UNIVERSITY OF LJUBLJANA SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS THE IMPACT OF COVID-19 ON THE ADOPTION OF ONLINE BANKING IN BOSNIA AND HERZEGOVINA

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LIST OF ABBREVIATIONS

AI – (sl. Umetna inteligenca); Artificial Intelligence
ATM – (sl. bankomat); Automated Teller Machine
BiH – (sl. Bosna in Hercegovina); Bosnia and Herzegovina
CBBH – (sl. Centralna banka Bosne in Hercegovine); Central Bank of Bosnia and Herzegovina
CNB – (sl. Hrvaška narodna banka); Croatian National Bank
EU – (sl. Evropska unija); European Union
IBAN – (sl. mednarodna številka bančnega računa); International Bank Account Number
KM – (sl. konvertibilna marka); convertible mark
POS – (sl. POS); point-of-sale
RTGS – (sl. Bruto poravnave v realnem času); Real-Time Gross Settlements
sl. – Slovene
USAID – (sl. Agencija Združenih držav za mednarodni razvoj) – United States Agency for International Development

1 INTRODUCTION

Although the financial sector faced many technological changes a decade earlier, the influence of the technology industry's rapid development on banks has recently become apparent due to the appearance of COVID-19 (Tadić-Živković, 2021). COVID-19 has had quite a significant impact on our quality of life in a variety of ways.

Nearly 6.77 million people around the world have died after contracting the respiratory virus (Statista, 2019). According to the World Health Organization (2021), COVID-19 can easily be spread between people at a conversational distance and in poorly ventilated and/or crowded indoor settings, where people tend to spend longer periods of time.

Many governments worldwide introduced different measures to stop the spread of the virus. Lockdown and social distancing were highly recommended at the time. These efforts to stop the spread of the virus negatively affected the economy, so the banking sector was not an exception (Chinyere & Oyiza, 2022). The demand for digital banking services was expected to increase because of social isolation and other pandemic-mitigation efforts (Al-Dmour et al., 2021).

Before the pandemic broke out, developments in the financial industry were not really coordinated because every bank chose the pace at which it was going to respond to the growth of the digital economy by individually determining its development program and the characteristics of the adoption of emerging technologies (Tadić-Živković, 2021). COVID-19 highlighted the importance of digital banking services and "forced" all banks, to devote themselves to these payment channels and take them as a priority. The World Health Organization (2021) advised adopting contactless payments, which were likely to help reduce the infection with the virus because banknotes may also transmit the disease.

As a result of the epidemic, new client demands have also emerged, including those for contactless payments and remote banking services, both of which may be satisfied through online banking. Banks must rapidly adjust to meet these shifting client expectations and provide more sophisticated digital customer service.

The purpose of this master's thesis is to investigate and contribute to understanding the impact of the COVID-19 pandemic on the adoption of online banking in Bosnia and Herzegovina. It is focused on analysing and understanding how online banking during COVID-19 has impacted the customers and their satisfaction and the banks that are providing those online services, what are the opportunities and challenges for both customers and banks in Bosnia and Herzegovina.

This thesis also focuses on understanding how banks in Bosnia and Herzegovina managed to develop new solutions and adapt to the changes that occurred due to the COVID-19

pandemic, how they maintain a secure system due to increasing fraud efforts, and, among other things, how they have encouraged customers to increase their use of online banking.

The master's thesis determines which solutions could lead to better affirmation and trust in the usage of online banking services based on customers' opinions and explains the reasons that led consumers to choose online banking. This thesis will be helpful in decision-making and product development in banks as well as in improving customer satisfaction.

Research questions that will be investigated in this master's thesis are:

- How did banks in Bosnia and Herzegovina convince their clients to use online banking during the pandemic?
- What are the advantages and disadvantages of online banking for both banks and their clients?
- How do banks maintain a secure payment system and what challenges do the institutions that supervise the work of banks face during the pandemic?

In this master's thesis, the method of research that was used includes both a review of the relevant literature and empirical study. The literature is obtained from different sources of national and global records, including professional writings, business journals, existing articles, publications, and scientific studies related to online money transfers, which serves as the theoretical foundation for writing this master's thesis.

To determine the difficulties experienced by banks during the pandemic in terms of implementing online banking and the security of those services, anonymous interviews were conducted with eight large banks in Bosnia and Herzegovina. An interview was conducted with Admil Nukić, assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, to discuss the challenges faced by bank supervisors. The empirical research is carried out through the qualitative methodology, which is used to determine and investigate the objectives of the thesis.

This master's thesis comprises four chapters, followed by the conclusion. The first chapter defines online banking, discusses its history and evolution, and summarizes the key advantages and disadvantages associated with it. It also includes key findings on the management of information systems in banks in Bosnia and Herzegovina

In addition to defining which emerging digital technologies are currently being implemented in the financial industry, the second chapter offers concise explanations of digital currencies. The second chapter also explains cybercrime and measures for preventing fraud and theft while using these services.

The third chapter defines COVID-19 and its opportunities and threats for the banking sector. It also presents a review of the adoption of online banking services during the pandemic in Bosnia and Herzegovina and neighboring Croatia and Serbia.

The fourth chapter provides a comprehensive breakdown of the findings of the empirical research, as well as the methodology and procedure of the research process. Within the fourth chapter, a discussion and a collection of recommendations were presented, both of which were based on the results obtained, followed by a conclusion.

2 ONLINE BANKING

Throughout the years, modern banking has introduced many innovations into its operations. One of these technology-based innovations is, among others, electronic banking. Users of banking services can access practically all the services that are typically provided by a local branch of banking online, such as withdrawals, transfers and electronic bill payment. Almost all banks in the world, as well as in Bosnia and Herzegovina, offer online banking services that the client can access using a computer or mobile application.

2.1 Online banking terms and definitions

The banking industry continuously incorporates a growing number of advancements into its operations annually. Banks provide incentives that encourage the development of new and appealing business methodologies as they leverage emerging technologies. Banks have understood that digitalization will benefit their client interactions, increase competition and give businesses higher efficacy, precision, cost savings, time savings, risk reduction as well as security, while lowering fraud and money laundering (Moșteanu et al., 2020).

Furst et al. (2002) define internet banking as the practice of receiving banking services remotely using the Internet. These banking services include, among others, creating a savings account or moving money between accounts, electronic bill presentment, and payment (Furst et al., 2002).

Electronic banking increased the use of banking services under the "self-service" system, so more jobs are transferred to service users (Komazec et al., 2000). Primorac et al. (2012) define online banking as a revolutionary channel for the distribution of banking products and services, as well as an innovative way of communication between the bank and its clients.

Credit and debit cards were surely among the most important innovations in the banking sector. However, mobile banking is the most recent innovation that alters the way that businesses and consumers conduct transactions within the financial system (Tadić-

Živković, 2021). With the help of a mobile phone, tablet, and other similar devices, online banking provides the user the same service as visiting a branch office.

These services, which are gained through online banking, are shown in Figure 1 below. There are various definitions of online banking, but in conclusion, online or internet banking, which occurred with the development of information technologies, can be defined as banking without the need to visit a branch office, which can be done with the use of the internet, through a computer, tablet or a mobile phone.



Figure 1: Online banking

Source: MyMoneySouq (2021).

2.2 History and development of online banking

The use of electronic banking appeared for the first time in the USA, which included efficiently delivering account balance and transaction information to their high-profile clientele at little cost and time (Komazec et al., 2000). Over time, progressive enhancements were made to this system, transforming the overall financial practice within society. The core concept was the capacity to execute a wide range of financial activities, including salary deposits, bill payments, loan repayments, and inter-company settlements, without the need for physical mediums such as paper, cheques, or cash (Komazec et al., 2000).

The financial system underwent a significant transformation in 1951 through the implementation of payment cards (Tadić-Živković, 2021). According to Tadić-Živković (2021), the introduction of card payment was a significant innovation that brought significant changes. The Visa card, which is well recognized today, was first introduced by Bank of America in 1958, so this innovation was subsequently accompanied by the rapid advancement in computer technology during the 1960s (Tadić-Živković, 2021).

According to Komazec et al. (2000), several authors have associated the phrase "online banking" with the development of a smart card, which is essentially a credit card equipped with an embedded chip. However, the authors argue that there is no distinction between the chip present on the card and those incorporated into computer systems.

The term "electronic banking" emerged as a label for this particular financial transaction method (Komazec et al., 2000). According to this definition, credit and debit cards were observed as a form of online banking.

The influence of technology and its increasing prevalence have significantly impacted the financial system's evolution. Financial institutions began utilizing computers, replacing traditional savings and payment books with digital accounts, specifically records of digitalized accounts. Komazec et al. (2000) define electronic banking as a consequence of the introduction of technological innovation, in which business transaction data is primarily stored within computer systems, specifically in databases on magnetic media, so paper-based business transactions, in the form of documents, have become secondary.

According to Tadić-Živković (2021), digital technologies have significantly influenced society's evolution and advancement across various dimensions since the 1980s. In the 1980s, clients were given the possibility to check their accounts and make payments using a computer, but online banking reached its full potential with the growth of the internet in the 1990s (Tadić-Živković, 2021).

The introduction of chip-enabled cards later replaced the initial implementation of magnetic strips on payment cards, and eventually, contactless payment methods were introduced (Tadić-Živković, 2021). Both Komazec et al. (2000) and Tadić-Živković (2021) agree that Automated Teller Machines (ATMs) have been seen as a significant technological advancement and that this particular event established the fundamental principles and played a significant role in the advancement of financial markets and financial instruments in their present form.

The introduction of modern banking practices and banking advances in Bosnia and Herzegovina was significantly delayed due to the war from 1992 until 1995. So, when discussing the transformation of the banking sector in Bosnia and Herzegovina, we must mention the year 2000, which was significantly important for the banking sector in Bosnia and Herzegovina. The Declaration of the Peace Implementation Council in Madrid on

December 16, 1998, established the Payment Transaction Plan, which was required to be executed by the end of 2000 (Central Bank of Bosnia and Herzegovina, 2017).

The Payment Bureau was an autonomous financial institution operating within the jurisdiction of the Federation of Bosnia and Herzegovina (Central Bank of Bosnia and Herzegovina, 2017). It was responsible for executing payment transactions, maintaining documentation, generating data and conducting information-analytical activities associated with internal payment transactions, established by the law on internal payment transactions.

The previously mentioned reform included the transfer of payment transactions from the Payment Bureaus to commercial banks and the Central Bank of Bosnia and Herzegovina (Central Bank of Bosnia and Herzegovina, 2000). This meant that all officially authorized banks within the country would possess the capability to execute payments for both legal and physical entities autonomously. The implementation of the payment system modernization in 2001 resulted in notable enhancements, shown by the increased efficiency in transaction transfers, decreased expenses, and alignment with European standards (Softić, 2020/2021).

This also meant that the responsibility of managing the domestic non-cash payments system was transferred to the commercial banks, although the clearing mechanisms for these payments will continue to be operated by the Central Bank of Bosnia and Herzegovina (Central Bank of Bosnia and Herzegovina, 2000). The Central Bank of Bosnia and Herzegovina played an active role in the financial system by implementing contemporary interbank settlement mechanisms, namely Real-Time Gross Settlements (RTGS) and the Gyro clearing system.

With the financial support provided by the donations received from the United States Agency for International Development (USAID), the Central Bank of Bosnia and Herzegovina has allocated a portion of the donation towards the procurement of gyro clearing equipment, leasing telecommunication lines and ensuring the installation of the entire system of commercial banks in Bosnia and Herzegovina (Central Bank of Bosnia and Herzegovina, 2017).

Central Bank of Bosnia and Herzegovina (2017) states that using this strategy, compliance with regulatory standards of equipment and software applications utilized by banks was guaranteed, resulting in an ideal state for the operation and maintenance of the system. Over the course of over 16 years since the inception of a contemporary payment system, there has been no instance of compromise in payment transactions (Central Bank of Bosnia and Herzegovina, 2017). The previously mentioned step has served as the ultimate stage in the process of revolutionizing the payment infrastructure in Bosnia and Herzegovina.

Central Bank of Bosnia and Herzegovina (2000) states that the legal modification in Bosnia and Herzegovina has similarities to the reforms implemented in Croatia and Slovenia, enabling the establishment of a fully competitive banking system like those existing across Europe. In their press release on 21st August 2000, the Central Bank of Bosnia and Herzegovina announced that they had signed a contract with "Logica", a London-based company, and "Halcom", a company based in Ljubljana, for computer equipment and software.

The implementation of this equipment and software has allowed the establishment of an innovative bulk clearing house by the Central Bank of Bosnia and Herzegovina. This clearing house has effectively managed the anticipated high volume of low-value payments that were processed through the commercial banking system in Bosnia and Herzegovina. In 1998, Halcom and Logica collaborated to assist the Central Bank in Slovenia through the installation and maintenance of similar computer technology and this particular experience has facilitated an effortless transition within the context of Bosnia and Herzegovina (Central Bank of Bosnia and Herzegovina, 2000).

In 2007, the International Bank Account Number (IBAN) was assigned to Bosnia and Herzegovina (Softić, 2020/2021). This was a very important step towards the introduction of an international standard for invoice numbering, which has enabled banks in Bosnia and Herzegovina to formally participate in the system of automated processing of foreign currency payment orders inside the European Union (Softić, 2020/2021).

Before 2013, online or internet banking was not mentioned as a part of the payment system in Bosnia and Herzegovina. In the present context, with the appearance of various alternatives and the advancement of alternative payment methods, the utilization of cards is gradually becoming antiquated and less essential, similar to the need for physical cash (Tadić-Živković, 2021).

According to the Annual Report of the Central Bank of Bosnia Herzegovina in 2013, there was a noticeable increase in internet or electronic banking usage, particularly among individuals. However, the overall value of transactions conducted through this medium remained relatively low, indicating that it was not considered an important part of the payment system in Bosnia Herzegovina.

In 2014, a total of 25 banks provided internet banking or other forms of electronic banking services to both legal companies and households (Central Bank of Bosnia and Herzegovina, 2014). Despite a notable increase in the customer base over time, the count of 213,562 users in 2014, which was a mere 0.01% of the total number of cards issued in Bosnia and Herzegovina, mainly cards of individual consumers, so it did not have a significant impact on the payment system in our country (Central Bank of Bosnia and Herzegovina, 2014).

Although the banking system enabled the initial adoption of credit cards, debit cards, and their associated point-of-sale (POS) and automated teller machine (ATM) systems, in recent times, there has been a notable movement towards the use of mobile applications, personal computers (PCs), and tablets as the preferred means of conducting financial transactions (Moșteanu et al., 2020). The amount of internet banking users in Bosnia and Herzegovina, including various forms of e-banking, continued to demonstrate growing trends, particularly among households.

In comparison to the year 2014, in the year 2015, there was a significant increase in the number of e-banking users, with over 100,000 clients, representing a growth of 47.39% (Central Bank of Bosnia and Herzegovina, 2015). According to the Central Bank of Bosnia and Herzegovina (2015), in 2015, one out of every six cards issued in BH was being used for e-banking services, besides other purposes. The growing trend of online banking among customers continued, so in 2018, almost every third card issued in Bosnia and Herzegovina was used for e-banking services (Central Bank of Bosnia and Herzegovina, 2018).

2.3 Advantages and disadvantages of online banking

Over the past few years, we have adopted a faster pace of life, which has resulted in an issue with our shortage of time. Time-saving is, among other things, one significant advantage of using online banking. Clients can access their bank account with the help of a mobile phone or tablet and quickly check their bank balance, make transfers, and pay bills without the need to visit a branch office and wait in long lines.

This is incredibly convenient for employed clients, who can make transactions during their working hours because the approximate working hours of a bank in Bosnia and Herzegovina are from 9 a.m. to 4 p.m., which usually overlaps with clients' working hours. According to Williamson (2006), the online banking channel is highly beneficial for financial companies, because it offers consumers flexibility and convenience at more affordable prices compared to conventional financial services. This has encouraged customers to avoid expensive bank branches.

Furthermore, Williamson (2006) states that some banks encourage consumers to use the online channel by billing for services that usually exist in branches. The following table, Table 1, summarizes the fees associated with some banking services provided through mobile banking, as well as the transaction fees associated with banking at an office branch in Bosnia and Herzegovina. In Bosnia and Herzegovina, there are a total of 14 banks; 12 of them offer mobile banking services.

	Mobile banking				Traditional banking at an office branch			
Name of the bank	Mobile banking services, monthly fee (in KM)	Payment to the account of another client within the Bank (in KM)	Fees for mobile banking transactions on a bank account at a different bank (in KM)		Fees for transaction s made at the bank counter on an account within the bank (in KM)	Fees for transactions made at the bank counter on a bank account of a different bank (in KM)		
UniCredit Bank	2.50	0.60	1.00		2.00	2.50		
Raiffeisen Bank	No fee	0.30	0.60		3.50	4.00		
ASA banka	3.50	0.50	1.00		No fee	3.00		
Intesa Sanpaolo banka	3.00	0.60	1.00		No fee	3.00		
Sparkasse Bank	3.50	0.50	1.00		2.50	3.00		
NLB banka	No fee	0.30	0.60		2.50	4.00		
Bosna Bank International	2.00	0.70	1.00		2.50	3.50		
ZiraatBank BH	2.99	No fee	0.50		3.00	3.00		
Union Banka	3.00	0.50	0.75		1.00	2.50		
	nk No fee 0.50		Transactions under 500.00:	0.70	2.00	Transactions under 500.00:	3.00	
Addiko Bank		0.50	Transactions from 500.00 to 10,000.00:	1.00		Transactions from 500.00 to 10,000.00:	4.00	
ProCredit Bank	3.00	No fee	1.00		No fee	1.00		
Privredna banka Sarajevo	2.90	0.50	0.70		1.20	2.00		

Table 1:	Pavment	processing fe	ees in	banks in	Bosnia	and Herzegovina
10000 11		p. cccssing,	000	0 000000 000	200.000	

Source: UniCredit bank d.d. Mostar (2022), Raiffeisen Bank d.d. Bosnia and Herzegovina (2023), ASA Banka d.d. Sarajevo (2023), Intesa Sanpaolo banka (2023), Sparkasse Bank d.d. Bosnia and Herzegovina (2023), NLB Banka d.d. Sarajevo (2023), Bosna Bank International (2022), ZiraatBank BH d.d. (2022), Union Banka d.d. Sarajevo (2021), Addiko Bank Sarajevo (2023), ProCredit Bank d.d. BiH (2020), Privredna banka Sarajevo d.d. Sarajevo (2023). Compared to the fees charged when using mobile banking, the processing fees for transactions and payments completed at a branch office have been proven to be much higher, as shown in Table 1. When it comes to transactions that are made in a branch office, the processing fee that Raiffeisen Bank bills is the most expensive, whereas the processing fee that is billed by Privredna banka Sarajevo is the least expensive. On the other hand, when it comes to mobile banking transactions, ZiraatBank BH offers the lowest transaction costs, whereas Bosnia Bank International offers the highest transaction costs.

Furst et al. (2002) emphasize that using the internet for data collection has significant advantages for banks as well as their clients. Consumers stand to gain by allowing banks to gather and combine a significant amount of private data that enables banks to customize a variety of products to suit customer needs (Furst et al., 2002). The internet works as an excellent tool for knowledge management and data acquisition, without regard to the bank's scale.

The advantages of online banking are, among others, decreased criminal activity and money laundering, a variety of non-cash payment methods, decreased grey economy, safety, and cost savings (Kozarić et al., 2020). There are many advantages to the use of online banking, but there are also many disadvantages. One of the perhaps most important ones is safety. The viewpoint of Williamson (2006) suggests that banking institutions are increasingly expanding the range of services offered online. However, they have not proportionately enhanced the level of verification required to carry out these services.

According to Williamson (2006), the insufficient level of verification needed to access a financial institution's online platform is now recognized as a significant issue. Criminals and cybercriminals have employed their expertise in technology to deceive individuals into exposing sensitive information, so providing unauthorized use of online banking accounts (Williamson, 2006).

Clients can sometimes hesitate to use online services for a variety of factors, including software technical issues, threats related to the program, mistrust of the application, and difficulties accessing these services. As a result, internet banking companies are forced to look for alternative strategies to persuade potential customers to adopt it.

Although online banking is secured through different authorization steps and PINs, Chinyere and Oyiza (2022) and Azzam (2022) agree that customers mostly reject the idea of using online applications, because they could become vulnerable to fraud due to a lack of digital education and experience regarding how to use some of these online banking products. To avoid this, both the educational system and the regulator play a vital role in raising financial knowledge (Kozarić et al., 2020).

According to Kozarić et al. (2020), the main concern regarding online banking is that as the use of online banking increases, banks may start to close branches and limit the number of ATMs, which might further exclude these vulnerable populations. Among others, online banking applications do not work without an internet connection, so, if the customers are away and no Wi-Fi connection is available at the time, they have no possibility of accessing their account. The user's acceptance and use of online services depends on several factors, especially his perceptions of the benefits he would get from transacting digitally with the use of these services, such as a reduction in transaction duration, time reduction, cost reductions, etc.

Perhaps the greatest challenge for the banking sector is cybercrime. The users of technological devices are at risk of cyber assaults since they store a lot of sensitive information, including personal data.

Kozarić et al. (2020) suggest that cybercrime includes various types of fraud techniques such as convincing individuals to purchase worthless applications, taking funds out of a bank account, deceiving an individual into thinking they are communicating with a banker, phishing, username and password theft, etc. Also, online banking may make it challenging for consumers to get individualized guidance and support while making financial decisions.

2.4 Management of information systems in banks in Bosnia and Herzegovina

The banks in Bosnia and Herzegovina are being supervised by two regulatory agencies: the Banking Agency of the Federation of Bosnia and Herzegovina and the Banking Agency of Republika Srpska. The two regulatory organizations that supervise banks in Bosnia and Herzegovina have reached an agreement on the regulation of the information system within banks.

To develop a comprehensive understanding of the implications of this decision, it is important to have an understanding of the concept of an information system. The Banking Agency of the Federation of Bosnia and Herzegovina (2017) defines an information system, as a wide range of resources systematically arranged to gather, store, process, preserve, use, distribute, and eliminate information. An information system's resources include hardware and software components, network components, databases, files, plans, as well as individuals and procedures.

According to decisions prescribed by the Banking Agency of the Federation of Bosnia and Herzegovina (2017) and the Banking Agency of Republika Srpska (2017) on the management of the information system in banks, the bank must establish, implement, monitor, maintain, regularly revise, and further develop the process of managing the information system. The following process is carried out to minimize risk, ensure the confidentiality, integrity, and availability of information, and improve the overall information system. The measures taken should be suitable for the bank's operations, the complexity of the information system, and the size and scope of the bank. The bank must build a comprehensive system that encompasses the identification, quantification, monitoring, and management control of risks associated with the utilization of the information system.

The entire infrastructure behind online platforms is an integral part of the information system. This means that it is not analyzed through transactions during bank supervision of regulatory agencies, but is supervised as infrastructure security (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024).

Instead of being examined alone, it is assessed as part of the overall evaluation of organizational and system controls, which encompassed factors such as delivering secure services to end users. There is no dedicated surveillance of internet services, but they are a subject to routine monitoring (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024).

Besides this, all banks are obliged to assess the risk of introducing significant changes to the information system and process in accordance with the decision on internal management. So, whenever there is a change in the system process, they must perform a risk analysis, and depending on the business model and specifics of the bank, for resources that are exposed to external risks such as internet banking and mobile banking, banks are required to perform periodic penetration tests which, as a rule, are performed by external suppliers of such services, who have appropriate knowledge, certificates, and these external suppliers can conduct these services (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024). FBA does not conduct this type of tests independently, but insists that the bank, depending on its business model, information system, performs these tests periodically (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024).

The banks are not only obligated to assess the risk of introducing significant changes, but also assess the risk of the whole information system structure, such as components of the information system that help crucial business operations (ATMs, electronic banking, card businesses, etc.), components of the information system and services that support fundamental administration procedures and corporate operations, components of the information system and services that handle or store confidential or sensitive data, where unauthorized access to such data might have a substantial impact on the bank's reputation, financial performance or stability, and the uninterrupted functioning of its operations (Banking Agency of the Federation of Bosnia and Herzegovina, 2017).

The decision also includes an obligation of the bank's management to assign an individual (manager/officer) to oversee the security function of the information system, and clearly outline their authority, duties, and scope of work. The security function of the information system should be separate from the role of the organizational unit responsible for administering the information system (Banking Agency of the Federation of Bosnia and Herzegovina, 2017).

The individual in charge of the security function of the information system must oversee and organize activities associated with the security of the information system and provide regular reports to the bank's management regarding the status and operations related to the security of the information system, at a minimum frequency of once every three months (Banking Agency of the Federation of Bosnia and Herzegovina, 2017). Among the person responsible for information system security, the information system is further supervised by internal and external audit.

The Banking Agency of the Federation of Bosnia and Herzegovina (2017) and the Banking Agency of Republika Srpska (2017) further obligate banks to implement an electronic banking risk management process that is an essential component of its overall risk management. This process should include detailed risk assessments related to electronic banking performance, considering factors such as the technology used, technological advancements and emerging risks, outsourced services, and the client's technical environment.

The bank is required to implement transaction monitoring measures in order to prevent, detect, and stop suspicious payment transactions within the electronic banking system (Banking Agency of the Federation of Bosnia and Herzegovina, 2017). Additionally, high-risk transactions should undergo a specific evaluation and assessment method (Banking Agency of the Federation of Bosnia and Herzegovina, 2017).

The Banking Agency of the Federation of Bosnia and Herzegovina (2017) further states that the bank is required to:

- establish a procedure for monitoring, resolving, and tracking security incidents and client complaints related to security, and regularly report on these matters,
- implement secure and effective authentication techniques to verify the identity and authorization of individuals, processes, and systems,
- ensure that user authentication involves at least two separate and unrelated components to validate the user's identity,
- offer suitable means for users of electronic banking to verify the bank's identity and legitimacy on the electronic banking platform,
- establish secure communication channels between all parties involved in the transmission of sensitive data throughout the entire session, in order to guarantee the confidentiality and integrity of the data,

- implement mechanisms to regulate the maximum number of logins to the system, including authentication and authorization processes (additionally, enforce rules to limit the duration of user sessions and the validity of authentication),
- establish procedures for generating, storing, and regularly analyzing operational and system records.

Ultimately, the regulations given forth by the Banking Agency of the Federation of Bosnia and Herzegovina emphasize the crucial need of strong security protocols within banking establishments. These rules highlight the importance of banks implementing thorough protocols for monitoring, resolving, and documenting security occurrences and customer complaints. Following these rules is crucial for improving the security of banking systems and building confidence among customers in the digital banking environment.

3 DIGITAL TECHNOLOGIES IN ONLINE BANKING

The rapid development in technology and the increased automation of the financial sector have resulted in various innovations in banking. These innovations include various innovative financial services and goods that focus on satisfying customers' demands.

Digital technologies have been established in modern society, which is why it is commonly accepted that they will significantly influence the banking industry and the services offered by banks (Golubić, 2019). The presence of intense competition in the banking sector, demands an innovative operational strategy for banks, which is demonstrated by the growing investments in technology that prioritizes services that are focused on customers.

3.1 New technologies in the banking sector

The fast adoption of digitalization has shown the potential of technology, including many advancements such as digital signatures and data analysis. The development of financial technologies has driven traditional institutions to undergo dramatic changes.

At the moment, plenty of technological advancements exist that could promote the banking industry's digital transformation (Kozarević & Ibrić, 2020). While financial technologies may threaten traditional banking practices, it is essential to note that their objectives are not necessarily in direct opposition to those of banks.

According to Kozarević and Ibrić (2020), an effective digital transformation strategy must include suitable technologies to deliver optimal value to the financial institution and its customers. Kozarević and Ibrić (2020) state that the most important technical solutions

in the banking sector, which encompass a wide range of innovative approaches, are among others Artificial Intelligence, Blockchain technology and the Internet of Things.

3.1.1 Artificial Intelligence

The field of Artificial Intelligence (AI) is now experiencing swift and significant progress and has a transformative impact on several industries, including healthcare, banking, customer service and automated transportation. Individuals who possess a mobile device might likely have used different forms of AI, such as the Siri or Google assistance applications.

D'Souza and Williams (2017) defined AI as a computer system that can do activities that often demand human intelligence, including, but not limited to speech recognition and decision-making. Machine learning, a subfield of AI, includes developing computer programs that possess the ability to acquire knowledge and improve performance through analyzing sample data or previous interactions (D'Souza & Williams, 2017).

By sending an enormous amount of data to neural networks, the system achieves the ability to identify and incorporate user behavior, providing a highly personalized experience (Kozarević & Ibrić, 2020). Therefore, this approach creates additional benefits and value for the user. By employing predictive analysis of the customer's behavior and expected demands, it becomes possible to proactively provide services that the client may not directly request due to their lack of awareness regarding the existence of it (Kozarević & Ibrić, 2020).

Furthermore, one of the many advantages of using AI in banking is improving operational efficiency and minimizing expenses. With the help of AI, many mistakes that occur when performing operational tasks can be avoided, due to the automatization of processes.

According to Intesa Sanpaolo Bank in Bosnia and Herzegovina (2021), AI has been specifically developed to safeguard financial portfolios against severe unfavourable changes in the market. Using integrated AI, their banking team can now analyze a significantly broader range of risk indicators compared to previous methods and accomplish analyses that previously required weeks to complete in a matter of seconds (Intesa Sanpaolo Bank, 2021).

Kozarević and Ibrić (2020) state that the incorporation of AI into the operations of banking institutions presents two key advantages. Firstly, it enables an increased level of service personalization, enabling personalized services that meet the needs of end users (Kozarević & Ibrić, 2020).

Another benefit is that AI offers a better approach to risk management, which involves accelerated and complex analyses of transaction risk levels (Kozarević & Ibrić, 2020).

Furthermore, AI has the potential to effectively analyze large quantities of data to identify criminal activity and trends, thereby assisting financial institutions in their efforts to reduce financial crime.

3.1.2 Blockchain

Approximately a decade ago, precisely on October 31, 2008, an essay titled "Bitcoin: A Peer-to-Peer Electronic Cash System" was published (Nuhbegović, 2019). Nuhbegović (2019) states that the author or authors of this article, who remain unidentified to this day, chose to adopt the pseudonym Satoshi Nakamoto to conceal their true identity.

To properly understand what Blockchain is, first, we have to define the term Bitcoin. Kubát (2015) defines Bitcoin as a commonly recognized form of cryptocurrency, a type of digital money that employs encryption techniques. It is occasionally referred to as a digital currency or, more specifically, as a medium of exchange (Kubát, 2015).

So, opposite to traditional cash, Bitcoin possesses the potential for duplication. The issue at hand, commonly referred to as "double-spending", was effectively addressed by Nakamoto through the development of the blockchain authentication mechanism (Nuhbegović, 2019).

The fundamental principle underlying Blockchain technology involves a distributed database that is regularly updated through interconnected blocks which are linked in a specific manner, characterized by a timestamp and cryptographic encryption, ensuring the unquestionable authenticity of recorded information (Nuhbegović, 2019). The name of this technology results from the linked interconnected blocks it contains.

Kozarić et al. (2020) agree that the adoption of blockchain technology in financial institutions allows complete transparency in transactions, as information entered is unaffected by falsification and each modification is permanently documented and traceable on a global scale through computer systems. The transparency of blockchain operations can be attributed, in part, to the fundamental rigid structure of the technology.

With the help of blockchain technology, eliminating intermediaries in transactions, caused by increased safety during transactions, leads to a significant decrease in costs (Kozarić et al., 2020). This decrease in costs enables financial institutions to provide clients with more beneficial services (Kozarić et al., 2020).

Furthermore, it is essential to reflect on the important effect of the widespread cloud technologies, resulting in their increased decentralization (Kozarević & Ibrić, 2020). In a centralized system characterized by a single administrator carrying all duties, the potential for hacking and data compromise is increased. Additionally, in the event of a problem, the system is vulnerable to becoming overwhelmed by an enormous flow of data.

3.1.3 Internet of Things

The Internet of Things (IoT) refers to the interconnection of physical devices, including smart gadgets, automobiles, buildings, and various other items (D'Souza & Williams, 2017). These devices are equipped with sensors, electronics, software, actuators, and network connectivity, allowing them to detect and broadcast occurrences or modifications in the environment around them (D'Souza & Williams, 2017).

Rose et al. (2015) define the IoT as the extensive integration of network connectivity and computing capabilities into objects, devices, sensors, and items that are typically not classified as computers, which enables these devices to independently create, exchange, and utilize data with little or no assistance from humans. The IoT contributes significantly to the advancement of digital banking.

The increased adoption in the use of electronic devices and internet connectivity has resulted in a rise in data generated by the IoT. The implementation of real-time data analysis enables increased personalization in the customer's banking experience, thus accomplishing the objective of personalized financial services (Kozarević & Ibrić, 2020). The concept being discussed represents an essential change in accessing personal data and applications.

By using information about their clients, banking institutions can enhance their understanding of their customers, detect their requirements, deliver customized services and products, and supply appropriate financial support and budgetary strategies. Kozarević and Ibrić (2020) state that it is commonly referred to as cloud computing because the data is now hosted in the cloud rather than being stored on individual computers.

Furthermore, it allows contactless payment and simplifies the use of the authentication method, among other benefits (Kozarević & Ibrić, 2020). Commercial banks in Bosnia and Herzegovina enabled the distribution of contactless payment cards, enabling individuals to make transactions without the necessity of physically swiping or inserting their cards into POS terminals (Central Bank of Bosnia and Herzegovina, 2020).

This includes the convenience of simply bringing the payment card within proximity of the POS device, thereby enabling purchases of up to 30 KM (Central Bank of Bosnia and Herzegovina, 2020). By adopting this approach, the payment procedure is made simpler and safer, significantly decreasing waiting lengths at retail stores. Besides contactless payment cards, payment can be made using a mobile phone, smartwatch, bracelet, etc.

Ultimately, users can access programs, records, and documentation from a multitude of devices, regardless of time and location (Kozarević & Ibrić, 2020). An example of IoT is the ability to remotely access one's financial account using various digital interfaces, such

as mobile phones, tablets, etc. In conclusion, mobile banking would not be possible without the IoT.

3.2 Digital currencies term and definition

The predominant form of currency in circulation is electronic money, as the expansion of payment transactions has reached an amount that is beyond the monitoring capabilities of current payment systems (Nuhbegović, 2021). Nuhbegović (2021) states that the implementation of electronic fund transfers was initiated with the support of technology. Subsequently, as information and communication technologies advanced, the conventional form of deposit money gradually came to be recognized as electronic money (Nuhbegović, 2021).

Digital currencies have become known as a significant feature of modern society. Following the occurrence of the global financial crisis, an innovative type of currency emerged in the form of digital currencies, driven by the concept of establishing a monetary system that operates independently from government interference and is immune to the effects of inflation (Kozarić et al., 2020). The most popular and known cryptocurrency is Bitcoin.

The introduction of the Bitcoin cryptocurrency allowed the transfer of data a representation of worth without the need for intermediaries, a capability previously restricted to physical currency (Nuhbegović, 2021). Bitcoin and other recently developed cryptocurrencies have been met with mistrust by both commercial and central banks for a considerable period.

Škreb (2018) states that, although blockchain technology possesses several beneficial attributes, cryptocurrencies have many disadvantages, such as high volatility, high energy consumption and high possibility of illegal activities. Blockchain technology serves as the foundation for cryptocurrencies, so, consequently, this avoids the necessity for a transaction to undergo verification by a reliable intermediary, such as a financial institution or a credit card corporation (Golubić, 2019).

According to the regulations outlined in the Law on the Central Bank of Bosnia and Herzegovina (1997), it is explicitly stated that the sole recognized form of legal tender within the territory of BiH is the convertible mark (KM). Consequently, the conversion of cryptocurrencies into KM is considered unfeasible, as only other officially recognized currencies can be traded for KM. Although the usage of cryptocurrencies is, until this day, not legal and not adequately defined in our country, various innovative technologies in the banking sector are either being implemented or are in the process of development for future utilization.

3.3 Cybercrime

Given the widespread dependence on technology in contemporary society, it is predictable that our personal information is usually stored on our smartphones, laptops and tablets. Consequently, our vulnerability to numerous kinds of online frauds has increased and can be a target of cybercrime.

Cybercrime encompasses a wide range of illegal activities that utilize computers or computer networks as a means, a target, or a location (Das & Nayak, 2013). Kozarić et al. (2020) suggest that the predominance of these concerns emerges from user carelessness, given that the internet enables individuals to present themselves in any way they please and to sell any product. Cybercrime includes theft of funds from the payment card, "phishing", username and password theft, fraudulent sales, etc.

According to Kozarić et al. (2020), credit card theft is likely the most prevalent type of cybercrime affecting individuals. Phishing assaults consist of deceptive internet pages, messages sent via email, text, or telephone calls that are intended to deceive consumers into exposing confidential information such as bank card numbers, login information, etc. The individuals behind these cyber-attacks, often present themselves as a bank employee, family member or other, in order to deceive the victim.

Dominantly or almost in all cases, security failures occur on the user's side (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024). Despite the security measures implemented by the bank, errors and abuses of access rights can still occur among users. The primary cause of these failures is the improper or irresponsible handling of access rights.

This includes leaving one's token unattended, disclosing one's code, or, in rare cases, the interception of communication between the bank and the user (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024). These failures can also be attributed to the end user's own actions, such as using compromised computers or devices that have been targeted by malicious software attacks.

Therefore, it is not possible to entirely eliminate the potential risk that may occur from the user's perspective. There is no evidence available indicating that any event has occurred as a result of a system or software security failure on the bank's side, FBA has not experienced any similar occurrences (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024). With the exception of instances where banks face attacks solely caused by traffic congestion, DDOS attacks, though uncommon, may occur when directed at a specific institution for alternative motives (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024).

Login and password protection, which was once the norm, is no longer regarded as a particularly effective safety measure, because under the current circumstances, where an overwhelming number of code-breaking software and viruses that record and distribute personal information are common, this method of protection is deemed outdated (Kozarić et al., 2020). Given the ineffectiveness of the method mentioned previously, there are additional forms of protection that can reduce the risk of deception, such as smart cards, tokens, as well as periodic password changes (Kozarić et al., 2020).

Regarding cybercrime and the safety of it in banks, the bank is required to implement controls in order to protect the information system from internet-based or other external network threats, such as traditional telecommunications links or communications with trusted partners. According to the Banking Agency of the Federation of Bosnia and Herzegovina (2017), banks are required to incorporate procedures or strategies to ensure the maintenance of a comprehensive and current record and assessment of all external network access points, such as websites, internet applications, wi-fi, remote access, etc., that could potentially be exploited by third parties to gain unauthorized access to the bank's internal information system.

Furthermore, banks must manage the administration and oversight of security measures, such as firewalls, proxy servers, antivirus software, and content scanning (Banking Agency of the Federation of Bosnia and Herzegovina, 2017). These measures are put in place to safeguard incoming and outgoing network traffic, as well as external network connections that could potentially be exploited by unauthorized individuals to gain access to the bank's internal information system.

Banks are also required to implement measures and strategies to safeguard their web pages and online applications against direct attacks originating from the Internet or external sources. These measures should also address the potential vulnerabilities that could serve as gateways into the bank's internal information system. Examples of such protective measures include system hardening, the use of IPS/IDS systems, and similar security solutions (Banking Agency of the Federation of Bosnia and Herzegovina, 2017).

Banks are required to develop network divisions, execute constant surveillance of network traffic, analyze data, perform software integrity examinations, and conduct frequent security penetration testing (Banking Agency of the Federation of Bosnia and Herzegovina, 2017). These steps are necessary to evaluate the efficiency of cyber and internal security measures and processes.

4 COVID-19 AND ONLINE BANKING

The pandemic caused by the COVID-19 virus has had a significant influence on a wide range of aspects of everyday life, including the way in which individuals conduct their banking transactions. Because of the installation of social isolation precautions and limits aimed at minimizing the transmission of the virus, an increased number of people have resorted to using online banking as a more secure alternative to conducting banking operations in person.

This is because online banking is considered more secure than traditional banking. Before the outbreak of the pandemic, banks were already offering electronic and mobile banking services, however their functionality was not highly desirable and the user experience was not sufficient. These services included a certain set of essential features, such as access to account information, domestic payments, transfers, and display of card data.

Banks lacked a clear focus on the growth of these features and instead attempted to align themselves with market trends, without seeing the significance they may have for both their clients and the bank itself. Amidst the COVID-19 pandemic, bank prioritized these services and made significant efforts to enhance their functionality in order to efficiently respond to the interests and desires of its consumers - the users. Simultaneously, there was a substantial increase in the number of users, indicating that both clients and the banks collectively recognized and embraced this alternative method.

4.1 COVID-19 disease definition

COVID-19 is a disease caused by the SARS-CoV-2 virus (World Health Organization, 2021). The virus transmits among those who are in close proximity to each other, such as when engaged in conversation.

According to the World Health Organization (2021), the virus can be transmitted through respiratory droplets expelled from an infected individual's mouth or nose during activities such as coughing, sneezing or breathing. Individuals can also contract the virus by rubbing their mouths, eyes, or noses, by previously touching the infected surface (World Health Organization, 2021).

4.2 **Opportunities and threats for the banking sector**

The fear regarding virus transmission by physical contact resulted in a rise in the adoption of contactless payment methods and transfers. The outbreak of COVID-19 compelled banks and financial institutions to accelerate their attempts in implementing digital transformation.

There were no significant changes or additional rules in regulations that would affect the popularity of electronic banking, but mostly clarifications and implementation of existing

decisions (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024). During the period of the pandemic, there was a little increase in requests for outsourcing, particularly for cloud services (Admil Nukić, Assistant director for banking supervision of the Banking Agency of the Federation of Bosnia and Herzegovina, personal communication, March 23, 2024).

Banks prioritized technological improvements aimed at improving user experiences, with a focus on personalization and expanded customer support. Before the pandemic, electronic and mobile banking services lacked robust functionality and user satisfaction, but during the pandemic, banks made these services a priority, actively improving functionalities to meet client needs.

Amidst the pandemic, banks had the chance to create new products and enhance their internet banking facilities to adapt to customers' changing demands. This involves implementing innovative features and capabilities, such as virtual financial advice services, online account creation, and contactless payment choices, with the aim of boosting the entire client experience and setting themselves apart in the market.

The user base of digital banking services witnessed significant daily growth (Bank 2, expert associate at the Department for Applications, Infrastructure and Telecommunications, personal communication, January 11, 2024). Specific clients reached out to the Bank directly via the call center, email, etc., expressing their desire for particular features that were not currently available and the bank attentively considered these requests, attempted to incorporate them into its daily operations, and enhance its services, which has undoubtedly resulted in increased client loyalty and satisfaction (Bank 2, expert associate at the Department for Applications, Infrastructure and Telecommunications, personal communication, January 11, 2024).

The objective of one of the banks in Bosnia and Herzegovina during the COVID-19 pandemic was to use video identification, which would provide flexibility in arranging meetings between the customer and the bank, with the aim of minimizing health risks and reducing the likelihood for infection (Bank 4, expert associate for the development and use of new technologies, personal communication, January 10, 2024).

However, unlike the countries of the European Union and the countries in the region, the legal framework of BiH does not permit this kind of customer identification. Thus, the bank employed a method to establish the identity of clients by written means (Bank 4, expert associate for the development and use of new technologies, personal communication, January 10, 2024).

The impact of online banking on the operational efficiency of banks, particularly in terms of transaction processing and customer service, was significantly improved during the pandemic. Rapid and effective processing of transactions through digital channels has

decreased the time needed for transaction completion and made financial services more accessible.

This also minimized the possibility of error. Business efficiency has been strengthened by the implementation of process automation. Branch employees were relieved of transaction processing duties and were able to dedicate their attention to other tasks during that period.

Regarding cost domains, the most significant savings were observed in operational costs. Specifically, in one of the banks in BiH, there was a 36% reduction in paperwork costs associated with physically processing transactions (Bank 4, expert associate for the development and use of new technologies, personal communication, January 10, 2024).

Additionally, costs related to printing and storing documentation for viewing account statements decreased by 56% (Bank 4, expert associate for the development and use of new technologies, personal communication, January 10, 2024). The bank states, that this reduction was made possible by the application, which allows users to view account statements, transaction amounts and the location of the point-of-sale (POS) device used for the transaction.

Furthermore, banks did not lose income from fees for transactions that clients would otherwise perform at the counter but were only redirected to more accessible channels for clients - online banking (Bank 7, associate for digitization, CRM and contact center, personal communication, January 7, 2024). But, as transactions over the internet increased, security emerged as a major concern, as the increase in internet banking usage resulted in a notable rise in various cyber threats, including phishing, malware, and other forms of internet fraud.

Financial institutions have enforced stronger security protocols to safeguard clients' personal and financial data from cyber-attacks and fraudulent activities. Banks have improved mobile banking applications with features like card limit management, 3DS confirmation of card transactions, PIN code review and transaction notifications.

There was a notable rise in inquiries from the Bank's customers regarding internet banking services, primarily due to their lack of knowledge with digital channels and considering that users' lack of education or knowledge poses a risk to transaction security, banks have implemented ongoing educational initiatives to proactively address this issue (Bank 1, expert associate for strategic risk management, personal communication, January 9, 2024). These initiatives include providing guidance on identifying internet fraud attempts, safeguarding passwords and personal information, recognizing and avoiding suspicious messages or links, utilizing double authentication, and regularly updating software, among other measures. Banks were required to engage proactively with clients, offering supplementary assistance, instruction, and enlightenment regarding the utilization of internet banking, with the aim of maximizing client education. This included coordinating informative seminars, delivering explicit guidance, and offering systematic assistance to enhance customers' security and assurance in utilizing digital banking services.

Consequently, financial institutions have broadened their remote customer support services to support consumers in addressing concerns related to online banking, resolving technical issues, and managing their accounts. Additionally, the requirement for contactless transactions boosted the need for online identity authentication methods. Financial institutions implemented sophisticated authentication techniques, including biometric authentication and digital identification cards, in order to ensure the secure verification of customers' identities during online transactions.

One of the difficulties encountered during the COVID-19 outbreak was the implementation of remote work for bank personnel. While the banks have acknowledged the importance of safeguarding their employees from infections caused by viruses, working from home has presented security challenges in carrying out banking operations.

Remote work often includes obtaining highly confidential financial data and the utilization of systems from locations outside of the safe office setting. Employees are at a higher risk of digital assaults and malware when they use personal devices or connect to insecure networks while working. Remote work can disturb regular operations, including challenges in interaction, organization, and cooperation between colleagues. This has the potential to affect productivity and the effectiveness of services provided by banks.

The outbreak of COVID-19 did not only impact banks but also the Agencies that supervise their work. Given the unusual circumstances, it was crucial to implement security measures that would guarantee the uninterrupted progress of the supervisory process. At the start of March 2020, direct supervision was discontinued due to the announcement of a state crisis caused by an outbreak of the coronavirus in the Federation of Bosnia and Herzegovina (Banking Agency of the Federation of Bosnia and Herzegovina, 2020). This decision was made in compliance with the directives of the Federal Headquarters of Civil Protection, which imposed restrictions on movement and activities.

According to the Banking Agency of the Federation of Bosnia and Herzegovina (2020), supervisors utilized internet communication tools to carry out controls, analyze documents, attend meetings with responsible individuals, and perform other control-related tasks. Under certain circumstances, banks were subject to indirect supervision, taking into account the epidemiological condition and the measures implemented by the

relevant authorities to safeguard public health (Banking Agency of the Federation of Bosnia and Herzegovina, 2020).

4.3 Online banking during the pandemic in Croatia

Due to the COVID-19 pandemic, the Croatian National Bank (2020) advised individuals to utilize existing online banking services and the ATM system to the greatest extent possible in order to reduce the number of people in a confined space. The behavior patterns of users of payment systems are shifting in favor of a consistent rise in both the quantity and monetary worth of non-cash transactions. The primary cause of this may be largely linked to the advancement of internet and mobile banking, as well as the growing number of credit card transactions (Croatian National Bank, 2020).



Figure 2: Open transaction accounts and use of payment services in 2021

Source: Croatian National Bank (2022).

As shown in Figure 2, based on the statistics as of December 31, 2021, the number of individuals who signed up for online banking reached 2,674,340 accounts, representing a 17% rise compared to December 31, 2020 (Croatian National Bank, 2022). Additionally, the Croatian National Bank (2022) states that mobile banking had been contracted for 3,018,558 accounts, showing a 22% increase from December 31, 2020.

The increased use of online and mobile banking channels was not only observed among individuals, but also among companies. Business organizations have entered into agreements for online banking services for a total of 275,174 accounts, which represents a 4.5% rise compared to the number of accounts on December 31, 2020 (Croatian National Bank, 2022).

Additionally, mobile banking services have been provided for 170,233 accounts, reflecting a 16.2% increase from December 31, 2020 (Croatian National Bank, 2022). The increase in the quantity of online banking accounts is indicative of a rising tendency among firms to carry out their financial operations in a digital manner. These considerations, including convenience, accessibility, and the necessity to adjust to evolving consumer tastes, particularly during the COVID-19 epidemic, may be the driving forces behind this.

4.4 Online banking during the pandemic in Serbia

The National Bank of Serbia has made significant efforts to promote digitalization despite the challenges of the COVID-19 pandemic. These efforts have played a crucial role in bringing forward an age of financial accessibility and simplicity for both individuals and enterprises.

The National Bank of Serbia (2021a) has successfully implemented advanced technologies, including electronic and mobile banking applications, as well as QR code scanning at seller points of sale. This has allowed for a smooth shift towards cashless transactions, reducing the dependence on physical currency and minimizing the dangers related to face-to-face transactions during the outbreak of COVID-19.

The implementation of video authentication is highly significant as it has not only accelerated the process of remote contracting but has also placed customers in Serbia at the center of technological development in Europe (National Bank of Serbia, 2021a). This innovative method of verifying identity not only improves security measures but also simplifies administrative processes, allowing individuals to participate in transactions with increased convenience and effectiveness.

In addition, in 2021, there has been an observable increase in the number of people utilizing internet banking services. By the conclusion of the third quarter in 2020, the contracted digital banking service had a total of 3,040,674 users, including individuals and legal businesses (National Bank of Serbia, 2021b). The number of customers utilizing the mobile banking service has experienced significant development, rising from 2,036,765 users in the third quarter of the year 2020 to 2,692,552 users in the third quarter of the year 2020 to 2,692,552 users in the third quarter of the year 2021 (National Bank of Serbia, 2021b).

These data emphasize the increasing dependence on online banking services and demonstrate the National Bank of Serbia's dedication to promoting financial inclusion and technological progress in the country. Serbia's adoption of digitization is set to strengthen its economic durability, provide its citizens with increased financial autonomy, and encourage ongoing innovation and development in the financial sector.

4.5 Online banking during the pandemic in Bosnia and Herzegovina

Similar to the neighboring countries, there was a shift in conditions and the manner in which the people of Bosnia and Herzegovina carry out their economic activities and is one of the effects that have emerged as a result of the pandemic. Čavalić et al. (2020) state that it is essential to digitalize the financial industry, specifically the banking sector, due to the bank-centric nature of the BiH economy. This will provide clients with easier use of banking services during the time of the pandemic.

During the year 2021, online banking services were used by 1,114,863 entities, with 86,627 being legal entities and 1,028,236 being natural persons (Central Bank of Bosnia and Herzegovina, 2021). In comparison, in 2020, there were 956,601 entities, consisting of 76,994 legal entities and 879,607 natural persons (Central Bank of Bosnia and Herzegovina, 2021). There has been a significant and noticeable increase in clients who have engaged in the use of this particular service.





Source: Central Bank of Bosnia and Herzegovina (2022).

Online banking was adopted in our country at a later stage than in neighboring countries, with a notable increase in its usage recorded in 2022. As shown in Figure 3, the usage of online banking services has risen to 1,324,202 customers, of which are 98,704 legal entities and 1,225,498 natural persons (Central Bank of Bosnia and Herzegovina, 2022).

According to the Central Bank of Bosnia and Herzegovina (2020), there is a notable preference for conventional methods of engaging with banking services, such as physically visiting bank facilities. Considering that almost every bank in Bosnia and Herzegovina offers some kind of online banking service, the Central Bank of Bosnia and

Herzegovina (2020) states that approximately only every third person uses some kind of these services.

The data published by the Central Bank of Bosnia and Herzegovina (2020) provides valuable insights on the patterns of debit card usage associated with individuals' checking accounts. By the conclusion of 2019, the number of active debit cards linked to checking accounts stood at around 1.7 million and surprisingly this amount is lower than the total number of active checking accounts, which was 2.1 million during the same period (Central Bank of Bosnia and Herzegovina (2020).

In order to motivate clients to use online banking services, many banks have provided some kind of promotion, such as lower processing fees or, in some cases, no fees and larger limits for contactless payments. In addition to being convenient and fast, this payment method also offers an important measure during the pandemic by reducing the risk of contact and spread of the virus (Central Bank of Bosnia and Herzegovina, 2020).

5 EMPIRICAL RESEARCH

5.1 Methodology

To determine and investigate the objectives of the thesis, the qualitative technique is used to carry out the empirical research that is being conducted. To gather precise information regarding the level of satisfaction and opinions of customers regarding online banking, a questionnaire was developed and distributed via e-mail to the biggest banks in Bosnia and Herzegovina. The questionnaire was distributed from November 2023 to January 2024.

This questionnaire was constructed with the usage of the Google Forms website. It consists of 31 questions, of which the first four questions refer to demographic characteristics of the participants.

The questionnaire includes 15 questions regarding online banking services before the COVID-19 pandemic, and an additional 12 questions specifically addressing the period during the COVID-19 epidemic. In addition to rating scales, it consists of questions with multiple choice answers and questions with open-ended responses.

A total of 172 participants, spanning a wide range of ages and educational backgrounds, were asked to provide their responses. These participants included both males and females.

The questionnaire includes questions that relate to the growth of technology and innovation, the difficulties that the banking system encountered during the COVID-19 pandemic, the level of customer satisfaction with regard to online banking, and the benefits and drawbacks of using online banking during the pandemic. In addition to this,

it includes questions concerning the implementation of various measures that have been established by the government of Bosnia and Herzegovina in order to prevent the virus from spreading further.

Following the completion of the survey, the data that was acquired is analyzed using the content analysis approach. This will result in the development of the policy that is recommended for decision-makers and managers in banks.

5.2 Results

The research was conducted with the participation of 172 individuals who completed the survey. The resulting data is given below. The research's findings are evaluated using descriptive and detailed graphical analysis to provide easier visualization of the response distribution within the sample.

Out of the 172 responders, 99 are women, accounting for 57.6 percent, while the remaining 73 are men, making up 42.4 percent. With 172 participants, the survey likely provides a substantial dataset for analysis.

When discussing the age demographics of the participants, among the 172 participants, 73 individuals (42.4 percent) were found to be between the ages of 25 and 31. The age group between 32 and 38 years old was the next most represented, with 57 respondents falling within this range (33.1 percent).

Individuals between the ages of 39 and 45 gave twenty-two responses, which accounts for 12.8% of the total. It is estimated that twelve people, or seven percent, are in the age range of 46 to 52 years old. The age groups that responded to this survey the least were those between the ages of 18 and 24 and 53 and 59. A total of four respondents represented each age category.

A large proportion of respondents, which accounts for 91.9 percent, has an employment. At the same time 2.9 percent of the respondents are students, 5.2 percent of the respondents are unemployed. None of the individuals who took part in this research were retired at the time.

A sizeable proportion of the individuals who were a part of the sample that was analyzed have either a bachelor's degree or a master's degree, with each category accounting for 33.1% of the total chart. 29.7 percent of those who participated in the survey had completed their secondary education. On the other hand, only 1.8 percent of respondents have earned a doctoral degree, while the lowest percentage of respondents (2.3 percent) have completed elementary school.

Figure 4: Percentage of respondents using internet banking



Source: Own work.

Figure 4 represents the percentage of respondents using internet banking services. According to the findings of the survey, there is a noticeable pattern in the preferences of banking services, with 73.3% of respondents opting for internet banking services, which is shown in Figure 8 above. There are 26.7 percent of individuals who have stated that they do not use internet banking for their financial transactions.





Source: Own work.

Figure 5 represents the percentage of respondents using mobile banking services. Out of the total number of respondents, 156 individuals acknowledged using mobile banking, accounting for 90.7 percent of the chart. The chart indicates that only 16 respondents of the total number of respondents, accounting for 9.3 percent, did not utilize mobile banking services.
Figure 6: Respondents' preference using electronic payment methods over traditional cash transactions



Source: Own work.

In contrast to conventional currency transactions, the survey results highlight a clear preference for online banking, as 83.7% of participants expressed a preference for digital financial services, as shown in Figure 6. On the contrary, a small proportion of respondents (16.3%) preferred the conventional method of currency transactions.







Sources from which the respondents learned about the use of internet banking is shown in Figure 7 above. According to the survey results, 60.5% of the participants obtained information regarding internet banking from a bank employee. A proportion of the respondents (22.1%) reported hearing about internet banking from family and friends.

On the other hand, 14% of the respondents indicated that they obtained information about internet banking through television or other media sources. Respondents obtained the least amount of information regarding internet banking from regulatory agencies (1.7%), the government (1.2%) and the bank's advertisements (0.5%).



Figure 8: Reasons for using mobile or internet banking

Source: Own work.

Out of the total of 172 participants, 156 participants provided reasons for using mobile or internet banking, as shown in Figure 8. 92.9% of the participants state that the primary motive for utilizing mobile or online banking is the effective use of time. 81.4% of the respondents indicated the ability to access the account 24 hours a day as their reason.

A majority of 71.8% of the respondents express that they find it beneficial to avoid visiting a physical branch office and 59.6% of the respondents claim that paying bills is more convenient using mobile and internet banking. 59% of the participants assert that the primary motive for utilizing internet banking is the faster processing of transactions.

49.4% of respondents find it more convenient to transfer funds using online banking, while 41% believe online banking offers reduced processing fees. Additionally, 12.8% consider online banking more secure, and 19.2% utilize it to avoid encountering rudeness from personnel. Solely one participant (0.6%) does not utilize mobile and online banking.

Reasons for not using mobile/internet banking	The number of participants who
	provided answers
Lack of information about the application and use	2
Fear of fraud and theft	8
Software technical issues	1
Inability to access the internet	4
Complicated to use	4
It is better with the assistance of the staff	6
Inability to access the internet Complicated to use It is better with the assistance of the staff	4 4 6

Table 2: Reasons for not using mobile/internet banking

Source: Own work.

In Table 2, the main reasons for not using mobile and internet banking services are presented. A total of 25 participants responded to their rationale for avoiding utilizing mobile or internet banking. The primary obstacle to utilizing mobile or internet banking is the fear of fraudulent activities and theft, as indicated by eight answers. Six participants reported the convenience of the staff, whereas four participants reported complications in use and four reported difficulties in accessing the internet. Two participants expressed a lack of knowledge and trust regarding the application and its use, however just one participant encountered software technology difficulties.





Source: Own work.

In Figure 9, respondents' most significant advantages in the use of online banking services are highlighted. Time savings were highlighted by 59% of the respondents as the most significant benefit of online banking. The following benefit that was emphasized was accessibility, representing 19.9% of the overall sum, whereas 13.5% of the respondents mentioned quicker transaction processing.

12.9% of the respondents listed ease of use as the principal advantage that impacted their choice to adopt online banking. A minority of the respondents (4.7%) identified reduced processing expenses as the principal advantage. Safety was cited as an essential factor by 4.1% of the respondents, followed by more straightforward transaction control/balance checks (2.3%) and mobility (1.2%).



Figure 10: Most important disadvantages of online banking

Source: Own work.

As can be seen in Figure 10, the results of the survey indicate that 36.6 percent of the respondents, which is equivalent to 63 individuals, think that there are no drawbacks associated with using internet banking. However, 34% percent of respondents, or 58

individuals, expressed mistrust over the services offered by banks through the internet and a fear of being a victim of fraud, which may delay the implementation of online banking in the region. 12.1% of the respondents mentioned other disadvantages, such as:

- faster processing of transactions when visiting a branch office;
- paying monthly fees for online banking services;
- inability to process an online payment in the afternoon;
- inability to issue a payment confirmation;
- no employee assistance;
- too much documentation is required to apply for online banking services.

As reported by 8.1% (or 16 individuals) of the participants, network and application errors represent the most significant drawbacks of online banking. 2.9% of the participants identified a lack of knowledge and complexity as the primary drawbacks of mobile banking services. In the survey, 1.7% of the respondents showed concern about the restricted number of money transfers.

Another 1.7% of the respondents expressed worry about expenditure, while another 1.7% mentioned difficulties related to simple errors that may occur when using online banking services. 1.2% of the respondents mentioned difficulty applying for a loan while using online banking services.





Source: Own work.

As shown in Figure 11, among 172 participants, 163 (or 94.8 percent) who utilized mobile or online banking never became vulnerable to fraud or theft. Solely nine participants (5.2%) claimed experiences of fraud or theft.

Figure 12: Participants' awareness of COVID-19 pandemic fraud prevention guidelines for contactless and internet transactions



Source: Own work.

Among the 172 responses, 36.6% confess their lack of knowledge regarding the regulations or suggestions for preventing fraud in contactless and online transactions during the COVID-19 pandemic, as represented in Figure 12. 33.7% of the respondents acknowledged being adequately educated on the rules and recommendations, whereas 29.7% admitted that they were not obtaining proper information regarding the rules and recommendations.





Source: Own work.

Figure 13 illustrates the usage of online banking services by survey respondents before and throughout the COVID-19 epidemic. According to Figure 17, before the COVID-19 outbreak, an important proportion of respondents, amounting to 75%, stated that they made use of online banking services.

This suggests that online banking was already a dominant and broadly embraced approach of financial management among the evaluated population before the epidemic. Conversely, a smaller portion, 25%, did not engage in online banking services before this event.



Figure 14: Participants who found visiting the bank risky

Based on the data presented in Figure 14, the opinions of the survey participants regarding the potential risk of contracting COVID-19 while visiting a bank are noticeably split. Of all the respondents, 85 individuals (equivalent to 49.4%) expressed that they did not perceive any danger of infection for themselves or their loved ones when conducting business at a bank. Conversely, 87 respondents (50.6%) expressed concern that visiting a bank could pose a health risk to themselves and their families.





Source: Own work.

Source: Own work.

Regarding online banking usage during the COVID-19 pandemic, as represented in Figure 15, 82% of the respondents (141) reported using online banking services. 31 individuals (18%) did not use online financial services during the pandemic.



Figure 16: Reasons for using online banking during the COVID-19 pandemic

Source: Own work.

When examining the factors behind the utilization of online banking services during the pandemic, as shown in Figure 16, a majority of 63.6% of the participants indicated that the main motives were the implementation of lockdown measures and the need for isolation. These policies-imposed restrictions on physical mobility and reduced the availability of traditional bank branches, leading individuals to rely on internet platforms for their banking requirements.

Notably, 43.6% of respondents in the poll indicated that they utilized mobile banking without concerns regarding the influence of COVID-19. The members of this group might have been using online banking services prior to the pandemic, suggesting a pre-existing tendency towards online banking services regardless of external circumstances.

Of the remaining respondents, 34.3% (48 individuals) cited reduced banking hours as the main reason for switching to online banking during the pandemic, while 33.6% (47 individuals) mentioned government-imposed limits as the driving factor. For 29.3% of participants, the fear of contracting the virus was the primary motivator, and 22.1% chose internet banking due to the inability to make cash payments.





Source: Own work.

Figure 17 illustrates the banking options offered by banks that attracted most clients to use online banking services during COVID-19. Amidst the COVID-19 pandemic, the most compelling banking alternatives that drove customers to use online banking services were electronic bill payments (80.3%), 24/7 balance check (68.4%), simple fund transfers (59.2%), financial report summaries (29.6%), financial analysis (20.4%), transaction cancellation (13.2%) and loan applications (2.6%).

Figure 18: Online banking users who obtained bank incentives during the pandemic



Source: Own work.

As shown in Figure 18, 160 survey participants (93 percent) reported not receiving promotional offers or incentives from their banks to utilize online banking services amid

the COVID-19 pandemic. Only 12 respondents (seven percent) confirmed gaining bank incentives and promotions. Among the 12 participants, seven of them specified the banks' incentives, which were lower processing costs (five participants), online banking services through the free smartphone application Viber (one participant), and fee exemption for 12 months (one participant).



Figure 19: Participants who will persist in using internet banking services postpandemic

As shown in Figure 19, based on their experience with online banking services during the pandemic, most 149 participants (86.6%) intend to maintain their reliance on such platforms. A minority of the respondents (8.7% or 15 individuals) expressed uncertainty regarding their continued usage of these services. Conversely, eight participants firmly stated that they did not intend to continue utilizing these services.



Figure 20: Participants' recommendations regarding the improvement of online banking

Source: Own work.

Source: Own work.

Figure 20 illustrates the recommendations regarding the improvement of online banking services. Among the 172 respondents in total, 89 individuals proposed improving security measures (51.7%). 81 participants suggested incorporating more personalized services (47.1%), and 66 proposed enhancing the user experience (38.4%). A total of 57 respondents suggested improving transaction processing speed (33.1). Conversely, only one participant advocated for reduced fees or prices (0.6%), and another suggested the implementation of Apple Pay (0.6%).





Source: Own work.

As shown in Figure 25, 168 out of 172 respondents rated the difficulty associated with the setup and use of online banking services on a scale from 1 to 5, with 1 representing "very difficult" and 5 representing "very easy". 75 respondents (44.6%) reported no challenges in establishing and utilizing online banking services (level 5). 27.4% of the total respondents (46 individuals) expressed that the setup and utilization were extremely straightforward (level 4). 31 individuals, or 18.5% of the participants, rated it as neither simple nor difficult (level 3). The remaining 7.7% (13 individuals) found the process to be difficult (level 2), while only three participants rated it as very difficult (level 1).





Source: Own work.

The survey data presented in Figure 26 offers useful information regarding the amount of trust and security that respondents have regarding online banking services. 168 of the 172 respondents rated their trust and security level in online banking applications. The scale ran from 1 (indicating "complete lack of trust") to 5 (indicating "complete trust").

A total of 43 participants (25.6%) expressed entire confidence in the security measures implemented in online banking applications. Additionally, 59 participants (35.1%) indicated that they trusted the security of online banking applications while using these services.

54 participants claimed that they neither trust nor distrust the usage of online banking services (32.1%). Solely 9 participants (5.4%) claimed they had a slight lack of trust in the security measures implemented in online banking applications. Three respondents (1.8%) were very insecure regarding their level of trust and security in online banking applications.



Figure 23: Indication of the impact of COVID-19 on the increased use of online banking services

Source: Own work.

The indication of the impact of COVID-19 on the increased use of online banking services is illustrated in Figure 27. On a scale from 1 to 5, 167 out of 172 respondents indicated the impact of COVID-19 on the increased use of online banking services, with 1 representing "no impact" and 5 representing "huge impact". Most respondents (29.3% or 49 respondents) claimed that COVID-19 did not impact the increased usage of online banking services. Taking this into consideration, it appears that the respondents' use of internet banking services may have been motivated by considerations other than the

epidemic. The same number of respondents claimed to be moderately impacted (29.3% or 49 respondents) by the effect of COVID-19 on the increased usage of online banking services. 16 respondents or 9.6% claimed to be slightly influenced by the COVID-19 pandemic to utilize these online banking services. 26 respondents (15.6%) indicated that the COVID-19 pandemic significantly impacted the increased use of these services. 27 respondents (16.2%) claimed to be highly impacted by the COVID-19 pandemic.



Figure 24: Level of satisfaction with the usage of online banking services during COVID-19

Of 172 respondents, 161 indicated their satisfaction with using online banking services during COVID-19. 57 of them (35.4%) claimed to be very satisfied with using online banking services during COVID-19, while 47 (29.2%) claimed to be satisfied. 49 participants (30.4%) claimed to be neither satisfied nor dissatisfied. A mere five participants expressed dissatisfaction, with three individuals expressing extreme dissatisfaction regarding the utilization of these services.

Figure 25: Indication of the improvement of access to banking services during COVID-19 compared to traditional methods



Source: Own work.

Source: Own work.

A considerable proportion of participants, 24.8% (40 individuals) assigned the greatest rating to the improvement. This finding indicates that a significant proportion of respondents hold the firm conviction that online banking has significantly improved their ability to access banking services throughout the COVID-19 pandemic compared to conventional approaches.

An additional considerable share of 23.6% (38 individuals) assigned the improvement the second-highest rating. This finding suggests that a considerable proportion of the participants experience a noteworthy enhancement, but marginally less noticeable compared to those assigned a level 5 rating.

Most participants, 40.4% of the total (65 individuals), admitted no change in the improvement. This indicates that a considerable proportion of respondents observed a moderate enhancement in the availability of banking services via online platforms throughout the COVID-19 pandemic.

A minority, 4.3% of the total of respondents (seven individuals), indicated that online banking has not substantially enhanced their accessibility in comparison to conventional methods during the COVID-19 pandemic, while 11 (6.8%) individuals indicated that online banking had not improved their ability to access banking services throughout the COVID-19 pandemic in comparison to conventional approaches.



Figure 26: The level of assistance that bank staff provided with banking operations during COVID-19

Source: Own work.

31 respondents (18.7%) evaluated the level of service at the highest level. This indicates that many participants received exceptional help from bank employees throughout the COVID-19 pandemic, showing a high level of satisfaction. Another significant group, comprising 40 individuals (24.1%), evaluated the degree of help as the second-highest, indicating that the support offered by bank employees during COVID-19 was commendable, but it may not have been exceptional.

51 respondents (30.7%) rated the help they received as moderate. A minority of responses, specifically 23 (13.9%) and 21 (12.7%) individuals, ranked the service at the lowest levels, indicating that bank staff's level of assistance with banking operations during COVID-19 was very disappointing.



11.50%

3

2-poortiv assisted

15,00%

10,00%

5,00%

0,00%

1-no assistance at all

7.90%

Figure 27: Level of assistance provided by bank employees while using online banking services

Source: Own work.

A-Bood assistance

5-Breat assistance

1- moderate assistance

Out of 172 respondents, 165 individuals indicated their level of satisfaction with the assistance provided by bank employees while using online banking services. 33 respondents (20%) received exceptional support from bank staff when utilizing online banking services, demonstrating high satisfaction. 51 individuals (30.9%) believed that the support offered by bank employees while utilizing online banking was great, though not necessarily outstanding. 49 respondents (29.7%) claimed to receive a moderate level of assistance while using online banking services, while 19 individuals (11.5%) were unsatisfied with the level of assistance provided by bank employees. A minority of respondents (13 individuals) claimed to be very unsatisfied with the assistance of the bank employees.

5.3 Discussion and Recommendations

The evident affinity for online banking signifies a substantial transformation in consumer behaviour, highlighting the growing dependence on digital platforms to conduct financial transactions. The increasing support for online banking indicates a growing recognition of its benefits, including ease of use, effectiveness, and availability. The ongoing progress of technology in the financial sector emphasizes the revolutionary consequences that digital banking has on conventional methods of carrying out financial transactions.

In order to provide a concise summary of the findings, the data reveals that 83.7% of the individuals who were questioned have a strong preference for using online banking services as opposed to the traditional ones. Some of the most important factors that play a role in this decision are the convenience, the ease of access, and the extensive range of financial services that are available.

Based on the survey findings, 156 individuals, accounting for 90.7% of the total respondents, admitted to utilizing mobile banking services. The significant acceptance rate indicates that mobile banking has become an increasingly embraced and favoured approach for carrying out financial transactions among the assessed population.

Mobile banking provides users with the benefit of monitoring their financial accounts and managing transactions at any time and from any location, by utilizing their cell phones or other portable electronics. This simplicity is attractive to persons who are frequently mobile or like having the option of remotely handling their funds.

Safety, personalized services, and customer experience enhancements were the primary focus areas for most respondents, suggesting a notable level of interest in these features. A considerable portion of the sample also stated the necessity for quicker transaction processing, indicating its priority, as well as offering more incentives in order to motivate clients to switch their banking operations online.

Apple Pay's reference indicates a potential interest in integrating different payment methods. Main reasons for utilizing online banking services highlighted by the respondents are time saving, account access 24/7, avoiding physical branches and electronical bill payments. The significant rate of acceptance highlights the significance of mobile banking as a fundamental element of today's banking services and indicates a continuing rise in the utilization of mobile banking in the next years.

The increased level of threats throughout the pandemic primarily applies to the safety of online transactions and their execution, considering that this method of payment was predominant throughout the quarantine period and, in general, during the epidemic. This survey also investigated users' impression of the security of electronic payment methods during the pandemic and has verified that a large proportion of participants believed that transactions conducted during this period were adequately protected.

Although internet banking has been widely adopted, according to the results of the survey 73.3% of the participants are using internet banking services, there is still a certain percentage of people that does not use it. Lack of information regarding the use of online banking applications, in addition to lack of familiarity with these applications, is perhaps the most typical reason for not using them.

According to the data, a total of 16 participants, or 9.3% of the sample, did not use mobile banking services. The factors contributing to lack of use can differ and involve worries regarding security, a preference for conventional banking methods, restricted availability of smartphones or mobile devices, or an absence of knowledge with the use of mobile technology.

The data highlights the significance of educational and awareness-raising initiatives aimed at informing the public about methods for preventing fraud during the COVID-19 pandemic. Inadequate knowledge and a lack of understanding might heighten exposure to fraudulent behaviours, underscoring the importance of preventive steps to distribute precise information and optimal strategies. Workshops, presentations, and free seminars could be organized within the bank as a potential solution to the problem of preventing errors in the use of online banking services as well as cyber-attacks. Users would thus have a higher level of trust when utilizing them, which would encourage them to perform their financial transactions online.

Considering the results of the survey, the results provide insight on the numerous ways in which the COVID-19 epidemic has influenced the rise in the number of people who use online banking services among the respondents. 75% of the respondents reported using online banking services before the outbreak of the pandemic, whereas 25% started utilizing these services during and after the outbreak of the pandemic.

Although almost half of the respondents didn't express any fear regarding the risk of being infected with the virus while visiting the bank, it can be concluded that the users did not increase the use of online banking services due to health protection, but because of government restrictions, lockdown and isolation, reduced working hours of the banks, limited number of users in the branch, etc.

Many suffered severe interruptions to their banking routines, which required them to rely more heavily on digital channels for doing financial transactions. While some people experienced very minor adjustments, others encountered major challenges. The findings of this thesis highlight the role that the pandemic plays as an incentive for speeding the use of online banking services and causing changes in customer behavior within the banking sector.

6 CONCLUSION

In order to properly define the term online banking, the development of online banking and to understand what digital technologies are used in online banking, a literature review is done. The literature is obtained from different sources of national and global records, including professional writings, business journals, existing articles, publications, and scientific studies related to online money transfers, which serves as the theoretical foundation for writing this master's thesis. The literature review also provides data on the adoption of the online banking system in neighbouring countries of Bosnia and Herzegovina, which is used to compare how online banking is developing in Bosnia and Herzegovina compared to Croatia and Serbia. Anonymous interviews were conducted with eight major banks in Bosnia and Herzegovina, as well as with Admil Nukić, the assistant director for banking supervision at the Banking Agency of the Federation of Bosnia and Herzegovina.

The purpose of these interviews was to examine the opportunities and threats for the banking sector in the country, and to determine whether the emergence of COVID-19 has affected the adoption of online banking services. The insights and findings from this master's thesis can be valuable for broader studies in the field of online banking and digital finance. The master's thesis can be useful for informing the financial institutions about the critical areas that need attention to foster the growth of online banking and investigate the shift in consumer behavior towards digital banking platforms, especially in the wake of global events like the COVID-19 pandemic, and how these changes can guide future banking strategies.

The emergence of COVID-19 has significantly impacted the mindset of individuals and customers, to the extent that it is now nearly unimaginable for a customer to establish a bank account without applying for mobile or electronic banking services. The clear preference for online banking during the pandemic indicates a significant shift in consumer behavior, emphasizing the growing reliance on digital platforms for financial operations. The rising acceptance of online banking signifies an expanding acknowledgment of its numerous advantages, such as user-friendliness, efficiency, and accessibility. The continuous advancement of technology in the financial industry highlights the transformative impact that digital banking has on traditional approaches of conducting financial transactions. Prior to the COVID-19 outbreak, consumers may have been oblivious to how much online banking simplifies their financial transactions. However, once they became familiar to utilizing digital banking for payments, they recognized the significant convenience it offers, particularly in terms of time saved compared to physically visiting a bank.

The digital environment facilitates faster transaction processing and provides consumers with more financial autonomy. Online banking facilitates the customization of services, allowing banks to gain a deeper understanding of consumers' demands and adapt their service offerings accordingly. These advantages enable customers to accelerate and optimize their financial management, so generating additional value for both the users themselves and the bank that offers these services.

It is essential to consistently gather feedback from customers regarding their online banking experiences and utilize this data to implement continuous upgrades. Displaying a dedication to adapting according to customer requirements helps create trust and loyalty. To encourage the use of online banking services banks could develop focused advertising strategies. They could emphasize the advantages of online banking, such as its simplicity, effectiveness, and security, through several social media platforms, email marketing, and promotional activities conducted in physical bank branches. Providing different incentives such as reduced fees, cashback incentives, or additional benefits for clients who enroll in and regularly utilize online banking services, could encourage the acceptance of these services and promote continuous usage.

One of major concerns regarding online banking services is security. Although banks independently engage in initiatives that raise awareness and educate clients about potential risks associated with cyber services, the user must put in more effort and pay greater attention to that particular aspect. There is uncertainty regarding whether banks that engage in a more extensive marketing effort may successfully increase awareness among users. This task is somewhat challenging, as failures typically follow straightforward patterns that are not limited to online services alone. Social engineering, often known as fraud, is an everlasting issue that persists regardless of technological advancements. In order to minimize those risks banks should ensure that online banking solutions are designed to be simple to use and instinctively understood by users. Simplifying the user interface and offering clear, user-friendly instructions can optimize the user experience and motivate a greater number of clients to transition to online banking. Managers should also direct resources into implementing extensive consumer education programs with the aim of enhancing knowledge regarding the safety protocols associated with online banking. In light of the security concerns, it is imperative for banks to create comprehensive educational programs to educate clients on how to protect their online transactions.

One notable drawback of online banking is the difficulties that arise from the ongoing requirement to adapt to technical advancements. This might lead to the necessity for frequent software and infrastructure updates, which can be challenging. Moreover, reliance on technology might result in difficulties in obtaining services in the case of technical issues or disruptions in the internet connection, so potentially compromising the user experience. Customers who prefer face-to-face engagement may find it challenging to not have human touch and support while addressing banking inquiries or issues. One major drawback that directly impacts internet banking is the insufficient legal rules that limit the complete growth of online banking. This includes the absence of laws regarding digital signature, video identification, and other related areas. The adoption of video

authentication is highly important as it has expedited the process of distant contracting for clients in Serbia. Unlike Serbia, Bosnia and Herzegovina did not permit the use of video identification during the COVID-19 pandemic and despite the adoption of the law in 2006, still does not permit consumer identification of this nature. This novel approach to identity verification enhanced security protocols during the pandemic, streamlined administrative procedures, and enabled individuals to conduct transactions with enhanced ease and efficacy.

This would have allowed for more flexibility in scheduling meetings between clients and banks, with the goal of limiting health hazards and reducing the likelihood of infection. These limitations might pose difficulties for banks in terms of adjusting to developments and maintaining a high level of customer satisfaction. Market liberalization significantly influences the future growth of internet banking by defining decisions about its benefits and disadvantages. Market liberalization is a crucial driver for fostering competition, driving innovation, and facilitating the broader reach of banking services.

Liberalization motivates banks to enhance their internet banking services in order to attract and keep consumers in a highly competitive environment. This can lead to improvements in technology infrastructure, enhanced security measures, more accessibility to individualized services, and so on. Nevertheless, market liberalization can present difficulties, including the requirement for swift adjustment to technical advancements and the regulatory structure. Financial institutions must be prepared to adapt their operations in order to effectively respond to the changes and market needs that could result from liberalization. Therefore, when considering future strategies for online banking, it is crucial to consider the influence of market liberalization on the advancement of technological innovations, compliance with regulatory changes, and the imperative of continually improving services in order to respond to the increasing demands of users. Finding a balance between the principles of the free market and the necessity for sufficient regulation will be crucial in ensuring stability, competitiveness, and security in the field of internet banking. The extent to which the banking sector will become entirely digital in the future is yet to be determined in the upcoming years (Tadić-Živković, 2021).

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APPENDICES

Appendix 1: Povzetek (Summary in Slovene language)

Magistrsko delo obravnava vse večjo priljubljenost spletnega bančništva v času izbruha COVID-19 in njegov vpliv na vedenje potrošnikov. Magistrsko delo vključuje pregled literature in empirično raziskavo. Opravljeni so bili anonimni intervjuji z osmimi bankami v Bosni in Hercegovini, da bi ocenili izvajanje spletnega bančništva v času COVID-19 ter priložnosti in nevarnosti za bančni sektor.

O problematiki, s katero se srečujejo bančni nadzorniki, sem se pogovarjala z Admilom Nukićem, pomočnikom direktorja za bančni nadzor Agencije za bančništvo Bosne in Hercegovine. Za zbiranje natančnih informacij o stopnji zadovoljstva in mnenj strank o spletnem bančništvu sem izdelala vprašalnik, ki so ga preko spleta izpolnile stranke največjih bank v Bosni in Hercegovini.

Glede na rezultate ankete in intervjujev obstaja veliko zanimanje za internetno bančništvo, zaradi priročnosti in enostavnosti dostopa predvsem za mobilno bančništvo. Izboljšanje varnosti in uporabniške izkušnje sta opredeljeni kot glavni prednostni nalogi prihodnjega razvoja na tem področju. Pandemija COVID-19 je pospešila uvedbo internetnega bančništva, saj so se posamezniki zaradi omejitev in zdravstvenih bojazni vse bolj zanašali na digitalne platforme.

Spletno bančništvo omogoča udoben in neomejen dostop do bančnih storitev s katere koli lokacije, kar je postalo bolj priljubljeno zaradi dejavnikov, kot so vladne omejitve in skrajšan delovni čas fizičnih bank med pandemijo. Kljub temu obstajajo posamezniki, ki zaradi pomanjkanja znanja in poznavanja oklevajo z njegovo uporabo. Stalni so pomisleki glede varnosti, zlasti v zvezi s socialnim inženiringom. Izvajanje delavnic in seminarjev bi lahko učinkovito rešilo ta problem.

Izzivi, s katerimi se soočajo banke, so varnost, tehnične prilagoditve in regulatorne omejitve. Močno zanašanje na tehnologijo lahko povzroči slabšo uporabniško izkušnjo, ko pride do tehnoloških težav. Pomanjkanje predpisov za digitalno podpisovanje in video identifikacijo predstavlja zakonske ovire, ki ovirajo popolno uresničitev zmožnosti internetnega bančništva.

Video avtentikacija, ki je bila implementirana v Srbiji, ne pa tudi v Bosni in Hercegovini, je olajšala in poenostavila postopke v času pandemije. Proces liberalizacije trga krepi konkurenco, spodbuja inovativnost in širi dostopnost bančnih storitev, kar poudarja potrebo po nenehnem izboljševanju metod spletnega bančništva. Vendar pa je nujno ohraniti občutljivo ravnovesje med ideali prostega trga in izvajanjem predpisov za zagotavljanje stabilnosti in varnosti.

Appendix 2: Bank customer's survey questions

- 1. Please select your gender:
- a. Male;
- b. Female;
- 2. Please select your age:
- a. 18-24;
- b. 25-31;
- c. 32-38;
- d. 38-44;
- e. 45+.

3. What is the status of your present employment?

- a. Student;
- b. Employed;
- c. Unemployed;
- d. Retired.
- 4. What is your education status?
- a. Elementary school education;
- b. High school education;
- c. Bachelor's degree;
- d. Master's degree;
- e. Doctor's degree.
- 5. In which bank do you have an active transaction account?
- a. UniCredit Bank d.d. Mostar;
- b. Raiffeisen bank d.d. Sarajevo;
- c. ASA Banka d.d. Sarajevo;
- d. Intesa Sanpaolo Banka d.d. BiH;
- e. Sparkasse Bank d.d. BiH;
- f. NLB banka d.d. Sarajevo;
- g. Bosna Bank International d.d. Sarajevo;
- h. Ziraatbank BH d.d. Sarajevo;
- i. Union banka d.d. Sarajevo;

j. A	ddiko Bank	k d.d. Sarajev	/0;
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- k. ProCredit Bank d.d. Sarajevo;
- 1. Privredna banka Sarajevo d.d. Sarajevo;
- m. Komercijalno-investiciona banka d.d. Velika Kladuša;
- n. Razvojna banka FBiH Sarajevo.
- 6. Are you using internet banking?
- a. Yes;
- b. No;
- c. The bank doesn't provide this service.
- 7. Are you using mobile banking?
- a. Yes;
- b. No;
- c. The bank doesn't provide this service.
- 8. Do you prefer using electronic payment methods over traditional cash transactions?
- a. Yes;
- b. No;
- c. I use both equally.
- 9. How did you discover that you were able to use online banking?
- a. Television and other media;
- b. Bank employee;
- c. Family and friends;
- d. Regulatory agencies;
- e. Government;
- f. Other: _____.
- 10. If you answered "Yes" to the question no. 7 or question no. 8, what are the reasons for using mobile/internet banking? It is possible to mark multiple questions.

- a. Lower processing fees;
- b. Access to the account 24/7;
- c. No need to visit a branch office;
- d. Faster processing of the transaction;
- e. Time-saving;
- f. Simple transfer of funds;
- g. Easier bill payment;
- h. Security reasons;
- i. Avoiding rudeness from employees in the bank;
- j. Other: _____.
- 11. If you answered "No" to the question no. 7 or question no. 8, what are the reasons for not using mobile/internet banking? It is possible to mark multiple questions.
- a. Lack of information about the application and use;
- b. Fear of fraud and theft;
- c. Software technical issues;
- d. Inability to access the internet;
- e. Complicated to use;
- f. It is better with the assistance of the staff;
- g. Other: _____.
- 12. In your opinion, what is the most important advantage of online banking?
- 13. In your opinion, what is the most important disadvantage of online banking?
- 14. Have you been a victim of theft or fraud while using mobile/internet banking?
- a. Yes
- b. No
- 15. If you answered "Yes" to the previous question, did the bank offer you a solution for the above?
- a. No, the money was lost;
- b. Yes, the bank has refunded the money to my account;
- c. I'm still waiting for feedback from the bank.
- d. Other: _____

- 16. Were you informed of the rules or recommendations regarding the prevention of fraud in the context of contactless and online transactions during the COVID-19 pandemic?
- a. Yes
- b. I was poorly informed
- c. No

17. Did you use online banking before the COVID-19 pandemic?

- a. Yes
- b. No
- 18. Did the practice of visiting the bank present a potential risk to you and your family due to the presence of the COVID-19 pandemic?
- a. Yes
- b. No.
- 19. Did you use online banking during the COVID-19 pandemic?
- a. Yes
- b. No
- 20. If you answered "Yes" to the previous question, what motivated you to use online banking during the COVID-19 pandemic? It is possible to mark multiple questions.
- a. Fear of being infected with the virus;
- b. Lockdown and isolation;
- c. Government restrictions;
- d. Inability to pay in cash;
- e. Reduced working hours of banks;
- f. I was not afraid of the coronavirus; I have used mobile banking before;
- g. Other: _____
- 21. Which online banking options offered by banks attracted you the most to use online banking services during Covid-19?
- a. Checking the balance on the account 24/7;

- b. Electronic bill payments;
- c. Summaries of financial reports;
- d. Simple transfer of funds;
- e. Transaction cancellation;
- f. Analysis of finances;
- g. Loan application;
- h. Other: _____.
- 22. Did the bank offer any special incentives or promotions to encourage you to use online banking during the pandemic?
- a. Yes
- b. No
- c. If yes, please specify the incentives: _____.
- 23. Considering your experience with online banking during the pandemic, do you plan to continue using these services in the future?
- a. Yes
- b. No
- 24. What improvements or changes would you recommend regarding online banking services?
- a. Improved security measures;
- b. Improved user experience;
- c. More personalized services;
- d. Faster transaction processing;
- e. Other (please specify): _____.
- 25. On a scale of 1 to 5, please indicate the level of difficulty associated with the setup and use of online banking:

1-very difficult; 2-difficult, 3-moderate, 4-easy, 5-very easy

26. On a scale from 1 to 5, please indicate the level of trust and security in online banking applications:

1-indicating a complete lack of trust; 2- slight lack of trust; 3- no trust or distrust in applications; 4- average trust in the application; 5-complete trust in the application 27. On a scale from 1 to 5, do you think the COVID-19 pandemic has affected your increased use of online banking:

1-no, it had no impact; 2- it had a slight impact; 3- it had a moderate impact, 4-it had a significant impact, 5- it had a huge impact

28. On a scale from 1 to 5, please indicate the level of satisfaction in the usage of online banking services during Covid-19:

1-very disappointed, 2- disappointed, 3- indifferent, 4- satisfied, 5-very satisfied

29. On a scale from 1 to 5, how has online banking during Covid-19 improved your access to banking services compared to traditional methods?

1-Significantly Decreased; 2-Decreased; 3-No Change; 4-Improved; 5-Significantly Improved

30. On a scale from 1 to 5, please rate the amount of help that bank staff provided with banking operations during COVID-19:

1-no assistance at all; 2-poorly assisted; 3-moderate assistance; 4-good assistance; 5-great assistance

31. Please rate the level of assistance provided by bank employees while using online banking services on a scale of 1 to 5:

1-no assistance at all; 2-poorly assisted; 3-moderate assistance; 4-good assistance; 5-great assistance

Appendix 3: Questions for the interview of banks

- 1. Were there any particular technological advancements or special features that were prioritized in order to improve the online banking experience during the pandemic?
- 2. Were there any significant improvements noticed in client satisfaction and loyalty?
- 3. What was the effect of online banking on the operational efficiency of banks, namely in relation to transaction processing and customer service?
- 4. Did the use of online banking lead to financial savings for the bank, and if so, in which specific domains?
- 5. What were the challenges and obstacles in relation to the security of online banking transactions and the risk of fraud?
- 6. Did the bank encounter any obstacles related to its dependence on technology for its banking operations, and if so, how were these obstacles solved?
- 7. What were the trends in clients using online banking services during the pandemic, and how did these figures compare to what they were before the outbreak of the pandemic?
- 8. Did the transition to online banking help keep customers? If so, were there any specific methods used to do this?
- 9. Were there any significant difficulties encountered in addressing consumer complaints related to online banking services, and if so, how were these difficulties effectively addressed and resolved?
- 10. What conclusions were made about the advantages and disadvantages of online banking? How could these experiences be used in establishing future plans?
Appendix 4: Questions for the interview of the assistant director of the Banking Agency of Bosnia and Herzegovina

- How did the laws and regulations in Bosnia modify to accommodate the increasing popularity of online banking during the pandemic? Were there particular modifications or additions to the rules that were made in order to allow the transition to digital services?
- 2. How did the regulatory agency monitor and enforce compliance with online banking regulations during the pandemic?
- 3. What were the main security concerns or obstacles encountered by regulatory bodies in their supervision of online banking activities during the pandemic?
- 4. What strategies have been taken to reduce and control cases of fraud associated with online banking, particularly in light of the higher risk identified during the pandemic?
- 5. How does the regulatory agency ensure compliance of banks with technological requirements in their online banking infrastructure?
- 6. Were there any difficulties encountered in ensuring the stability and trustworthiness of the online banking infrastructure, and if so, how were these obstacles eliminated?
- 7. How did the regulatory agency participate in shared efforts with banks to improve security measures for online banking services?
- 8. What measures were undertaken to effectively communicate regulatory requirements to financial institutions and improve their understanding and compliance with online banking regulations?
- 9. In what ways did the regulatory agency promote the education of clients on the potential dangers associated with online banking and the corresponding protective measures?
- 10. What are the potential regulatory trends and considerations that might be expected for online banking in the years following the pandemic?
- 11. How does the regulatory agency intend to maintain a balance between developing technology in online banking services and maintaining regulatory oversight?

12. What conclusions have been found regarding the regulatory obstacles associated with online banking, and how may these insights shape future regulatory strategies?