Chapter 1. Digitalization and its impact on the Banking Business Process

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1. Introduction

In recent decades, digitalization has profoundly transformed various sectors, with the banking industry experiencing some of the most significant changes. This chapter explores the rapid development of digital technologies and their substantial impact on banking processes. From the widespread use of the internet and mobile phones to the integration of artificial intelligence and big data, digitalization has reshaped how banks operate and interact with customers.

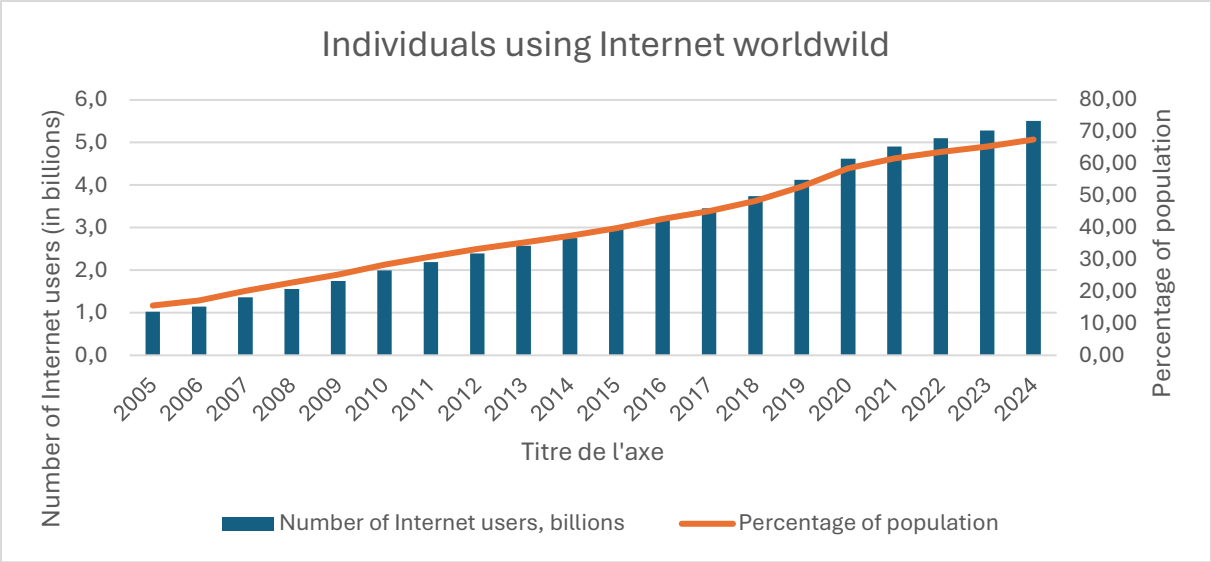
The chapter delves into the myriad benefits of digitalization, such as enhanced efficiency, reduced operational costs, and improved customer relationships. It also addresses the challenges and risks associated with this transformation, including cybersecurity threats, the need for substantial financial investments, and regulatory concerns. By examining both the advantages and the obstacles, this chapter provides a comprehensive analysis of the ongoing digital revolution in the banking industry, setting the stage for understanding its future trajectory and the evolving landscape of financial services.

2. A Digital World

The digital world has rapidly developed since the 2000s, significantly impacting society and the economy. Technological advancements have been numerous and swift, with substantial investments in new technologies, including hardware, software, and communication equipment (Mairesse et al., 2000). Recent technological developments have led to changes across various sectors, posing significant challenges for developing countries striving to modernize. Few societal domains remain un-digitalized, as the digital era is widespread.

Among technological advancements, Internet is one of the biggest evolution. According to the International Telecommunication Union (ITU), around 5.5 billion individuals, which is about 68% of the global population, are using the Internet in 2024. This marks a significant rise from 2019, when only 53% of people were online. During this period, approximately 1.3 billion new users have gained Internet access. Despite this growth, there are still 2.6 billion people who remain offline.

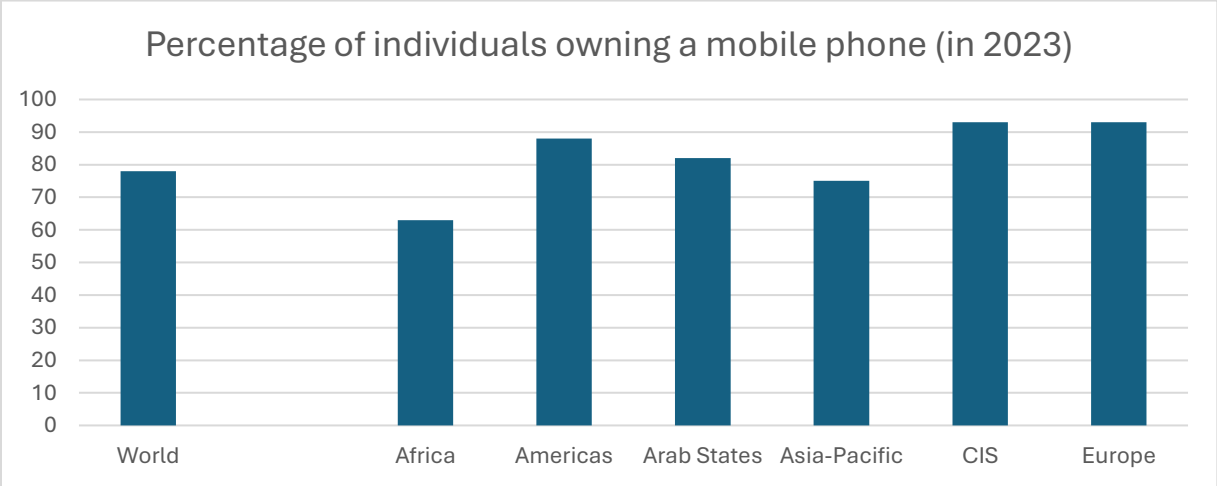
Figure 1 – Individuals using Internet worldwide



Source : ICT international, data processed by the authors.

Digitalization is notably driven by mobile phones, making it interesting to look at the global ownership rates of these devices to get a proxy of the level of digitalization. According to ICT international, almost 80% of individuals in the world own a mobile phone in 2023. A difference across several regions can be seen, Africa being the less "connected" through mobile phone.

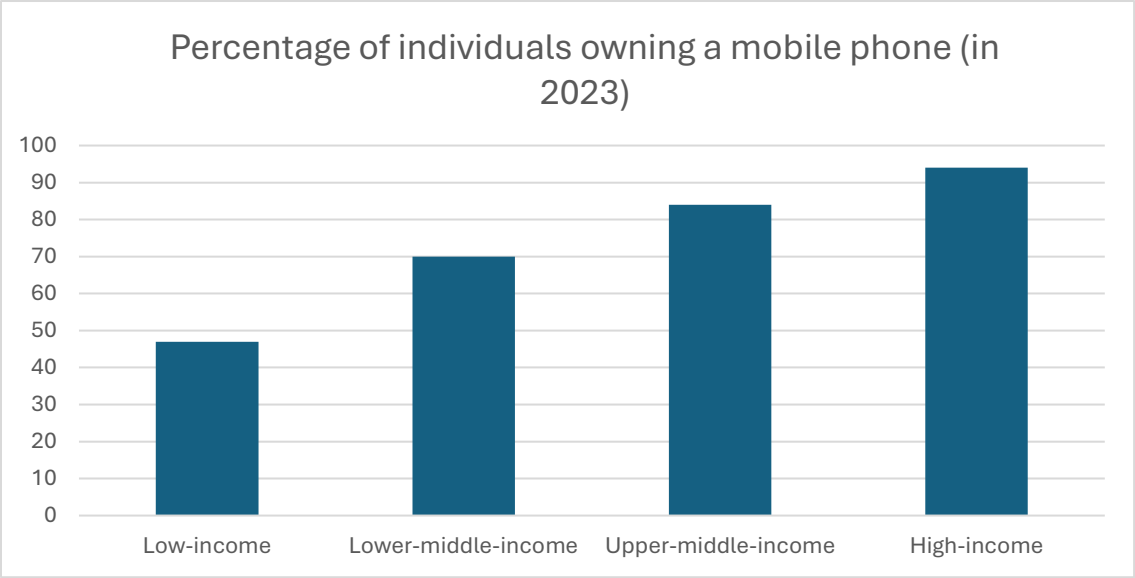
Figure 2 – Mobile phone detention rates based on world area



Source : ICT international, data processed by the authors.

A difference based on the income is also observed. The data shows a clear trend: as income increases, so does the percentage of individuals owning a mobile phone. Specifically, approximately 40% of individuals in the low-income group own a mobile phone, compared to about 60% in the lower-middle-income group, 80% in the upper-middle-income group, and 90% in the high-income group. This indicates that higher income levels are associated with higher mobile phone ownership rates.

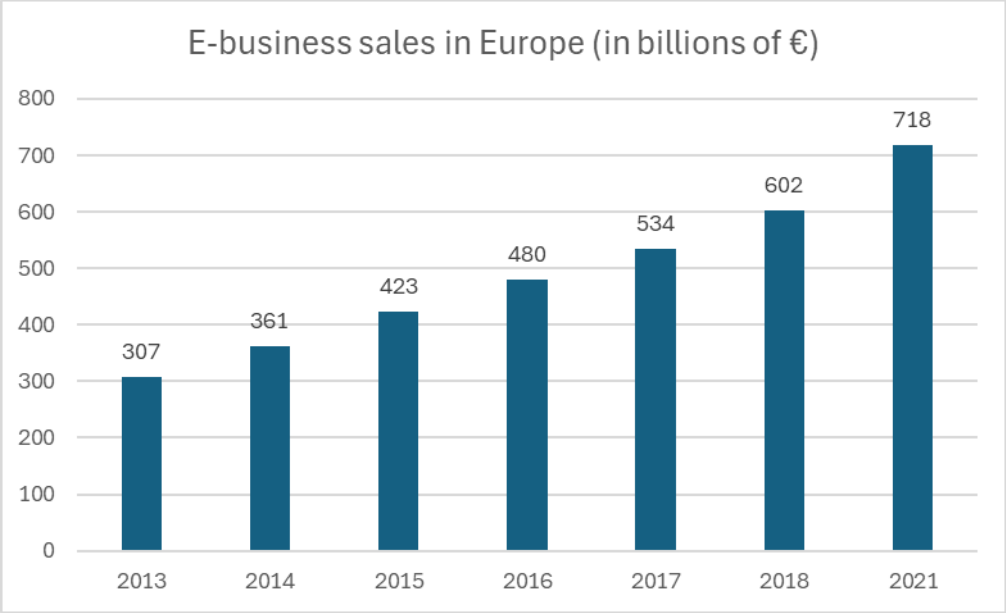
Figure 3 – Mobile phone detention rates based on income



Source : ICT international, data processed by the authors.

Digitalization affects the economy in multiple aspects: externally (company presence on social networks and customer interactions), internally (impact on workers, organizational structure, and operations), and centrally (effect on team members and the overall business environment) (Béziade et Assayag, 2014). Digitalization has led to a reorganization of the labor market and the economy, causing drastic changes and disruptions in some industries while introducing new opportunities like e-commerce (Jepsen et Drahokoupil, 2017).

Figure 4 – E-commerce Evolution accross Europe (between 2013 and 2021)



Source: Statista[1] Data processed by the authors

The COVID-19 pandemic accelerated the shift towards digital services, forcing companies to adopt innovative strategies (Melrose et al., 2021). The World Bank's Business Pulse Survey (BPS) tracked firms' digital uptake from April 2020 to December 2022. The share of firms investing in digital solutions increased significantly during the pandemic, rising from 16% in

[1] E-commerce B2C : chiffre d'affaires Europe | Statista

the early phase (April-August 2020) to 26% in the second phase (September 2020-June 2021), and reaching 33% in the final phase (July 2021-December 2022). The percentage of micro firms investing in digital solutions doubled from 10% to 20%, while large firms saw a threefold increase from 20% to 60%. The use of digital solutions peaked during the middle phase of the pandemic and remained higher in 2022 than in early 2020. Firms' digital readiness and management practices before the pandemic predicted higher investment in and use of digital solutions during the pandemic.

The same trend is observed at individual level. Indeed, World Bank Group (2023) shows also in its report that the pandemic significantly increased the use of business, education, finance, medical, health, and shopping apps. Lockdowns in March 2020 led to a rise in remote work, online schooling, telemedicine, and online shopping. Smartphone app downloads and usage grew, especially for business apps like video conferencing and communication tools. Business app downloads peaked at more than 300 million in May 2020, 75% higher than in January 2019, and total time spent more than doubled. Digital payments and online shopping also saw a lasting increase, with notable growth in finance and shopping app downloads in various regions, including Sub-Saharan Africa and the Middle East.

Since the advent of the internet, digitalization has driven organizational changes, necessitating the integration of new technologies into work procedures and personal lives (Jovevski & Josimovski, 2022).

According to World Bank Group report (2023), ICT (Information and Communication Technology) has been the most innovative field of technology in recent decades, driving innovation in other sectors. The share of ICT-related patent publications grew from less than 10% in 1980 to 26% in 2021. Major technological breakthroughs, such as personal computers, the internet, 4G/5G, smartphones, cloud services, and AI, were dominated by the ICT sector. In 2020, the top seven R&D spenders were all ICT companies.

The IT services segment has grown twice as fast as the global economy over the past two decades, with the ICT sector's total value added exceeding $6.1 trillion in 2022, representing around 6% of global GDP. Value added in ICT manufacturing and services is highly concentrated in high-income economies, with China and the US accounting for over half of the global value added. Several Central and Eastern European countries, as well as others like Chile and Vietnam, have achieved significant growth in ICT manufacturing and services. ICT goods and services are increasingly used as intermediate inputs in other sectors, with IT services showing substantial spillovers in the broader economy (World Bank Group, 2023).

Digitalization remains a developing phenomenon, prompting organizations to adjust their business models to enhance digital competencies and ensure sustainability. These changes impact various business areas, including strategy, operations, and work organization, affecting overall performance (Alsufyani et Qumer Gill, 2022).

The banking world is no exception; it has been significantly impacted by digitalization. This transformation will be further explored in the following section.

3. Digitalization in the Banking sector

3.4. Definition and Scope of Banking Digitalization

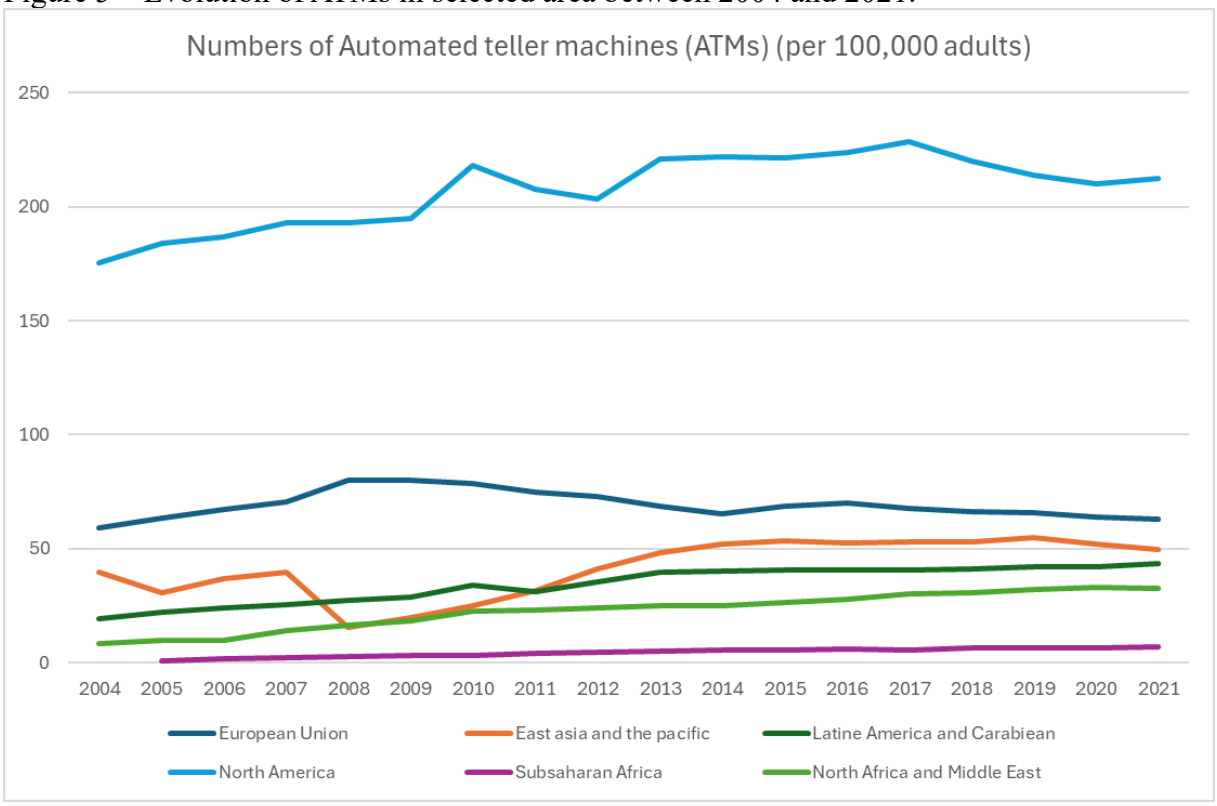
Digitalization in the banking sector refers to the integration of digital technologies into banking processes and services. It involves several aspects.

Firstly, it includes the **automation of processes**, where software is used to automate repetitive tasks such as transaction processing and client file management. For instance, automation is exemplified by the use of robotic process automation (RPA) to handle repetitive tasks like processing loan applications, which increases efficiency and reduces human error -such as managing client files and creating digital archives (Derridj et Amiar, 2020).

Secondly, it involves **dematerialization**, which is the conversion of paper documents into digital formats, making storage, retrieval, and sharing of information easier.

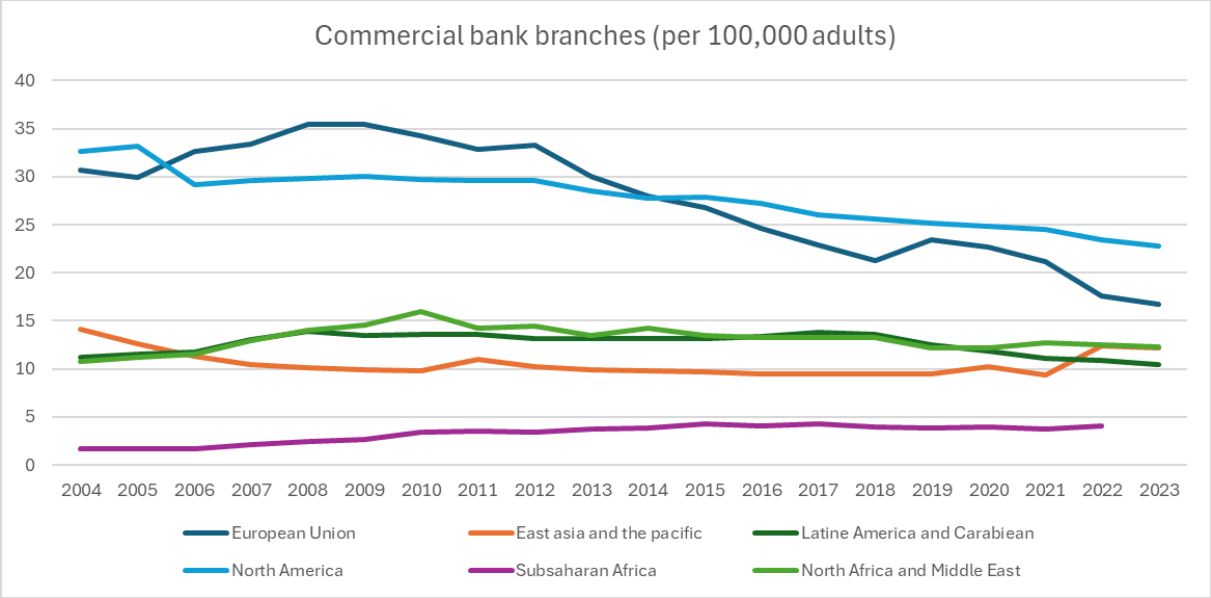
Thirdly, banks offer **online services** through platforms and mobile applications, allowing customers to check their account balances, transfer money, and pay bills from their smartphones, providing convenience and accessibility. The digitalization of banking is achieved through the adoption of various technologies and practices.
Banks develop websites and mobile applications to provide banking services accessible anytime and anywhere. Automated teller machines (ATMs) and other banking kiosks enable customers to perform transactions without visiting a physical branch. The evolution of ATM and commercial bank branches among selected area are shown in Figure 5 et 6.
Electronic communication methods such as SMS, emails, and call centers are used to communicate with customers and provide real-time information.

Figure 5 – Evolution of ATMs in selected area between 2004 and 2021.



Source : https://donnees.banquemondiale.org/ data processed by the authors.

Figure 6 – Evolution of Commercial bank branches in selected area between 2004 and 2023.



Source : https://donnees.banquemondiale.org/ data processed by the authors.

Additionally, **Big Data** refers to the vast volumes of data generated by digital processes and interactions, which can be analyzed to reveal patterns, trends, and associations, especially relating to human behavior and interactions (Eling & Lehmann, 2018). The use of **Big data** plays a crucial role in analyzing vast amounts of customer data to identify trends and personalize banking services, such as offering tailored financial advice based on spending habits. (Klein, 2019).

Furthermore**, Artificial Intelligence** (AI) helps banks better understand customer needs, personalize offers, and improve decision-making. AI is for example used in chatbots and virtual assistants to provide instant customer support and answer queries, enhancing the overall customer experience. (This topic is developed in chapter 5).

Lastly, **security and compliance** measures are implemented to protect customer data and comply with regulations. For example, advanced authentication methods like fingerprint or facial recognition are implemented to secure access to accounts. Furthermore, banks equip their staff with digital tools and provide training to use these technologies effectively.

So, banks adopt various technologies to automate tasks, dematerialize documents, provide online services, and ensure data security.

3.5. Digitalization enhanced financial inclusion

According to ITU (2016), mobile financial services have significantly boosted financial inclusion in many countries. The expansion of mobile networks has enabled these services to reach populations previously underserved by traditional banks. Between 2011 and 2014, 700 million adults became account holders, reducing the number of unbanked adults by 20% to 2 billion. By 2015, mobile money accounts had grown to 411 million globally, available in 93 countries.

Indeed, mobile money transfers and payments often serve as an entry point into the formal financial system, with transaction data potentially aiding in credit scoring and facilitating digital

borrowing. Transitioning from informal to formal financial systems can improve access to finance. This is particularly the case for low- and middle-income countries. In 2021, 26% of people in low-income countries had a mobile money account, compared to 25% with an account at a financial institution. The percentage of adults with a formal financial account in low- and middle-income countries rose to 71% in 2021, up from 63% in 2017. However, only 57% made or received digital payments, and just 37% did so with a merchant (World Bank Group, 2023).

As stated before, the pandemic accelerated the adoption of digital payments, with 80% of countries using digital payments for social assistance by May 2021. The Global Findex 2021 reported that 865 million account owners, including 423 million women, opened their first financial institution account to receive government transfers. Around 65% of those receiving government transfers did so digitally. The shift to digital payments during the pandemic has laid the groundwork for long-term financial inclusion, with 62 countries leveraging account-based transfers for COVID-19 response programs (World Bank Group, 2023).

4. How Digitalization disrupts the Business Model of Banks

Digitalization has revolutionized the banking world, bringing significant improvements and advancements such as enhanced accessibility, personalized services, and cost reductions. However, it also presents its share of challenges and drawbacks, including cybersecurity threats, digital inclusion issues, and regulatory and ethical concerns.

POSITIVE DISRUPTIONS

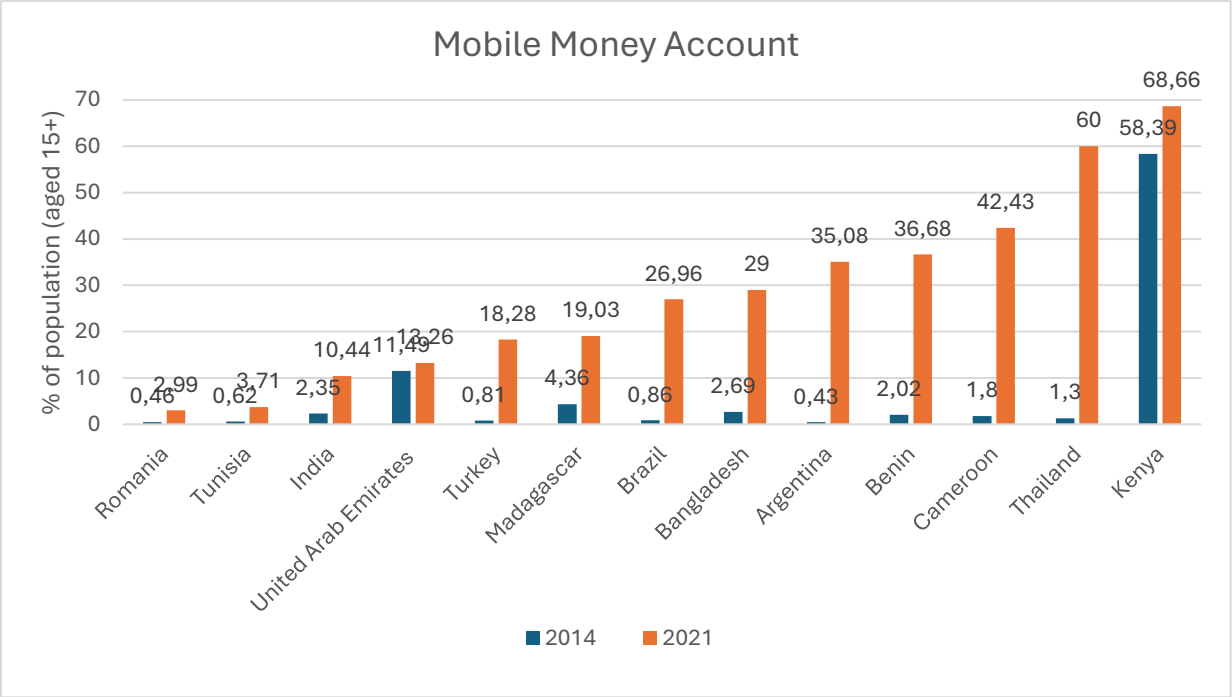
4.1.Improvement of Customer Relationship:

The shift to digital technology disrupts the relationship a company has with its customers, as consumers are now more experienced, demanding, and particular than before. Today's clients are highly connected and seek personalized products or services that are immediately available. This is the "*I Know What I Want And I Want It Now*" generation (Béziade & Assayag, 2014). In this sense, digitalization leads to an improvement in customer relations. Banks can offer services that are more tailored to customer needs, thereby strengthening the customer relationship (Cherkaoui, 2020). It is proven that the personalization of services and online accessibility enhance customer satisfaction (Mckinsey, 2014).

Because digitalization leads to procedural optimization, it simplifies banking procedures, making services more accessible and attractive to customers (Cherkaoui, 2020).
On the other side, automated repetitive tasks allow advisors to focus on specific segments, enhancing the relevance of their recommendations (Klein, 2017). The number of communication points with customers increases through digital networks, providing high-quality and consistent services (Lecigne, 2013).

The use of applications and computers for financial transactions is increasing, with a significant rise in mobile banking subscriptions.

Figure 7 – % population using mobile money account among selected countries



Source : Global Findex Data[2]processed by the authors

Digital banking tools have become more accessible, with customers increasingly using online services for bill payments, account balance checks, and transfers.

4.2.Increased Efficiency and Productivity

Automating processes save time for banking advisors, allowing them to dedicate more time to other commercial activities (Aaras and Nicolosi, 2020). Customers can perform their operations autonomously, optimizing the allocation of human resources. The use of digital technologies enhances productivity and simplifies procedures. According to OECD (2021)[3] 's report states that intangibles (measured by levels of digital skill intensity) have a positive and statistically significant impact on firm-level productivity growth in the service sector and for younger firms.

4.3.Reduction of Operational Costs

Bank's digitalization also offers cost savings. A more autonomous customer base allows banks to save costs, as basic tasks no longer require a banking advisor. The digital transformation of financial services reduces personnel-related expenses and improves bank profitability (Cherkaoui, 2020). Enhanced customer experiences also optimize satisfaction and reduce costs for the bank (McKinsey, 2014).

In summary, digitalization provides significant advantages for banks in terms of improving customer relations, increasing efficiency, reducing costs, and optimizing procedures. But there are also negative disruptions and challenges that must be recognized.

NEGATIVE DISRUPTIONS AND CHALLENGES

[2] https://www.worldbank.org/en/publication/globalfindex/Data#sec3
[3] OECD (2021) retrieved on https://one.oecd.org/document/ECO/WKP%282021%2931/en/pdf

4.4.Significant Financial Investments:

Banks need to invest considerable amounts in both material and immaterial infrastructure to implement the desired technological adaptations (Aaras and Nicolosi, 2020). The process often involves two stages: data reorganization and the implementation of data-related levers. For larger infrastructures, investments can reach around one billion euros, with returns becoming noticeable after a few years (Lavayssière, 2015). These investments include costs for acquiring IT equipment, developing technologies, and maintaining and servicing machines. Banks also need sufficient IT capacity to handle the volume of transactions (Habets, 2014).

4.5.Security Risks:

Digitalization exposes banks to security risks related to cybercrime and data protection. The risk of cybercrime increases as cybercriminals can access sensitive information to steal funds. Security challenges are more significant in the digital age than in the past (Revathi, 2019). Banks must ensure that customers are willing to accept new digital security measures and that these measures effectively protect privacy and commercial information (Bienvenu, 2019). New risks require banks to develop effective solutions to prevent losing the benefits of digitalization. Risk management and control must evolve alongside new threats (Tourabi et al., 2022). The topic is more developed in chapter 7.

4.6.Reduction in physical branch traffic:

The rise of digital banking has resulted in a decrease in the number of customers visiting physical branches, questioning the cost and efficiency of maintaining extensive branch networks (Dalla Pozza and Texier, 2017). Many customers now prefer to use online services, reducing the need for physical bank visits. This trend is expected to continue, leading to further closures of physical branches (Campos and Gayte, 2017).

However, digitalization does not suit all customer categories equally. For example, the elderly may have difficulties adapting to digital banking services (Aaras and Nicolosi, 2020).
Additionally, digitalization induces pressure in customer relations, as customers expect quick responses, and delays can lead to dissatisfaction (Lecigne, 2013). Banks face challenges in adapting to reduced branch traffic while managing increased interactions through digital channels. These factors pose threats to maintaining good customer relations. Therefore, banks should implement measures to support these customers in the digital transition.

4.7.Increased Competition:

Technological advancements (and favorable regulations, see 5.2) have redefined the economic landscape, allowing new entrants like fintech and GAFA (Google, Apple, Facebook, Amazon) to offer competitive services (Denis, 2019). Financial activities have been destabilized by digitalization, leading to increased competition from market innovators who recognize and exploit opportunities in a transforming market (Bienvenu, 2019). Digitalization has enabled the development and expansion of fintech by providing the necessary technological infrastructure, such as high-speed internet, mobile networks, and cloud computing, which fintech companies rely on to offer their services.

In their paper entitled *Fintech and Banking. Friends or Foes,* Navaretti et al. (2018) explore the impact of fintech on traditional banks. It discusses how digital innovations and technology-based business models can either provide new opportunities for banks or disrupt the existing

financial industry structure. They find that fintech disrupts traditional banks by introducing new players into the financial services market, thereby increasing competition. Fintech companies offer more efficient, transparent, and customer-centric services, compelling traditional banks to enhance their offerings to remain competitive. The use of innovative technologies such as artificial intelligence, blockchain, and mobile applications revolutionizes financial services, making processes faster and less costly. Additionally, fintech enables cost savings and increased operational efficiency, putting pressure on traditional banks to adopt similar technologies. Fintech also expands access to financial services for previously underserved populations, increasing the market but also intensifying competition. Finally, the emergence of fintech poses new regulatory challenges, forcing traditional banks to adapt to an evolving regulatory framework. These dynamics illustrate how fintech disrupts traditional banks by introducing new competitive and technological elements. (This topic is developed in chapter 2)

Digitalization has also enabled the emergence of a new banking model: neo banks.

5. Neo Banks: A New Banking Model

5.1.Definition and Characteristics of Neo Banks

Neo banks are digital banks that operate entirely online without any physical branches. They offer a range of financial services like traditional banks, such as checking and savings accounts, payment and money transfer services, and loans. Neo banks emerged as a response to the growing demand for easy and effective banking solutions driven by advancements in financial technology (Jaglan, 2021).
They emerged in the early 2000s and have since evolved in their relationship with traditional banks. These new players leverage modern technologies to establish themselves and compete with conventional banks, initially targeting consumers already integrated into banking services but now aiming at a broader audience.

Customers are increasingly drawn to neo banks for their speed, accessibility, ease of use, and transparency. Digital solutions appeal to younger generations who value mobile connectivity and practical, fluid experiences. Neo banks offer lower fees and simplified processes, making them attractive for routine transactions (Deloitte, 2019).

5.2.Open Banking, a favorable regulatory framework

Open Banking is a revolutionary banking practice that mandates financial institutions to provide customer information to third parties through application programming interfaces (APIs). This practice enables banks to develop new products and services, thereby improving the delivery system to meet the needs of modern consumers (Gottipati, 2024).

The core principles of Open Banking include (Gottipati, 2024):
- Data Access and Sharing: Customers can authorize third parties to access their financial data, allowing for the provision of personalized financial services such as budgeting tools, peer-to-peer lending platforms, and payment solutions.
- Security and Privacy: Open Banking frameworks emphasize robust security measures to protect consumer data, including strong authentication processes and compliance with data protection regulations.
- Innovation and Competition: By opening access to financial data, Open Banking encourages the development of new financial products and services, fostering competition between traditional banks and fintech companies.

- Collaboration between Banks and Fintechs: Collaborations between traditional banking institutions and fintech firms leverage the efficiency and flexibility of fintechs while providing fintechs with a customer base and credibility from well-established banks.
- Enhanced Customer Experience: Open Banking allows banks to gain insights into customer behavior, offering personalized advice and products, and improving customer interactions.

Europe was pioneer with **PSD1** directive in 2007. This directive allows initially non-financial players to offer new payment solutions. It is precisely in this context that neo-banks were able to provide financial activities. The European directive on payment systems PSD2 has also greatly favored the emergence of neo-banks. It has become easier for them to find a place in the market thanks to more flexible entry barriers. **PSD2** directive came into effect in 2018. The objective is to continue improving European payment systems for the benefit of consumers as well as businesses. This directive aims to support innovation, stimulate competition, and increase market efficiency through superior consumer protection (European Commission, 2019).

Around the world, other regulations share similar objectives to PSD2, including promoting innovation, enhancing competition, and protecting consumers. For example, in the **United Kingdom**, Open Banking[4] (launched in 2018) requires major banks to open their financial data to third parties via secure APIs. This aims to stimulate competition and innovation in the financial services sector.
In **Australia**, Consumer Data Right[5] (CDR), introduced in 2019, allows consumers to control their data and share it securely with third parties. The banking sector was the first to adopt this regulation, followed by other sectors such as energy and telecommunication.
In 2021, **Brazi**l, implemented Open Banking[6] to improve competition and innovation in the banking sector by allowing consumers to share their financial data securely with third parties.
In Africa, **Nigeria** is leading the way with its Open Banking initiatives. The Central Bank of Nigeria has issued guidelines to promote data sharing and enhance financial services in the country.
Open Banking is also developing in the Gulf countries. For example, **Bahrain** introduced a trial directive on Open Banking[7] in 2018. **Saudi Arabia** has established an Open Banking policy framework through the Saudi Arabian Monetary Authority (SAMA)[8].

An overview of open banking 'spread around the world is available at https://www.openbankingmap.com/

5.3.Key players

Many neo banks are linked to traditional banks, either as subsidiaries or through direct creation. Other players consist of more independent entities offering limited services like payments and crypto transactions. Fintech Magazine[9] proposes a list of top 10 Neobanks in the world.

Table 1 – Top 10 Neo banks

	Neo banks	Founded in	Country

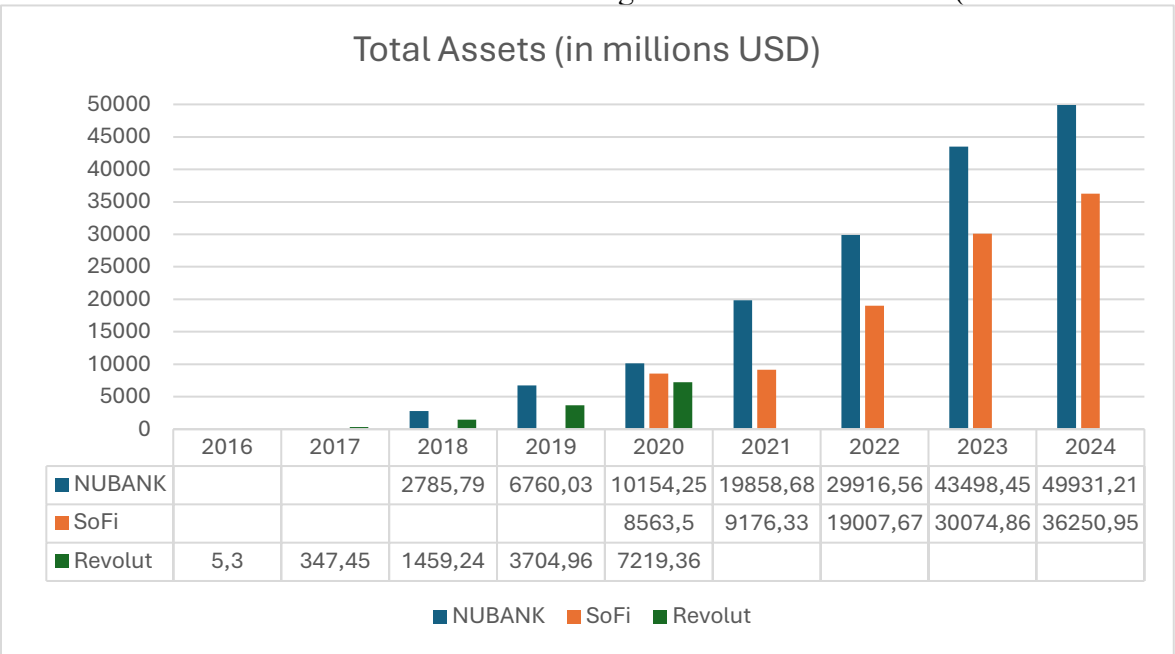
[4] https://www.openbanking.org.uk/
[5] https://www.accc.gov.au/by-industry/banking-and-finance/the-consumer-data-right
[6] https://www.bcb.gov.br/content/config/Documents/Open_Banking_CMN_BCB_Joint_Resolution_1_2020.pdf
[7] https://www.cbb.gov.bh/media-center/cbb-launches-the-bahrain-open-banking-framework/
[8] https://sama.gov.sa/en-US/Documents/Open_Banking_Policy-EN.pdf
[9] https://fintechmagazine.com/banking/top-10-neobanks-in-the-world

1	Nubank	2013	Brazil
2	SoFi	2011	US
3	Chime	2013	USA
4	Revolut	2015	UK
5	N26	2013	German
6	Monzo	2015	UK
7	Varo Bank	2015	US
8	Starling Bank	2014	UK
9	Atom	2013	UK
10	Upgrade	2016	US

Source : Fintech Magazine

The growth in this sector is quite impressive. For example, between 2018 and 2024, Nubank's total assets has increased by 1692%; while Revolut's total asset has increased by 1361% (see Table 2).

Table 2 – Evolution of Total Assets among selected Neo Banks (in millions USD)



Source: Bloomberg Data processed by the authors

Even if UK and US are leading the market, other initiatives are arising elsewhere. We can highlight the Gulf Cooperation Council (GCC) countries with the emergence of several neo banks, driven by a young, tech-savvy population and supportive regulatory environments such as Liv. by Emirates NBD (2017), Mashreq Neo by Mashreq Bank (2017), Meem by Gulf International Bank (GIB) (2014), STC Pay by Saudi Telecom Company (2018), YAP (2021) and Zand (2022).

5.5.Limits and Risks of Neo banks

Neobanks are becoming very popular, but they face unique risks that traditional banks don't (Kapliar, Maslova & Hnoievy, 2024). One major risk is cybersecurity. With heavy reliance on digital technologies, neobanks are more vulnerable to **cyber-attacks**. Strong cybersecurity measures are essential to protect this data and maintain trust.

Neobanks also face **operational risks** like technical issues, system failures, and inefficiencies. These problems can damage customer trust and hurt the bank's reputation. Effective risk management is crucial to handle these issues and keep the bank stable.
Neobanks must comply with laws and regulations, which can be challenging. They need to continuously innovate and adapt to changing market conditions. Their success depends on managing these risks effectively and ensuring high security for their services.

6. Conclusion

Digitalization has undeniably revolutionized the banking sector, bringing about significant changes in how banks operate and interact with their customers. The integration of digital technologies such as the internet, mobile phones, artificial intelligence, and big data has enhanced efficiency, reduced operational costs, and improved customer relationships. Banks can now offer more personalized services, streamline processes, and reach previously underserved populations, thereby promoting financial inclusion. The integration of Big Data and Artificial Intelligence has further personalized banking services, while security measures have evolved to protect customer data.

However, this transformation also presents challenges. Cybersecurity risks have increased as banks become more reliant on digital technologies, necessitating robust security measures to protect sensitive information. The need for substantial financial investments in digital infrastructure and technology is another significant challenge, as is the increased competition from fintech and neobanks. Regulatory compliance and digital inclusion also require continuous attention and innovation to ensure that all customer segments can benefit from digital banking services.

The rise of fintech and neobanks has leveraged technological advancements to offer innovative, customer-centric financial services. Fintech companies have disrupted traditional banking by providing more efficient, transparent, and accessible services, compelling banks to adapt and innovate. Neobanks, operating entirely online, have gained popularity for their convenience, lower fees, and user-friendly interfaces, appealing particularly to younger, tech-savvy customers. It is crucial for traditional banks to keep a close watch on these emerging players and consider potential collaborations to harness their innovative capabilities and stay competitive. The collaboration between banks and fintech firms, supported by regulatory frameworks like Open Banking, will be crucial in driving innovation and enhancing financial services.

In conclusion, the digitalization of the banking sector presents both opportunities and challenges. The ability to navigate these changes and address emerging issues will determine the success and sustainability of financial institutions in the digital age. The journey towards a fully digitalized banking ecosystem is ongoing, and the future holds exciting possibilities for further advancements and improvements in financial services.

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