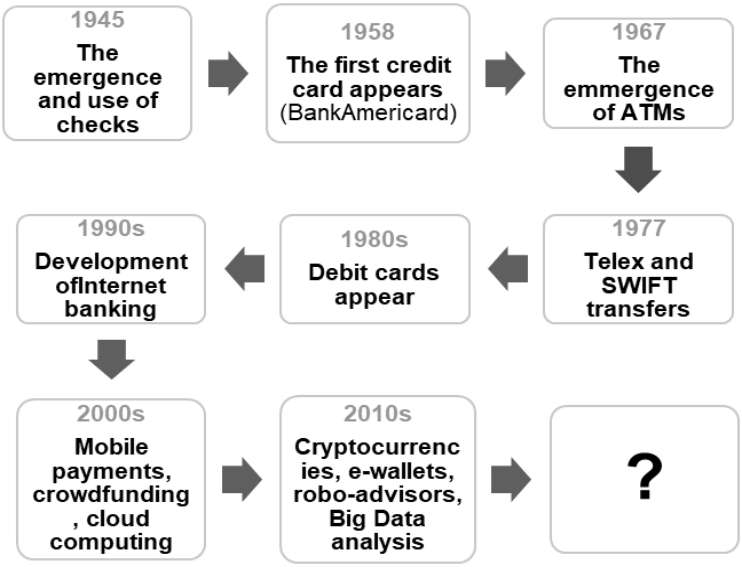

Figure 4. Technological innovations in the banking sector over time
Source: author's elaboration based on Ashta (2018)

Overall, all the technologies described and reflected in Figure 4 have a significant influence on the way banking activities are conducted. The remarkable evolution of the IT sector leaves its mark on the range of products and services offered by banks, which strive to embrace digitalization and meet all customer expectations. As highlighted, there is a growing trend in the adoption of technologies in the banking sector, driven by the emergence of FinTech companies, which intensify competition in the financial sector and represent a new challenge for traditional banks.

3. OPPORTUNITIES AND CHALLENGES OF DIGITAL BANKING

The continuous evolution of technology leaves its mark on the functioning and organization of the banking sector. The impact of digital innovations on banks is both positive and negative, resulting from the wide range of advantages as well as the risks they generate. This impact is felt by both banks and their customers. Due to digital technologies, which have contributed to shaping a digitized image of the banking sector, the specialized literature includes a wide range of studies that highlight the benefits and drawbacks of banking sector digitalization (Sardana and Singhania, 2018; Harchekar, 2018; Bhosale, Kadam and Jagtap, 2020; Litvishko *et al.*, 2020; Balkan, 2021).

Therefore, in general, the following advantages of the digital revolution in banking are highlighted:

- IT innovations create a more facile way of distributing banking services and products;
- digitalization contributes to the creation of new business models in the banking sector;
- digital channels are an efficient way of collecting necessary information in the process of decision making in the day-to-day activity of a bank;
- clients have uninterrupted access to the bank services and products, as digital banking operates in a 24/7 regime, unlike traditional banking;
- reduced prices for the bank's products and services, due to the reduced operational costs;
- digital banking maximizes the level of satisfaction of the clientele as they are offered personalized products and services, adapted to their needs and expectations;
- the risk of losses caused by human errors is eliminated;
- the discrepancy between urban and rural areas in terms of access to banking services is eliminated;
- due to the growing popularity of cashless payments, the need to manage large amounts of cash disappears, as well as the risk of counterfeit currency circulating;
- digitalization contributes to income growth as the bank can penetrate new markets internationally.

It should not be ignored that digitalization brings a series of benefits to the investment sphere as well. Capital markets have been digitized, leading to the gradual disappearance of physical interaction in the process of trading securities, which have been dematerialized (no longer issued on paper), as highlighted by Moșteanu *et al.* (2019). This has expanded accessibility for a wide range of investors. As emphasized by the European Central Bank (2023, p. 48), the number of retail investors who, during the pandemic, carried out their activities

on the capital market using mobile applications, saw a significant increase. The increase in the number of market participants brings the advantage of risk distribution, as well as ensuring lower trading costs. Furthermore, technological advancements have led to the promotion of a wide range of investment opportunities and ideas through social networks.

The process of digital transformation in the banking sector can create a series of benefits for the financial sector in terms of contributing to meeting customer expectations. However, it can also be a factor of instability, amplifying the risks to which the financial sector is already exposed (Beau, 2023). Additionally, it should be considered that, within banking regulations, there is no specific direction outlined regarding how banks should identify, monitor, evaluate, and manage the risks involved in the process of implementing digital technologies (Papathanassiou, 2024).

Some of the most important risks and disadvantages which appear in the process of digitalization are highlighted in the specialized literature (Harchekar, 2018; Aguayo and Ślusarczyk, 2020; Balkan, 2021; Indriasari *et al.*, 2022; Murinde, Rizopoulos and Zachariadis, 2022; Fayziev, 2024) and include:

- risk related to cybersecurity, caused by the vulnerability of banks to cyberattacks such as hacking, phishing, and malware, which can lead to both financial losses and the deterioration of customer trust in the bank;
- bank fraud through digital channels, which manifests through methods such as the theft of personal and banking data, card cloning, or unauthorized access to bank accounts;
- job losses for a wide range of employees, who are being replaced by digital technologies such as chatbots or virtual assistants, as well as a decrease in labor demand through the automation of banking processes;
- the technical complexity of digital systems, which refers to both their implementation and maintenance, requiring additional work from IT professionals, as well as financial resources;
- reduced accessibility for certain categories of people, explained by the fact that the digitalization process is uneven and can be characterized by pronounced divergences in terms of customer access to the internet or IT tools such as computers, mobile phones, tablets etc.;
- banks' dependence on third parties, such as FinTech companies, which are responsible for providing IT services and maintaining their digital systems;
- operational risk, caused by technical errors and problems that arise during the use of digital technologies and are often encountered due to the short time some banks allocate for testing and implementing technological innovations.

According to the author Vyas (2012), electronic banking presents certain limitations, including the danger of using card data in e-commerce, as well as the precarious security and fraud risk at Automated Teller Machines (ATMs).

However, it is important to note that banks are attempting to take measures to minimize these dangers. For example, to avoid the risk of thefts at ATMs, Huntington Bancshares (USA) has installed a red button on its banking machines, which allows customers to directly contact a police department in case of suspicious activities (Chorafas, 1999, p. 403).

In addition to all the risks, the use of artificial intelligence technologies and tools could strengthen the market dominance of BigTech companies, contributing to a reduction in the need for employees, leading to mass layoffs. Moreover, due to potential programming errors or the introduction of flaws in the algorithm behind this technology, the risk of distributing incorrect information arises, increasing vulnerabilities in terms of security.

Regarding the emergence of cryptocurrencies and the increased interest of the population in them, Constantinescu (2020) highlights, in addition to the risks associated with their trading, a series of general security implications of cryptocurrencies. Thus, the author emphasizes the idea that, due to the fact that it is not strongly regulated, this technology is also used for dishonest and illegal purposes. Relevant examples include:

- the use of cryptocurrencies in money laundering and organized crime activities;
- cryptocurrencies are used in order to avoid taxation;
- financing illegal activities, such as terrorism, espionage and information warfare;
- promotion of extremist ideologies through cryptocurrency funding.

Social media represents another threat to the banking sector due to the fact that information spreads at an exceptionally high speed, increasing the risk of a phenomenon known as a social media bank run (NBR, 2024). The rapid dissemination of negative information regarding the financial situation of a credit institution triggers an immediate reaction from depositors. They rush to withdraw their funds from banks, a process facilitated by digital channels such as internet and mobile banking, which exacerbates liquidity issues for the credit institution. A clear and recent example is the case of Silicon Valley Bank (SVB) in March 2023. One of the catalysts of this bank's collapse is considered to be the significant number of posts on the Twitter platform by its depositors, which included the term "withdraw," and the link between the bankruptcy and social media was demonstrated through the empirical study conducted by Cookson *et al.* (2023).

Banks and financial institutions must monitor the direction in which the IT field is developing and take advantage of the opportunities it can offer. Additionally, it is crucial that, in the pursuit of achieving objectives related to the implementation of digital technologies in the banking sector, the emerging risks of this process are considered, as they can cause significant losses for banks and lead to the deterioration of their public image.

4. TRENDS AND FUTURE OUTLOOK OF BANK DIGITALIZATION

Identifying the trends and patterns by which the banking sector evolves through digitalization is crucial for banks as it enables them to develop effective strategies for personalizing their products and services. This is particularly important in the context of the growing significance of digital services for the sustainable socio-economic development of countries (Dudin, Shkodinskii and Usmanov, 2021).

Analyzing the specialized literature, we conclude that many authors (such as Hamidi and Safareeyeh, 2019; Wewege, Lee and Thomsett, 2020; Garg *et al.*, 2021; Indriasari *et al.*, 2022; Petare *et al.*, 2024) highlight certain general trends and perspectives in the digitalization process of the banking sector, namely:

- increasing customer satisfaction levels by launching personalized products and services that meet their needs and expectations;
- strengthening collaboration between banks and FinTech companies, which will contribute to the creation of innovative solutions for emerging risks and challenges in the digitalization process;
- improving digital identity verification processes for new banking customers, as well as implementing technologies that enable the secure sharing of data between banks and authorized third parties;
- further development of electronic payment services and the integration of blockchain technology to ensure transaction transparency;
- automating a wide range of internal processes to reduce banks' operational costs;
- increasing overall competition in the banking market, driven by the emergence of new players such as digital banks and FinTech companies;
- boosting investments in technologies that enhance the cybersecurity of banking operations;
- launching new digital currencies, including Central Bank Digital Currencies (CBDCs).

Throughout history, banking activities have undergone profound transformations, which are continuously evolving due to the digitalization of the economy and the necessity of implementing ICT in managing client-bank relationships. The internet remains a crucial component of banking, helping to maintain the connection between banks and their clients while maximizing customer satisfaction—an aspect that will ensure the continued integration of this technology into banking operations. Its use is expected to expand further in the near future, driven by favorable factors highlighted by Căpraru (2009, p. 144):

- continuous improvement of internet security;
- increased use of computers and internet access in households, as highlighted in Figure 5, which reflects the proportion of households with internet access in both urban and rural areas;

- the increasing sophistication and education level of clients regarding ICT applications;
- the tendency of banks to diversify the range of banking operations conducted through internet-connected applications.

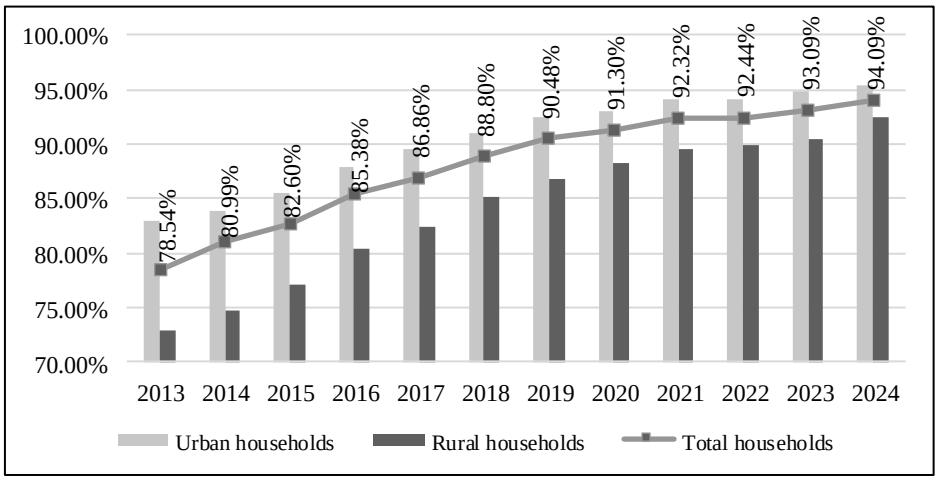

Figure 5. The evolution of the share of households with internet access in the member states of the European Union from 2013 to 2024

Note: until 2019 the available data for all 28 member states are considered, while from 2020 onwards the average is calculated for the 27 EU member states (excluding the UK)
Source: author's elaboration based on Eurostat Database

The implementation of digital technologies in the activities of banks contributes to improving financial inclusion, given that all digital channels used help in increasing the number of clients by providing broad access to the products and services offered by banks. According to a report elaborated by NBR (2024), a significant increase can be observed in the number of clients – both individuals and legal entities – who use digital channels in their interactions with banks (see Figures 6 a and b). This highlights the growing trend of an increasing number and volume of transactions occurring on digital banking platforms. As more customers embrace digital channels for their banking needs, the frequency of transactions—such as payments, transfers, and investments—has significantly risen. This surge is driven by factors like the convenience of mobile banking, faster transaction processing times, and the broader adoption of online payment systems.

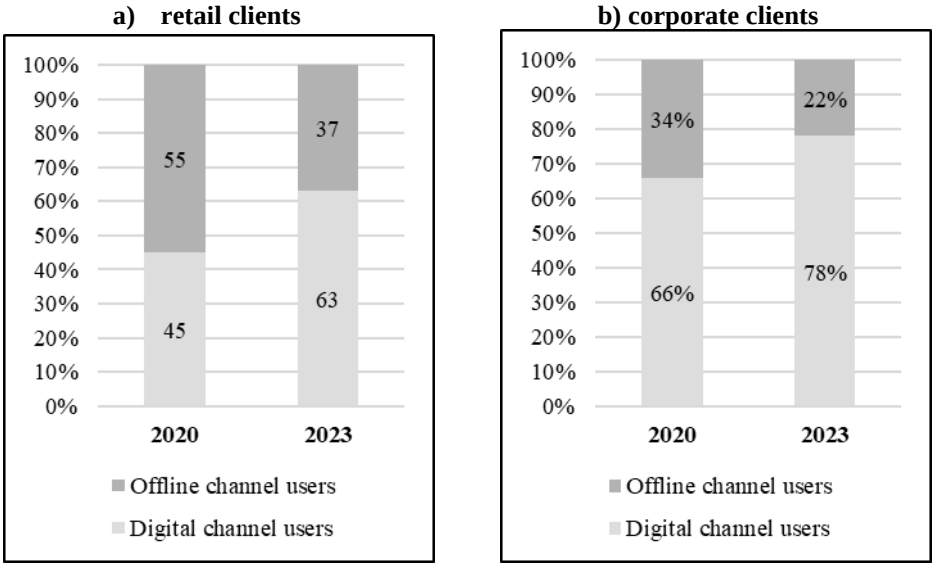

Figure 6. The share of digital channel users out of the total bank clients, 2020 versus 2023

Note: "digital channel users" are clients who benefit from internet banking and online banking services, while "offline channel users" are those who rely on traditional banking

Source: author's elaboration based on NBR (2024)

Among the prospects for the development of a digitized banking sector, we can highlight the intensification of competitiveness in the banking market. Digitalization provides banks with access to a large number of new clients, and we must note the emergence of new competition resulting from the blurring of boundaries (Chirleșan, 2023, p. 23). Another factor contributing to the intensification of competition in the banking products and services market is the rapid increase in the number of FinTech companies, as evidenced in Figure 7. Thus, we see that the value recorded in 2018 has experienced significant growth to the present.

One of the most significant catalysts for the digital transformation of the banking sector was the COVID-19 pandemic, which became the most influential factor in history in shaping digital banking services, forcing banks to revolutionize traditional strategies and communication models with clients (Dudin et al., 2021). It is remarkable that the most significant advances in the FinTech field occurred specifically during 2020–2021, given that the restrictions imposed by the pandemic left their mark on the classic connection between clients and banking service providers. The trend of increasing the number of FinTech companies represents a new challenge for traditional banks, and the most appropriate solution is the adoption of new digital technologies and the promotion of innovative banking methods, considering the possibility of collaborations between credit institutions and FinTech companies.

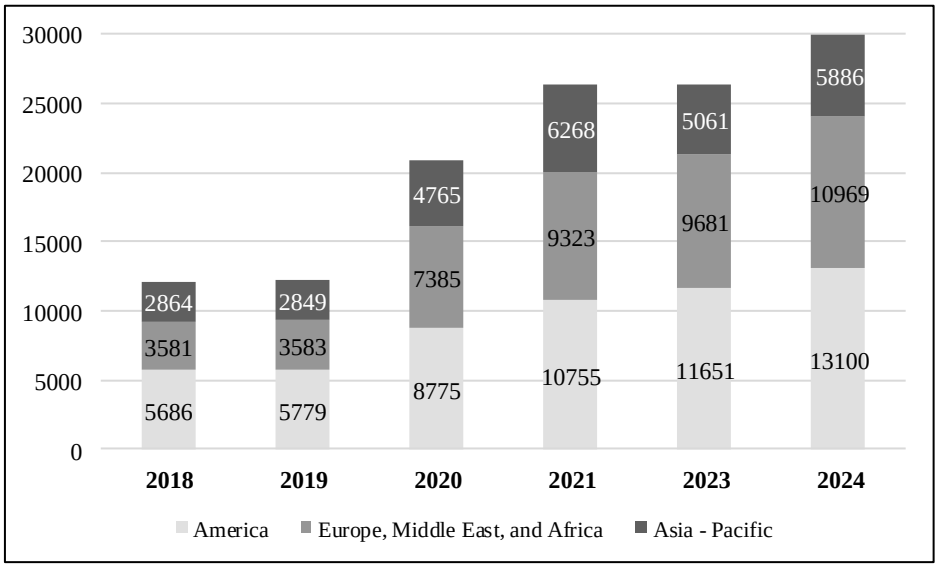

Figure 7. Number of FinTech start-ups by region (2018 – 2024)
Source: author's elaboration based on Statista, available at: www.statista.com/statistics/893954/number-of-fintech-startups-by-region/.
Note: data for 2022 is not available.

Another well-highlighted trend in the contemporary banking sector is the emergence and growing use of *digital currencies*. These are defined as currencies that exist only in digital form (they do not have a physical form, meaning they are not found as banknotes or coins), and can only be transferred, stored, and spent in the digital environment, through electronic wallets, online transfers, online commerce, or other interconnected networks (Constantinescu, 2020, p. 187). Due to the popularity of this term and the increasing interest of the population in these currencies, along with the development of blockchain technology, Central Banks worldwide have considered that it is the right time to investigate and implement their own digital currencies, known by the acronym CBDC (Central Bank Digital Currency). The launch of these currencies will help maintain the important position of Central Banks in the financial intermediation process and the economy as a whole (Moșteanu *et al.*, 2019, p. 174). In Figure 8, the countries that are still researching this concept (Chile, Mexico, Poland, Mongolia, etc.) are highlighted, as well as the countries whose Central Bank digital currency is in the testing phase (Russia, China, India, Euro Area countries etc.), and the states where CBDCs have already been launched (Nigeria, Zimbabwe, Jamaica, Bahamas).

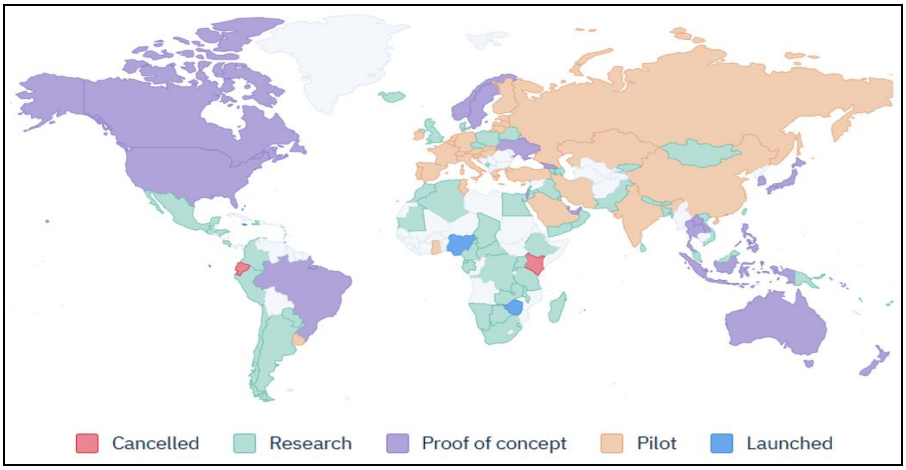

Figure 8. Current state of Central Bank Digital Currency adoption (January 2025)

Source: CBDC (Central Bank Digital Currency) Tracker (2025), available at: https://cbdctracker.org

One of the major current issues nowadays is global warming. Both the population and economic agents are concerned with minimizing the level of pollution arising from daily activities, and banks are no exception. Although banking activities are not directly related to the general state of the environment, the actions of their clients, arising from interactions with them, leave an imprint on the global ecosystem (Nath, Nayak and Goel, 2014). Thus, there is a need for the adoption of environmentally friendly strategies, which are known in specialized literature as *green banking*. Given that conducting banking operations involves an excessive consumption of materials (such as paper), to achieve their eco-friendly policy goals, banks are forced to automate banking processes, which involves using digital technologies. Thus, services such as mobile banking and internet banking represent an efficient and environmentally friendly way to conduct activities with minimal impact on nature.

However, the downside of digitalization in relation to green banking is that digital technologies consume a large amount of energy, which raises the need to include innovations in the banking industry that have as low an energy consumption as possible. The issue is not about abandoning the digitalization process in the banking sector, as there are solutions for its adverse effects on the environment. Brunori *et al.* (2023) emphasize the idea that digital technologies are key factors in the transition to a green economy and the achievement of sustainability goals defined within the European Green Deal. Therefore, banks are considering financing green technologies in order to contribute to reducing carbon emissions, as well as continuing the digital transformation of the sector (Shaumya and Arulrajah, 2016).

5. CONCLUSIONS

Nowadays, our society is undergoing a profound transformation, characterized by a series of radical changes across all areas of activity, driven by technological progress. Obviously, banks represent a key element in our lives that is no exception from the shift to a digitized society. Therefore, the process of digitalization has become a relevant topic among researchers and policy makers.

The transformation of traditional banking services has been driven by rapid technological advancements, reshaping the way financial institutions operate and interact with customers. Among the key technologies that have reshaped the global banking sector are those related to the digitalization of payment processes and the connection between banks and their customers. Artificial intelligence, which is based on computer algorithms, plays a particularly important role in simplifying and optimizing banking services such as lending and risk management. It is also at the core of innovations like chatbots and virtual assistants, which facilitate the connection between clients and banks. Inevitably, a number of changes in the banking sector have been driven by the emergence of new players: digital banks, also known as neobanks, and FinTechs. These can be seen from two perspectives: as competitors or as partners. By combining finance and technology, they create a wide range of competitive services that attract the attention of banking product consumers.

Digitalization offers banks many benefits, such as being always available to the customer, cost efficiency due to reduced operational costs, or making payment transfers in real-time. However, the bank sector faces some barriers, such as cybersecurity risks, operational risk, or increased expenses due to the implementation of innovations. Highlighting both the advantages and disadvantages of digitalization helps form a complete picture of the studied phenomenon and its effects.

Regarding current and future trends in the banking sector, we can underline several ideas. One major trend is the growing adoption of digital technologies, such as artificial intelligence and blockchain, which are revolutionizing banking operations. These innovations enhance efficiency, streamline processes, and improve customer experience by offering personalized services. Additionally, there is a significant shift toward digital-only banks, or neobanks, which operate without traditional physical branches, offering a more flexible and cost-effective alternative to conventional banks. Another important trend is the increasing use of Central Bank Digital Currencies (CBDCs), which could reshape the future of digital payments and monetary policy. Last, but not least, collaboration between traditional banks and FinTech companies is becoming more common, as financial institutions seek to leverage the agility and innovative capabilities of FinTechs to meet evolving customer needs. This partnership is expected to accelerate the development of new financial products and services, driving further transformation in the banking landscape.

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