Digital Banking In Croatia

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Digital Banking in Croatia

Master Thesis

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Abstract

With the increase in the usage of digital devices, digital banking has become an important factor for banks. In past, bank performances depended on branch sales but digital banking has become the main tool in retaining and capturing new customers. FinTech is a technology that can provide new and improved financial services. It is important to adopt digital trends and improve the banking experience to increase customer experience. There are new advanced technologies and methods for the customer to complete transactions such as mobile banking, blockchain technology and, wearable devices. Although technology allowed customer to instantly access their accounts and conduct online transactions it also encouraged illicit financial activity. By following global trends, the Croatian banking sector also adopted digital banking and they published their version of banking apps such as m-zaba and mHPB to keep competitive advantages and increase customer satisfaction. Digital banking removes paper transactions while also reducing operational costs which simplifies doing business in every sector. During the coronavirus pandemic in 2020, some businesses banned the use of cash to protect employees and customers, opting for contactless payment while people who were confined home, massively used online shopping. Digital payment transitioned from being convenient to become a necessity.

Keywords:

FinTech, Blockchain , Digital banking, Mobile banking, Internet Banking

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1. Introduction

1.1 Overview

Over the last 30 years, financial services experienced intense revolution due to many factors, such as globalization, technology, competition, demographics, deregulation, etc. To keep with trends and look for alternatives in delivering services, the financial sector gradually introduced telephone banking, ATM, point of sale purchasing and internet banking. Exponential development in technology required the financial sector to go even further. For banks to keep customers and retain quality, it was necessary to adopt digital banking as a new tool. Digital banking greatly increased customer satisfaction, however, transformations continue as competition and customer expectations increase.

New tools in digital banking such as telephone banking, internet banking, mobile banking have influenced the way customers obtain services, confronting traditional banking methods. The first concept of digital banking was born in the 1980s by First Direct as they introduced selling services via phone. First Direct offered their customer multi-channel services which made UK banks close some branches and the number of customers decreased rapidly. This transformation made banks put more emphasis on researching digital banking.[1]

[1] Cajetan Ikechukwu Mbama, Digital Banking Services, Customer Experience and Financial Performance in UK Banks, (2018), pp 1

1.2 History of internet banking

In 1966 company called Advanced Research Project Agency (ARPA) in collaboration with the US government created the internet for military use. ARPANET was the original name of the internet. Internet was unknown in corporate and universities. It became known in 1990 with the introduction of the World Wide Web while electronic banking became popular in the 1980s. Internet banking started with ATMs and has included electronic fund transfers and payment bills. The information technology revolution started in the 1970s when Barclays Bank installed the first automated teller machine (ATM) in the United Kingdom. Internet banking was first introduced and adopted in New York and banks like Chase Manhattan, Security First Network and Wells Fargo were first to provide home banking.

In the 1990s customers were comfortable with using internet banking and transacting over the web. Therefore, the banking sector introduced a new era of Information and Communication technologies in distribution channels in the form of debit cards, internet banking, telephone banking and mobile banking. All mentioned services are also known as "any time anywhere" banking.

Banks invested large amounts of money in technology in order to reduce costs, enlarge their customer databases, edge competitive advantage, improve financial services, boost their general customer loyalty and satisfaction, and improve profit through innovative products.[2]

[2] Elizabeth Ujarura Kamutuezu, The Adoption of Digital Banking in Namibia, University of Mauritius, (2016), pp. 17

1.3 Objectives

In this paper the main objectives are:

- Measure usage and knowledge people have about digital banking
- Evaluation of customer services
- Examine the correlation of digital banking with people age and education in Croatia
- Identify factors that influence the effective adoption of internet banking services
- Provide recommendations for improvement of digital banking services in Croatia
- Analyse banking services offered by commercial banks in Croatia

1.4 Methodology

To achieve the objectives of this thesis, the research in form of a questionnaire will be conducted.

The main research will be in form of a Likert scale questionnaire with five offered answers ranged from “strongly disagree” to “strongly agree”. A questionnaire will be based on previous research of Elizabeth Ujarura Kamutuezu, 2016, The Adoption of Digital Banking in Namibia, Amity University.

The main purpose of this research is to identify factors that affect the adoption of internet banking in Croatia, examine the correlation of digital banking with people education and age, evaluation of customer services, analysing banking services offered by commercial banks in Croatia.

Secondary data that will be analysed are; Report on cashless payment transactions in Croatia by Croatia National Bank, DESI report. Reports will allow us to get insight into expenditure and digital competitiveness in Croatia.

1.5 Structure of the thesis

In the first part of the paper, I will explain the general terms about digital banking and the main focus will be on technology trends and possible risks that we may encounter. In the second part, I will discuss technology, trends and threats that new technology could potentially bring. In the third part, I will focus on financial technology known as FinTech where I will discuss the development, risks, opportunities and regulatory challenges that this new technology brings. In the fourth part motivation for digital banking will be discussed in terms of security, cost, efficiency, convenience, customer experience. In the fifth part, domestic banking applications and international digital banking platforms will be analysed to see what kind of competitive advantage each of them brings. In the sixth part, the reports regarding cashless payment and digital competitiveness will be analysed. Understanding consumers habits will allow us to use digital banking more efficiently. The last part will focus on questionnaire research results and discuss its findings regarding the correlation of digital banking with people education, age and salary in Croatia which will serve to establish insight into digital banking in Croatia.

2. Technology trends and risks

2.1 Impact on the banking sector

Since the financial crisis in 2009, the banking industry has been faced with low credit growth, increased compliance and regulation requirements, low-interest rates and a damaged reputation. Ten years ago, the ten largest banks were based in the United States or Europe and today, the top ten are dominated by six banks based in Asia. The profitability of the banking sector has been threatened by digital disruption coming from increased competition in retail from financial technology. European and Japanese banks are barely covering the cost of capital, while the capitalization of Google and Amazon is more than double that of JP Morgan Chase.

Banking is going through a transformation from being based in physical branches to using IT and big data together with specialized human capital. A change in the use of technology in developing new business models and services has been developed with the rise of the FinTech sector, which can be understood as the use of automation technology and innovative information in financial services.

Digital technology could have a great impact in terms of increasing competition in banking markets. Banks will move into a model based to a customer-centric platform.

Digital disruption offers the potential to improve efficiency with enhanced supply diversity, innovation and a competitive financial system. It promises to lead to an increase in service and efficiency to overcome information asymmetries by using blockchain technology, AI, providing a higher standard of service, a user friendly interface replacing obsolete technologies. This forces banks to move to a customer platform based model. Those changes present challenges to banks as they will have to move from rigid mainframes to the flexible cloud, reduce overcapacity of a branch in low profitability environments (Japan, Europe), and reach a new standard of service by competing with new entrants.

BigTech firms pose a great challenge to banks as they will try to control consumer interface by acting as gatekeepers to the distribution of financial products with superior data. If this would happen, banks would have to provide their products on a platform they do not own. Some banks recognized this threat and are trying to form a

partnership with BigTech firms or offering open platforms to incorporate products from other financial providers.

It is up to regulators to ensure that new technology delivers benefits to firms and consumers without endangering financial stability[3]

2.2 Blockchain technology

In order to enhance customer service and make the transaction faster while being cost-efficient, banks are always exploring new ways. Technology with an efficient and promising application is a Blockchain. With its application banking sector can become more efficient, secure, democratic and transparent.

"Blockchain is a technology that combines several technologies like distributed data storage, consensus mechanism, point-to-point transmission and encryption algorithms. A blockchain acts as a decentralized ledger that keeps track of transactions between two parties effectively. Although these parties have simultaneous access to update digital ledger constant and system is virtually impossible to hack.

Blockchain is a decentralized, digital and distributed ledger that record transactions near real-time. Blockchain is as spreadsheet or ledger, that power (P2P) network to verify and validate every transaction.[4]

This technology promises immense opportunity to tackle new challenges in the banking industry. In terms of payment, central and commercial banks are planning to adopt blockchain technology in order to make the payment process more efficient, as transactions can be done without a third party and ignoring cross border payment. Another advantage is digital verification where we can remove traditional verification factors such as face checking and identity.

Blockchain provides an option for users to identify themselves and others without repeating registration for each new service. But as the ledger system is shared, everyone who is participating can see the information without approval.

[3] OECD (2020), Digital Disruption in Banking and its Impact on Competition, https://www.oecd.org/daf/competition/digital-disruption-in-financial-markets.htm

[4] Thulya Palihapitiya, Blockchain Revolution in Banking Industry, University of Moratuwa, Sri Lanka, (2020), pp2

In terms of lending, traditional banks offer various kinds of loans. The problem here is that process to approve a loan takes a lot of time. To improve lending systems and improve transaction speed while being transparent, the implementation of Blockchain is necessary. This system can link all information together such as Bank Secrecy Act and Know Your Customer. Pieces of information are all linked together in a single consumer block which saves time and many unlike traditional process.

For services such as auditing, accounting and bookkeeping, banks still depend on paperwork. They are digitalized slowly because traditional systems use double-entry transactions, which take a lot of time to be digitalized. By entering transaction details directly into the ledger system, information becomes irreversible and transparent. Invoices can be pay automatically with a feature of smart contracts.

The smart contract is a set of code gathered in Blockchain. When conditions are met program is automatically executed. Because decentralized ledger transactions are performed transparent and cryptographic, without intermediaries.

KYC stands for „Know Your Customer" and in all banks, KYC process uses a long time to perform. Blockchain enables independent verification for any customer which can be accessed by other banks, which reduce administration, save time and eliminate duplication.[5]

[5] IBID, pp 6

2.3 Mobile banking and threats

Channel, where consumers can interact with the bank through a smartphone device is mobile banking.

It is a way of carrying payments through a mobile device with the use of various protocols such as the internet or text. In the mobile banking communication process, operators act as intermediaries for conducting the payment between a business and client. Because of telecom regulation, operators are not opposed to the accountability to perform anti money-laundering checks.

Growing demands for micropayments are the main driver for the evolution of mobile banking.[6]

Mobile banking was introduced in the late 90s when the internet started to gain popularity. Wells Fargo and Wachovia started to offer basic services on their websites such as viewing balances, checking accounts, finding ATMs but they did not offer interactive services. Websites did not have a friendly web browser and were difficult to use. Slow screen refresh speed, poor functionality and limited features contributed to why customers did not adopt banking channels beyond ATM or physical branches.

Mobile payment services were a predecessor to mobile banking and it was accepted by consumers and merchants. It used dial up technology which was limited and slow.

Mobile banking uses smartphones to perform accounting features and access bank accounts.

As the technologies improved in app development and data transmission, mobile banking started to steadily increase as banking institutions started offering mobile services.[7]

[6] Tatiana Tropina, 2016, Do Digital Technologies Facilitate Illicit Financial Flows, Max Planck Institute for Foreign and International Criminal Law, pp 14

[7] Courtney Elizabeth Cleveland, 2016, A Study on How Mobile Banking Has Affected the Banking Inudstry: Has Mobile Banking Improved Bank Performance, University Of Mississippi, pp 5

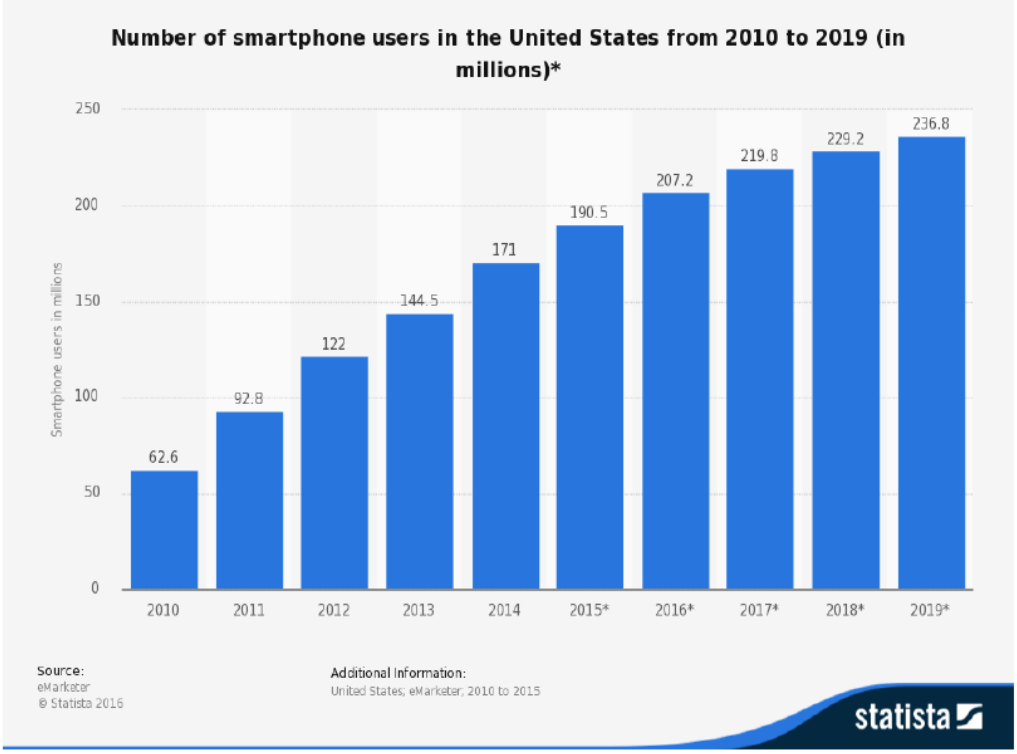

Figure 1. Growth in adult smartphones users in the United States

Source: Statista (https://www.statista.com/statistics/201182/forecast-of-smartphone-users-in-the-us/)

The introductions of smartphones with comparable platforms have been a steady cause in the growth of mobile banking as smartphones digitized everyday tasks. It allowed customers to regain valuable time spent in brick and mortar banking. Millennials, Gen X and Y adapt quicker to a digital experience making them become core banking customers in the future.[8]

One of the main vulnerabilities linked with the use of mobile banking is money laundering as there is a possibility to buy pre-paid SIM cards without identity checks and registration. This brings a great amount of anonymity from which money launderers can profit.

Still, the potential of using mobile banking for illicit activities and illegal transfers is debatable as transfers involve a small amount of money.

[8] IBID, pp 14

In different studies, mobile payments are names as one of the possible causes of digital money laundering but the latest reports questioned the role of mobile banking in illicit financial activities.[9]

2.4 Wearable device

Despite the numerous form factors that wearables have, from augmented reality glasses, clothing to smartwatches, they provide a fewer distracting layer that gives a client constant intelligence about the world before they even know they need it. It helps businesses engage with clients better than ever before

Being able to pay with a gesture, instead of with a credit card, smartphone or cash requires more than just a gadget on hand but also a huge amount of data.

The device needs to authenticate a user and store payment but also prior spending habits and coupling location data to minimize chances for a fraudulent transaction. Wearables require information that is made possible through many technologies such as communication devices, servers, sensors, analytics engines and decision making aid known as IoT (Internet of Things). Devices collect data and are able to aggregate, communicate, analyse it before enabling actions to be taken. The picture below shows how this process can be modelled with the information value loop.

[9] Tatiana Tropina, 2016, Do Digital Technologies Facilitate Illicit Financial Flows, Max Planck Institute for Foreign and International Criminal Law, pp 14

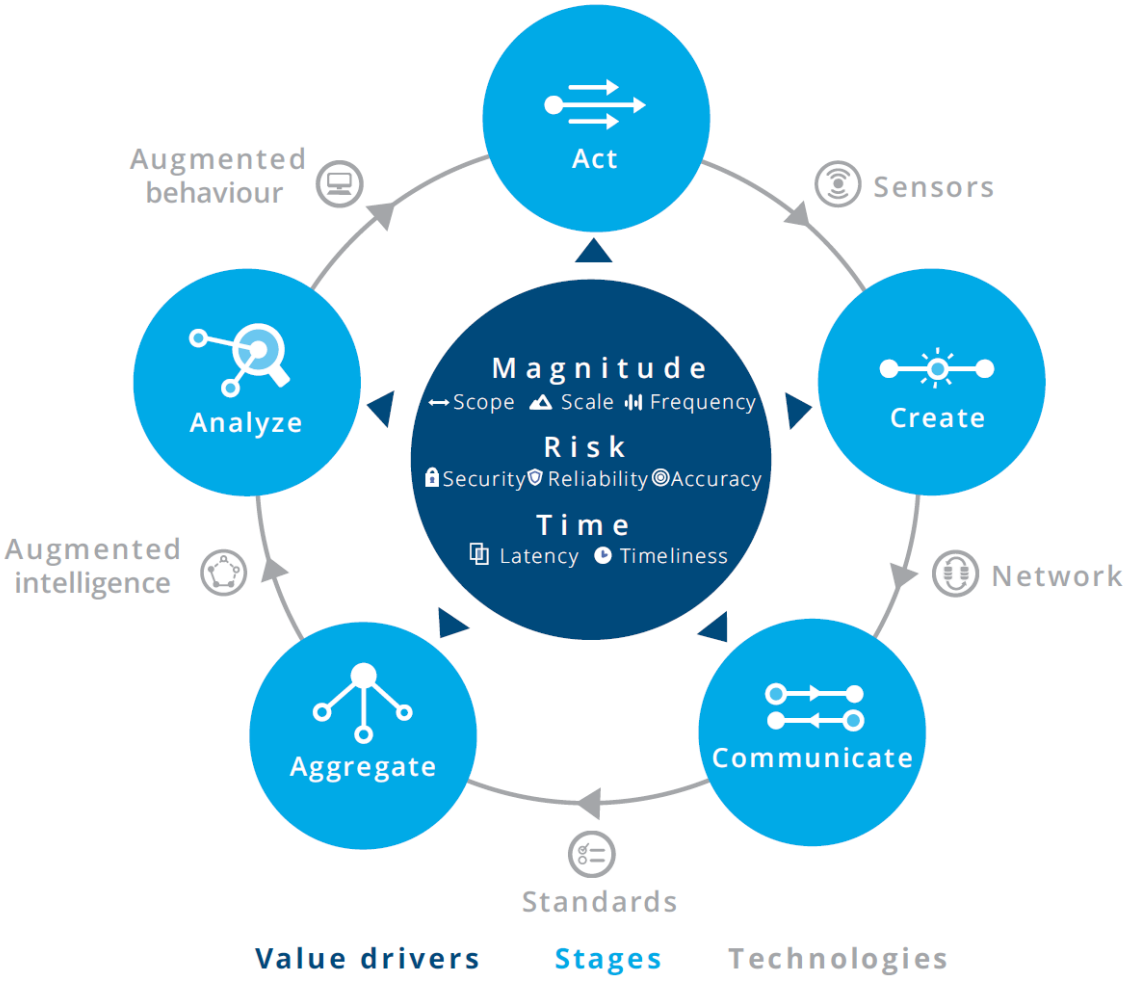

Figure 2. Information Value Loop

In these actions lies the true value of IoT, rather than assumptions it is driven via data. Wearables can help the banking industry with information from other solutions to deliver a particular "customer-centric" experience for their clients. Data-driven insight encourages financial institutions and clients to make more informed and smarter decisions. The consumer will no longer be judged solely on demographics but also by behavioural trends. Institutions will be able to better coordinate the services they provide with clients actual needs because now they have insight on information such as employment, spending habits, prior interactions with banks.[10]

[10] Deloitte, 2016, Did You Wear Your Bank Today? Wearable Banking, pp 3-4

2.5 Future trends

Digital banking was confined to having a mobile app and a web until 2020, but not it has a different meaning altogether. 2020 was a year when banks realized the gaps in their digital banking course; Financial technology gave users a look into what is possible and enabled banks to reexamine the speed at which they have been evolving.
It has urged banks to actively seek to implement the latest improvements and level up their digital transformation.
The digital banking sector could go through extensive development and the following trends could shape its future:

Blockchain enables financial institutions to process cross border transactions in a cheaper, faster and efficient manner. Visa and Mastercard are exploring blockchain implementation while Veem company already reaps its benefits. Banks like HDFC and Bank of America partnered with Ripple to pick up on this technology.

Internet on Things – many people have internet connected devices at an arm distance and also in the house devices like Smart TVs, Smart Speakers, etc. As consumer interacts with many devices it is important to make them convenient. Internet on Things helps banks to interconnect all such devices to allow clients to operate their account from the comfort of their house using smart speakers or using a smartwatch on their wrist while jogging. In that way, connected devices allow banks to know their clients better. In 2026, IoT is forecasted to reach $116 billion in the financial services, banking and insurance industry.

Open Banking is the practice where banks open up their application programming interfaces (API) to external parties which allow them to assimilate third party services into the system. This enables third parties to process and access the data of the banks and combines their services accordingly. This model allows banks to solve the problem with constant chase of advancements in technology. Banks can connect with FinTech solutions as a collaborative approach to tackle evolving technology in a way that banks lend their network and data to FinTech companies and FinTech would be responsible for innovation.

The digital banking industry could go through a collaboration phase where instead of competing, banks will collaborate with FinTech allowing models like Open banking and Neo banking to grow in popularity. Some banks might try building internal solutions with technologies like AI, IoT, and blockchain but their time to market and cost would be higher than those who choose collaboration.[11]

[11] Abhinaw Paliwal, 2021, Trends that will shape Digital Banking's future, (https://www.finextra.com/blogposting/20494/trends-that-will-shape-digital-bankings-future 26.07.2021)

3. Financial Technology (FinTech)

3.1 FinTech development

The beginning of Fin-Tech started in the 1950s when technology was applied to speed up, simplify and ease financial services and processes in Bank. The first steps of Fin-Tech were in form of issuing credit cards and cashless transactions followed by the introduction of ATM. From there, it expanded on the stock market and securities trading and later on e-commerce and the internet. There were also significant changes on the institutional level in banks with continuously improved processes on managing assets, risks, trading and other activities. With the appearance of mobile networks and communication infrastructure through the internet, the whole modern world was connected into a unique global market.

Because of that, the application of digital technologies in the financial sector spread rapidly leading to the creation of many Fin-Tech companies and apps. We are already using virtual cards, digitalized wallets, transaction apps, financial virtual assistants for planning pension or saving funds, equity crowdfunding platforms, online credit, alternative investment, alternative money which is digital cryptocurrency.[12]

We can define FinTech as the use of technology to provide improved and new financial services.

The Financial Stability Board defines FinTech as "technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated effect on financial markets and institutions, and the provision of financial services."[13]

For creating business value in FinTech there are various applications that can be classified under different categories: payments, advisory service, financing and compliance.[14]

[12] Dr. sc. Sanja Bračun, Krešimir Turkalj, Utjecaj Fin-Tech Kompanija na Digitalnu Transformaciju Bankarstva u Republici Hrvatskoj, Tehničko veleučilište u Zagrebu, pp 3

[13] Anjan V. Thakor, 2019, Fintech and Banking: What Do We Know?, Olin Business School, Belgium, pp 2

[14] Kelvin Leong, Anna Sung, 2018, (Financial Technology): What is it and How to Use Technologies to Create Business Value in FinTech Way

3.2 FinTech in Croatia

Croatia started the implementation of Fin-Tech technology relatively late and limited. Croatia banking industry is well adjusted and stable industry as the Croatian financial market is organized and oriented through commercial banks. In past, it was not prepared for disrupted changes brought by Fin-Tech and changing technology. Fin-tech itself is a global business and it is not affected by boundaries of states, allowing it to develop in Croatia.

Those are primarily foreign companies who offered services on a global level as their first customers were people who preferred online shopping. Customers have used PayPal which were available in Croatia since 2011 and today it is supported by almost every Croatian bank through their credit cards for online payments. One of the greater Fin-Tech companies and online banks which service is also available in Croatia is Revolut, which, in just a few months reached over 50 thousand users.

Payment service directive 2 (PSD2) on the EU level contributed to the further expansion of Fin-Tech solution in Croatia, which from 2019 allows access to a bank database and information about companies with previous authorization of regulators. Such an approach allows Fin-Tech companies to access information which were collected, organized and processed by banks within their IT system. PSD2 directive enables a better overview of personal finance, secured, innovative, faster and more efficient digital services through two innovative services – account review services and payment services.

This will soon allow that instead of various cards, internet and mobile banking and tokens, client only use one application which is a mobile wallet that combines every service from financial institutions and Fin-Tech companies.[15]

[15] Dr. sc. Sanja Bračun, Krešimir Turkalj, Utjecaj Fin-Tech Kompanija na Digitalnu Transformaciju Bankarstva u Republici Hrvatskoj, Tehničko veleučilište u Zagrebu, pp 4

3.3 Opportunities and risks

In the banking industry FinTech offers many opportunities:[16]

- Increases financial stability
- Cost advantage - as it provides services and transactions faster for a lower cost. Cut costs such as cross border transfers and faster payment methods
- Offers more efficient banking services as it provides financial services more flexible and cost-effective.
- Fintech appears in peer to peer networks and provides credits to customers who cannot get loans in bank
- Increases security of banks who use Blockchain by enhancing transaction security over hash encryption and prevent information leakage

There are a variety of risks that can influence the diverse sector in tactical and strategic ways. FinTech in the banking industry can increase the complexity of the system as there is limited experience and expertise in managing risks. Banks can lose profit margin and market share because of competition. Technology like AI and cloud computing increases interconnectivity, which can potentially make more vulnerable to cyber-attacks. Other threats are compliance risk concerning data privacy and the potential risk of malpractice or fraud.

[16] Thulya Palihapitiya, Blockchain Revolution in Banking Industry, University of Moratuwa, Sri Lanka, (2020), pp 7

3.4 Regulatory frameworks

Previous Deputy Chief Executive of the Hong Kong Monetary Authority, David Carse gave a speech where he talked about the necessary new regulatory framework for e-banking. The speech was given in 1999 while e-banking had been since the 1980s which highlighted delayed reaction in regulation considering technological changes. The time lag was expected and also welcomed as immediate regulation would slow innovation severely and increased the workload of regulatory agencies. The late reaction of regulators can be beneficial in allowing the emergence of a new channel or industry.

The regulator's view of FinTech was that although e-banking is a digital version of brick and mortar banking model, it did create new risks.

"By providing direct and virtually unlimited access to their accounts, the technology removed the necessity for depositors to be physically present at a branch to withdraw funds. Indirectly this could facilitate electronic bank runs as the lack of physical interactions removes the friction from a withdrawal."[17]

Regulators determined that online banking could potentially create new credit risks. It was anticipated that with the removal of a physical link between the bank and consumer, competition would increase as borrowers without geographical limits have access to a larger pool of lenders. Although this seems favourable for consumers, competitive pressure could pose a problem from a financial stability perspective.

On the positive side, organized data leads to an improved understanding of borrower credit risks which allowed offering products aligned to the risk profile of the customer. Carse's speech was based on the premise that technological innovation would only be used by licensed financial institutions. It was expected that providers of e-banking services would be supervised financial institutions.[18]

[17] Ross Buckley, Douglas W. Arner, Janos Nathan Barberis, (2016), The Evolution of Fintech: A New Post-Crisis Paradigm, University of New South Wales, pp 12

[18] IBID, pp 13

FinTech was developing so rapidly that financial services no longer rested with regulated financial institutions. Financial services were also provided by non-banks which may mean that there are no effective regulators to act on the concerns. It did not make any difference whether the provider is regulated or not which means that the final way of protection may come from the distrust of placing assets with off-shore non-bank and consumer education.

Banks brand images and their perceived stability was shaken to the core. A survey from 2015 reported that Americans trusts more in technology firms handling their finance rather than banks. The level of trust Americans have in Amazon is 71 % and in Google 64% while for CityBank is only 37%. There are also young start-up and non-listed companies that are handling financial data and customer money. China has over 2000 P2P lending platforms which operated outside of a regulatory framework. This does not discourage millions of borrowers and lenders, who are willing to borrow or place billions on these platforms due to the better return, cheaper cost and increased convenience.[19]

The global financial crisis was a turning point that has affected the further development of FinTech. Factors such as economic conditions, political demand, public perception created a new group that started applying technology to financial services. The financial crisis had two impacts on human capital and public perception.

First, as financial crisis transformed into economic crisis, around 9 million American workers lost job. The general public developed a distrust of the classic banking system and many financial workers lost their job or were less compensated. This newly educated workforce saw FinTech as new industry where they can apply their skills. New generation of fresh graduates had an educational background which allowed them to understand and apply skills to FinTech.

Second, public perception of banks deteriorated as predatory lending methods directed at communities damaged their standing and breached consumer protection obligations of banks.[20]

[19] IBID, pp 14
[20] IBID, pp 16

Fintech comprises five areas:[21]

- Payments and infrastructure
- Data security and monetization
- Finance and investment
- Risk management and financial operations
- Customer interface

Payments and infrastructure: Mobile and internet communications payments are the main FinTech focus and a driving force in developing countries. Payments are an area of great regulatory attention which resulted in the development of domestic and global payment systems, which today support $5.4 trillion per day in global foreign exchange markets. Infrastructure for OTC derivatives and securities trading is a major aspect of the FinTech landscape and are areas where telecommunications and IT companies are looking for opportunities to remove the middle man which are traditional financial institutions.

Data security and monetization: after the global financial crisis it has become clear that the stability of the financial system is a national security issue. With the appearance of FinTech, the financial system became particularly vulnerable to espionage and cybercrime. This will remain a considerable concern for governments, industry participants, policymaker regulators and customers.

Finance and investment: public, investor and regulatory attention focuses on alternative mechanisms for financing, especially P2P lending and crowdfunding. FinTech extends beyond this tight scope to include the financing of technology itself (e.g. via private equity, public offerings, private equity, crowdfunding, venture capital, listings, etc.

Risk management and financial operations: These are a core drivers of IT spending by financial institutions, especially from 2008 as financial institutions needed to build a better compliance system to deal with the great volume of post-crisis regulatory

[21] IBID, pp 18-20

changes. The development of quantitative techniques and finance theory and their translation into risk management and financial institution operations was the main feature in the 1990s and 2000s, as the financial industry built systems based upon Value at Risk (VaR) and other systems to maximize profits and manage risk.

Customer interface: This will be the main focus of non-traditional FinTech developments and traditional financial services. In this area, new telecommunications and IT companies seek to compete against traditional financial firms.

4. Motivation for Digital Banking

4.1 Security

"Security is a synthesis of physical and logical measures that work cooperatively to control and counter vulnerabilities that leave service users and providers open to harm. In many cases, both banks and customers are sensitive to some of the same weaknesses that cause security problems and weaknesses."[22]

It is necessary to protect themselves with measures to ensure information safety, counter malicious users and deter unauthorized access to sensitive systems. In order to make the internet a safer place for service provider and user, new strategies and techniques have been developed.

Customer needs to understand terms and conditions of transactions in which they are engaging in online banking. The Central bank requires that each customer understand their rights and responsibilities, risks involved in using Internet banking services and products, terms and conditions for Internet banking services, their role to maintain the security of their banking information. Customers should be cautious of opening emails or files from unknown sources and never send personal identification number or password. It is also possible for a consumer to use protective software or personal firewall as they can block outside access to their computers. This measure blocks hackers from penetrating into your system when online. Anti-virus software is a good protective measure but it is necessary to check for the latest online threats.

Banks have a responsibility to provide a safe environment on the internet in order to make e-banking a secure venture. It is necessary to establish a security plan that includes: maintaining well trained staff to protect the integrity of data, review intrusion detection systems, include background checks and employee verification. As customers can manage their finance online, banks have a responsibility as service providers to guarantee security. Danger can also come within the company which can lessen the integrity of the banks and create security problems. A disgruntled or unqualified workers can expose banks to great risks and be unaware of them. IT administrators can overlook minor software problems as they are focused on running

[22] Moutaz Abou-Robieh, A study of E-Banking Security Perceptions and Customer Satisfaction Issues, Faculty of Argosy University, 2005, pp 31

the system. Those minor problems can cause flaws in banks programs and operations if they remain unsolved. It is necessary for IT administrators to focus on installing patches that fix security flaws and maintain the upgrades.

4.2 Lower cost

It is convenient in terms of labour, capital, time and all the resources needed to make a transaction. With the internet, access to banking services is convenient, fast and available at any given time. As there is less involvement by salaried employees and fewer buildings to maintain Internet banking costs are relatively low.

Costs in using and accessing banking services are reduced. Internet banking is beneficial to customers because of the savings in space it offers, time, cost, its delivery of improved services, its quick response to complaints, making the internet convenient to use.

4.3 Efficiency

By providing internet access for their customers, banks can become more efficient than they already are. Internet Banking provides the banks with a paperless system, customers can serve themselves, which negates the need for frontline staff and savings are gained from reduction in branch sizes, reduction in staff and reduction in consumable costs: such as in cartridges, paper and other stationery.

4.4 Convenience

Banking transactions can be made from the comfort of the home or any place a customer wants to. Conducting banking outside banks has been significantly convenient in case of adoption of e-banking and customer has access to the bank 24 hours a day.

Customers can download and access different accounts in order to perform analysis on their device before making any transaction on the web. This leads to better management of funds.

4.5 Customer experience

Internet banking allows the customers to have a full range of services available to them and it also allows them some services not offered at any banks. Customers can print forms, information and applications via the internet and search for information efficiently instead of waiting in a bank. With faster and better options, a bank will certainly be able to create better customer satisfaction and relations.

"According to Hosein (2010:13) internet banking improved banks' ability to retain customers as customer relationship management (CRM) can be facilitated by the data acquired and captured on the corporate database as Products and services can be customized to suit the needs of the customer or groups of customers, thus facilitating customer loyalty". [23]

4.6 Cashless society

The Cashless Society defines an economic situation where financial transactions are made through the transfer of digital information (electronic representation of money) instead of money in coins or physical notes.

Cashless society as a concept has been extensively discussed, especially since the increased usage of digital methods of managing, exchanging, recording access to investment, commerce and daily life in many parts of the world is increasingly used.

During 1990, the trend of using non-cash began in daily life and electronic banking became popular. In 2010, digital payment methods had widespread in many countries as middlemen with Apple, PayPal, NFC payment by contractual, smartphone or electronic card, and digitally powered by companies like Banking Olet system and Electronic Bill.

It has been described as a controversial and sometimes "scary" or "frightening" move and related to banking transaction tax, negative interest rates and global taxation regime, with such impact to the society, such progress will be both potentially socially dangerous and potentially useful. In the situation of central control of currency supply

[23] Elizabeth Ujarura Kamutuezu, The Adoption of Digital Banking in Namibia, University of Mauritius, (2016), pp. 22

quantitative easing and global negative inflation, it can be useful for economies and central government.

The loss of cash transfers full control of the information about personal use of interest, money and transactions to the third-party providers and the state. Some states have restricted and controlled private digital currencies, like Bitcoin, as it is believed that for the economy and in the fight against terrorism and crime, many dangers have been raised on unexpected "dangerous" consequences. This means that money can be controlled in detail and negative interest rates can be implemented.

Singapore	61
Netherlands	60
France	59
Sweden	59
Canada	57
Belgium	56
United Kingdom	52
USA	45
Australia	35
Germany	33
India	2

Table 1. Estimated share of payments done by non-cash methods

Source: Banks for International Statements

Over the past years, drastic digitalization has affected almost every part of our lives. In India, the recent effect has been the move to a cashless economy. It started with the note ban in 2006 due to unforeseen withdrawal of the notes Rs 500 and Rs 1000 from the Indian economy overnight. India decided to go into cashless, in a way that least paper transaction will be involved, substituted by digital transactions with the help of digital wallets, debit and credit cards, internet banking, Point-of-Sale machines.[24]

[24] Parmar Ravi, (2018), A Study Of Cashless System And Cashless Society: Its Advantages And Disadvantages, Indian Journal of Applied Research, pp. 10

4.6..1 Advantages Of Cashless Economy[25]

- A cashless economy will allow less strain of tackling a wallet full of banknotes with us. Instead, we can rather use mobile as a one-stop solution for all kinds of transactions such as funds transfer, fees payments, bill payments, recharge, etc.
- It will help to stop the "parallel economy" where people neglect the banks to gather money in their closets.
- Crime rates have already started declining because of the cash ban as most of the terrorist and criminal activities are funded with black money
- Increase in the income tax due to least involvement of cash. All transactions will be done through a bank where appropriate KYC verifications will be done before banking transactions and therefore it will be easier for the government to the income tax evasion by suspicious persons. This will increase the revenue received by the government.

4.6..2 Disadvantages Of Cashless Economy

- We could see a surge in the hacking of personal information over the internet such as PINs, debit and credit cards, passwords and other sensitive information because of an increase in digital transactions.
- The poor population will suffer a lot as it is scarcely covered under the conventional banking system and they are dependent on cash for daily wages.
- Sectors such as restaurants, retail, real estate, cement and other micro, small and medium enterprises, where a high amount of cash transactions are involved are going to be terribly affected.
- Third parties such as banks, government, payment interfaces will always be in control of funds which could lead to extreme uncertainty.

[25] IBID, pp. 10

5. Banking apps

5.1 Domestic banking apps[26]

5.1.1 M-zaba

A basic part of application m-zaba is services for insight of account and transactions, transactions made with credit cards and card limit. Functionality to pay bills with 'm-foto pay' is mostly used and of the main reason why over 50% of citizens use this application to pay their bills. Besides named functionalities, there are also: purchasing prepaid vouchers, paying in-store with a smartphone, a locator for bank offices and ATM, managing daily limits for credit cards. More than 400 thousand Zagrebačka banka customers uses m-zaba application.

All data which are being exchanged between application and bank are protected with encryption. With activating mobile banking on a smartphone, software tokens is being installed which guarantee safety when using services.

M-zaba also offers a non-banking services such as: purchasing prepaid vouchers, different insurances like supplementary health insurance, car, travel and insurance.

In their systems, Zagreb bank uses artificial intelligence. Examples of processes are making decisions in automatic processes (verification), using neuron network when creating offers for clients, using chatbots, assistants, etc.

5.1.2 PBZ mobile banking

Privredna banka Zagreb (PBZ) was one of the pioneers in Croatia regarding the implementation of digitalization in the banking sector. It was among the firsts that introduced contactless payment, Google Pay, in Croatia.

Today, more than half a million clients use the services of PBZ mobile banking and they implemented series of new functionalities in an application, such as login and authorization of payments with fingerprint or face ID, fast insight in account balance without login in an application, advanced electronic

[26] Croatian banks in Croatian smartphones https://www.hub.hr/hr/hrvatske-banke-u-hrvatskim-mobitelima (01.08.2021)

signature, a new concept of daily saving, abilities to transfer funds between clients without additional authorization, using ATM without card and sending funds to others with phone number.

The Application also has a function to scan and pay, after scanning the application automatically fill payment order with necessary information. Visualizing financial data in the application has upgraded and eased interaction of clients with a bank, and software itself is adjusted for people with bad eyesight.

PBZ is a bank that uses information from electronic ID card.

5.1.3 Keks Pay

Faced with competition in mobile banking applications from other banks and fintech, Erste bank decided to organize their own startup and present application Keks Pay.

Keks Pay was developed with cooperation from domestic IT companies Infinum and MicroBlink.

The Application allows secure and fast transactions when sending or receiving funds, without any fees. It is the first banking solution on the Croatian market as it is intended for everyone, no matter in which bank clients have accounts.

The primary goal of the application is to ease everyday situations such as sending money to friends or family, collectively gathering money for various occasions, for transferring funds only a mobile phone number is needed as there is no need for entering the account number of the receiver. The daily limit for transactions is a thousand kuna.

Application is designed in accordance to highest security standard encryption for data, regulative PCI DSS for protection of numbers on credit cards and additionally protected with PIN and biometric.

In the first three months, Keks Pay attracted more than thirty thousand customers, 2.5 million kuna transactions were initiated. 65% of Keks Pay customers are clients of other banks while 35% had anaccount in Erste bank.

Keks Pay will increase its functionalities on paying parking and other non-banking services.

5.1.4 Addiko mBanking

For the last few years, Addiko bank records a fast increase in digital customers, mostly young people with new demands. In 2017 bank presented 'Addiko Chat Banking' service which allows payment through Viber, becoming a first commercial bank in Croatia that support transaction over popular global communication platform.

In 2018, Addiko introduced the Addiko Virtual office which allowed them to request and process a credit for their customers and also the customers of the other banks.

Addiko application for mobile banking (Addiko mBanking) allows customers 24/7 access to information regarding accounts, balance, travel orders, credits, deposits and simple payment with scanning. Application for login uses two-factor authentication, data is being exchanged using safe protocols. Addiko online banking is being used by more than eighty thousand clients, mostly accessing from their smartphones. For now, the Addiko application for smartphones does not have installed non-banking services. Addiko bank has a team for making software robots and their implementation is being considered in a new version.

5.1.5 mHPB

Croatian Post bank (HPB) is the only bank in Croatia that is owned by the state. Mobile application mHPB is currently the highest growing service that HPB offers. An application does not save financial data of clients on a device, it just uses necessary data in order to provide service and does not exchange with third parties. HPB uses mobile application as channel for informing clients and marketing.

5.1.6 MojaRBA

Basic functionalities of Raiffeisenbank (RBA) mobile application is to process a transaction, access account details and access transaction history.

Application is secured with an approach based on SCA (Strong Customer Authentication) protection model. It is a situation where the client logs in with

mToken from the application and PIN or password. Transactions that cross through the application are constantly being watched and for any suspicious activity, the transaction is stopped and the client is asked for additional confirmation.

It is currently being considered to implement safety elements based on machine learning.

MojaRBA mobile application has software that is adjusted to customer behaviour and acts as a personal financial advisor. Application has a specific option for paying in-store –mCard- which uses the already existing ecosystem of card payment. Through its selling activities, RBA constantly works in order to implement new stores and customers into the existing ecosystem, whether it is a traditional or online store.

RBA mobile application MojaRBA has more than 80 thousand registered users. Inside the application, there is a solution that has been developed by Companies Infinum, Asseco and MicroBlink.

5.1.7 OTP m-banking

OTP bank created its first mobile application in 2012. In the meantime, the existing system has been modernized and adjusted for the new operating system and technologies.

OTP m-banking supervises transaction traffic and allows using a card in real-time. It is possible to purchase e-goods within an application and it eased payments by scanning bar codes on bills.

It offers customers over 30 banking and non-banking services.

OTP m-banking application made advancement by approaching Sepa Instant Payment scheme, which additionally pushes mobile banking to the main channel of OTB bank. Today, more than 105 thousand customers use the m-banking service. A bank is planning to implement NFC paying option, paying taxi services, a ticket for tram or train, etc.

5.2 International Digital Banking Platforms

5.2.1 Revolut

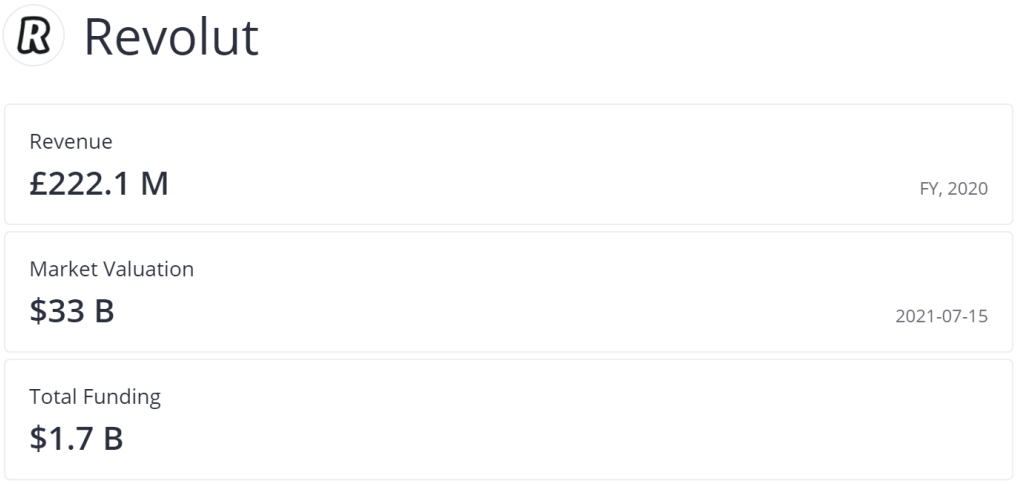

Figure 3. Revolut revenue and valuation

"Revolut is a financial technology company that provides a range of online banking services. It develops a platform offering a pre-paid debit card, cryptocurrency exchange, currency exchange and peer-to-peer payments. The company enables users to exchange currencies at interbank rates, spend with a multi-currency card and send money through social networks."[27]

[27] Revolut company profile https://craft.co/revolut (01.08.2021.)

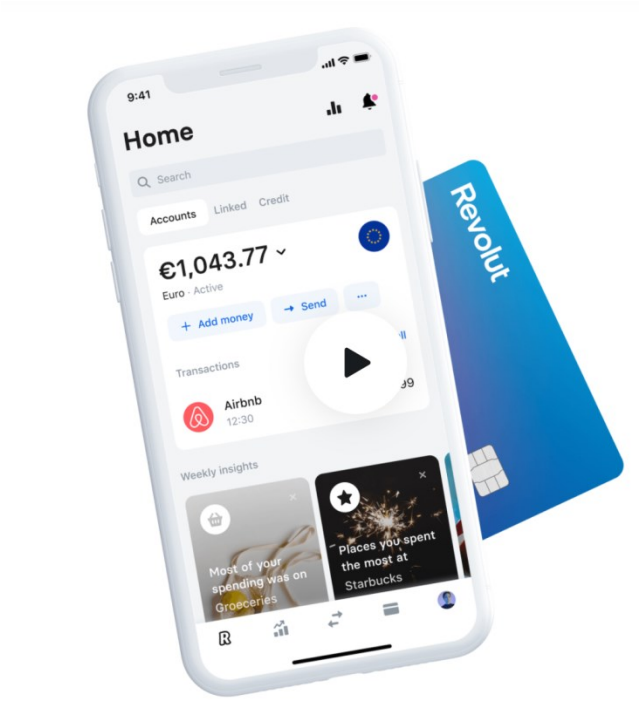

Figure 4. Revolut mobile application and card

It was founded by Vlad Yatsenko and Nikolay Storonsky in 2015. It offers debit cards, virtual accounts, accounts featuring currency exchange, interest-bearing vaults, Apple Pay, trading commodities, stocks and crypto.

Revolut supports ATM withdrawals and spending in 120 currencies and transfers in 29 currencies directly from the application. It provides customers access to cryptocurrencies such as Bitcoin, Litecoin, Ethereum, XRP, Bitcoin Cash, Doge, Cardano, Stellar and many more which can be exchanged with 25 fiat currencies. For buying or selling cryptocurrencies, a fee of 1.5% applies. On Revolut, cryptocurrencies cannot be spent or deposited. They can only be converted back to fiat currencies because Metropolitan Commercial Bank of New York banks with Revolut and do not allow transfer of fiat currencies from or to cryptocurrency exchanges.

Revolut provides equities trading with access to a range of US stocks and option to purchase or sell fractional shares. Stocks that are purchased in the application cannot be transferred to another broker, but must be converted back to cash and then it can be withdrawn.

Revolut uses algorithms to identify fraud, money laundering and other criminal activities. The algorithm additionally activates an automated suspension of accounts. The company explained that "the system is programmed to temporarily lock an account and place it in queue until one of our compliance agents can review the case."[28]

Revolut offers four package plans: Standard, Premium and Metal.

Standard is free and it offers: Spending in over 150 currencies at the market exchange rate, exchange in 28+ fiat currencies up to 1000$ per month with no hidden fees, no cost ATM withdrawals up to $300 per month, free Revolut card, earning 0.10% on APY on savings, instant access to a range of crypto tokens, Revolut Junior account for one kid.

Premium costs 54.99 HRK per month and it offers: Spending in over 150 currencies at the market exchange rate, exchange in 28+ fiat currencies with no monthly limit and no hidden fees, no cost ATM withdrawals up to $600 per month, Overseas medical insurance, global express delivery, Priority customer support, earning 0.14% APY on savings, Instant access to a range of crypto tokens, premium card with exclusive designs, disposable virtual cards, LoungeKey Pass access, free lounge passes for you and a friend if your flight is delayed by more than one hour, one fee free international transfer each month

Metal costs 99.99 HRK per month and it offers: no fee on ATM withdrawals up to $1200 per month, overseas medical insurance, delayed baggage and delayed flight insurance, global express delivery, priority customer support, disposable virtual cards, LoungeKey pass access, free lounge passes up to 3 friends, Revoult Junior account for up to five kids and three free SWIFT transfer each month.[29]

[28] Revolut.com https://blog.revolut.com/why-has-my-account-been-locked-and-how-to-regain-access/ (01.08.2021.)
[29] Revolut.com https://www.revolut.com/en-US/a-radically-better-account (01.08.2021.)

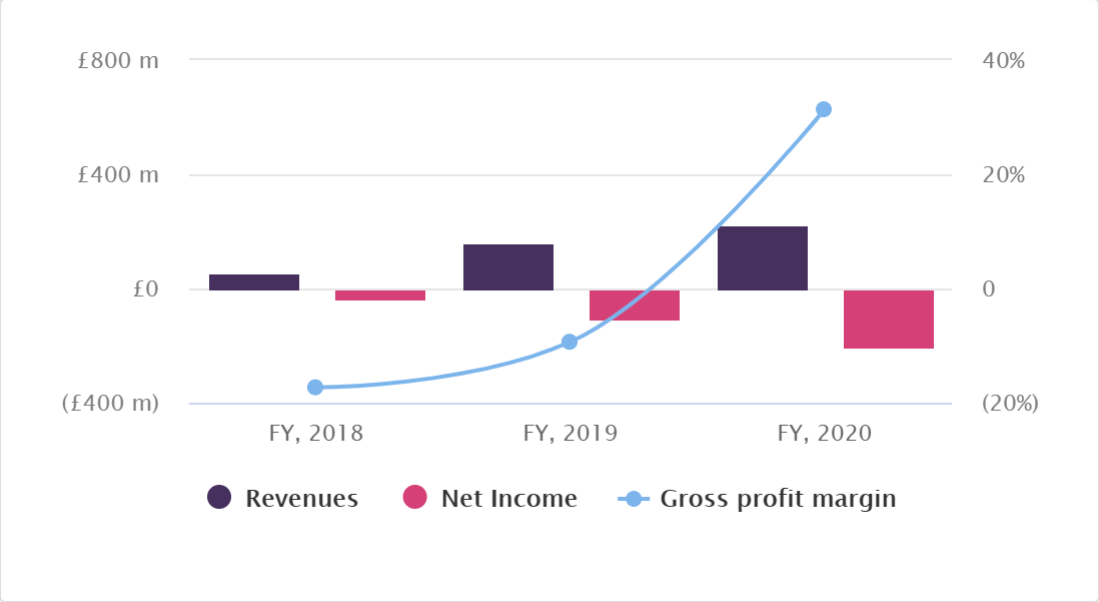

Figure 5. Revolut revenue

Revoult revenue was reported to be £222.14 2020 which is a 36.5 increase from the previous period.[30]

Revolut in Croatia allows clients to receive deposits but they are not able to open a debit or credit account within Revolut. Deposits collected by Revolut are protected within security deposits system in Lithuania, not Croatia. Institution for electronic money established in other EU member state is allowed, in accordance with the conditions regulated by "Electronic Money Law", to issue electronic currency or provide payment services. Government body of Institution in question is obliged to inform Croatia Central Bank and ask for their permission.[31]

[30] https://craft.co/revolut (01.08.2021.)
[31] Telegram.hr, 2021, Što Revoult smije, a što ne smije raditi u Hrvatskoj? HNB objavio upute, www.telegram.hr/biznis-tech/hnb-se-detaljno-raspisao-o-revolutu-smije-primati-depozite-ali-ne-smije-otvarati-i-voditi-racune-za-placanje/ (20.09.2021)

5.2.2 Ant (Alipay)

Ant Group CO., LTD develops online payment platforms. The company produces financial services platforms and credit system which provide consumers and small businesses with convenient, safe and inclusive financial services globally.[32]

Figure 6. Ant Group Logo

Ant Group is formerly known as Alipay and Ant Financial. It is an affiliate company of Alibaba Group. The Ant group owns the largest digital payment platform in China, which serves over a billion users and 80 million merchants. Ant group operates the world's largest online and mobile payments platform, formerly the world's largest money market fund, it runs a third-party credit rating system Zhima Credit. Through Alipay services, the group unveiled a facial recognition payment technology.

"Our vision is to build the future digital infrastructure of services, and thereby bring about constant and incremental changes that are beneficial to the world. We do not believe bigger is better; our pursuit is sustainable development that lasts at least 102 years"[33]

Ant group aim is to provide every small business with a level playing field to develop and grow, to make all aspects of digital life accessible – anywhere, anytime, through open collaboration with partners.

[32] Ant Group profile company https://www.bloomberg.com/profile/company/1051260D:CH (02.08.2021)
[33] Ant Group web page https://www.antgroup.com (02.08.2021)

Alipay has developed from a payment tool to a digital daily life platform. Alipay had introduced services providers in local life, government affairs, digital finance and other sectors that provide consumers with digital daily life services.

Users can access daily life services on Alipay, covering social insurance, covering utilities payment, electronic marriage certificate, housing funds, etc. The smart and friendly service connects users to free digital life anywhere and anytime.

Group is committed to bringing inclusive financial services to the world. The usage of cloud computing, AI, data analytics and blockchain have entitled every individual to accessible, safe, sustainable and green inclusive finance.[34]

[34] https://www.antgroup.com/en/digital-life (02.08.2021)

5.2.3 N26

N26 is a Berlin based bank whose main focus lies in bringing all financial services to the client smartphone.

The company became successful because it provided all services within a single application, which provides amazing usability. N26 enables clients to directly perform payments to other N26 clients, take out an insurance policy, requests an overdraft, all from within the application.

For banks, it is important to keep customer data and money safe. N26 was the first German bank that combined the entire transaction process in one application. By implementing transaction initiation and confirmation in a single application, it eliminated two-factor authentication.[35]

Products and Services of N26	
1 The only current account optimized for the smartphone	12 Debit Credit - Adjust the overdraft frame in two minutes
2. Intuitive mobile app for iOS and Android	13. MoneyBeam - send money to friends with one click, by e-mail or SMS
3. All finances in just one app	14. TransferWise - International transfers in 19 currencies
4. Account opening in less than 8 minutes via smartphone, paperless through video identification	15. N26 Invest - Simple, flexible investment, individually depending on risk appetite
5. Clear security features on product, e.g. lock and unlock the cards with just one click	16. Complete N26 Credit - Lending Accounts in minutes
6. directly in the app	17. N26 Business - For freelancers and the self-employed for private and business use
7. Cash in and out of more than 7,000 retail partners with Cash26 throughout Germany.	18 N26 Savings - Save money on very attractive terms
8. Real-time Banking - Push notification for all transactions in the same second.	19. N26 Insurance - digital insurance service
9. Mastercard - payments abroad or foreign currency fees	
10. Accounts: Free Current Account N26 Business Account for Freelancers & Self Employed	
11. Premium accounts N 26 Black and N26 Metal	

Figure 7. Products and services of N26 (Source:N26GmbH; Productmint, 2020)

[35] Vincent Haupert, Dominik Maier, Tilo Muller, (2017), Paying the Price for Disruption:How a FinTech Allowed Account Takeover, TU Berlin

N26 adapted its service portfolio by collaborating with different FinTech organizations and offering their services like insurance, investment, international money transfer with banking service.

N26 was founded by Maximilian Tayenthal and Valentin Stalf in 2013 to improve the retail banking system in Europe. The number of clients increased to 2.5 million in 24 European countries, with 3 offices in Barcelona, Berlin and New York, and the contribution of professionals from 50 nationalities.

It's a completely digital banking system which target generally individuals to ease banking operations through a mobile application. Bank does not have a physical branch but cash can be withdrawn from a wide range of ATMs and any retail shop[36]

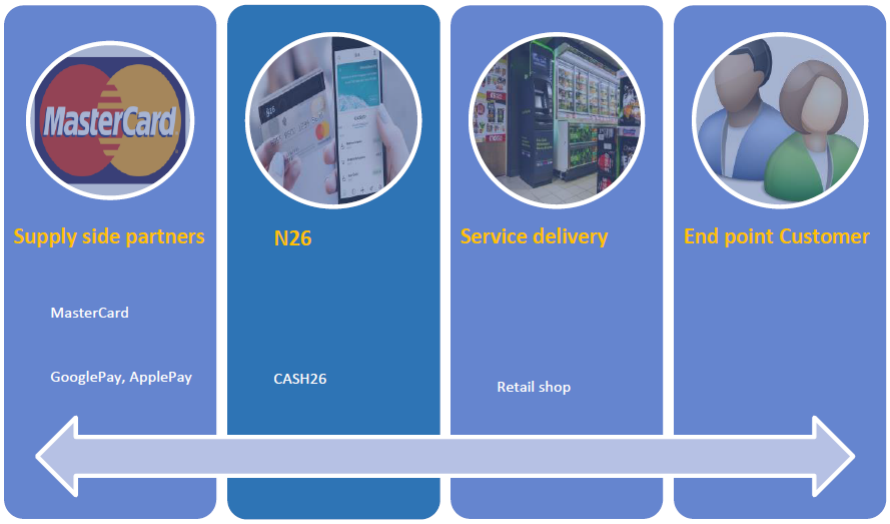

Figure 8. Supply Chain of N26

[36] Dr. Anastasios Fountis, Dr. Moumita Mukherjee, (2021), N26: A FintTech – Revolutionizing The Bankin Sector's Supply Chain, Berlin School of Business and Innovation, Germany, Pp. 390-391

N26 Partners are: Allianz, Vaamo, MaserCard, TransferWise, Clark, WeltSparen, Auxmoney and WeltSparen

Supply Chain Management (SCM) practices are:[37]

1. Inventory reduction, re-engineering of material flows, JIT delivery, JIT capability, waste elimination
2. Using Information and Communication Technology
3. Customer relationship including dealing compliance, fulfilment of customer requests, generating long term partnership and relationships, increased sensitivity and customer service management
4. Planned partnership strategies with suppliers

[37] Dr. Anastasios Fountis, Dr. Moumita Mukherjee, (2021), N26: A FintTech – Revolutionizing The Bankin Sector's Supply Chain, Berlin School of Business and Innovation, Germany, pp. 391

6. Digital Economy in Croatia

6.1 Report on cashless payment transactions in Croatia – 2020

"The increase in the number and the value of cashless payment transactions continued in almost all EU member states over the past few years. The increase in cashless payment transactions has been strongly driven by advances in internet and mobile banking as well as on card payments. In the Republic of Croatia, the increase particularly referred to the number of national card based transactions which, according to Croatian National Bank data, increased by 51%, while their value increased by 44% in the past five years. An average Croatian citizen today has 2.06 payment cards in his/her wallet, which places Croatia at the very top of the European Union."[38]

53% of business companies and 20% of consumers in Croatia have internet banking agreements and 27% of business companies and 39% of consumers have mobile banking agreements.

Over the last several years, the consumer number of internet banking services grew relatively slower than the consumer number of mobile banking. In 2020, consumers in Croatia initiated 37% of the total number of transactions with mobile banking.

By analysing 2020, we can conclude that card payment transactions accounted for 40 % of total volume of national cashless payment transactions and credit transfers stood at 37% while in international cashless payment transactions card transactions accounted for 85 % and credit transfer 15%.[39]

The table below shows the total number of cashless payment transactions in the Republic of Croatia in 2020.

[38] Croatian National Bank, 2021, Cashless Payment Transactions (Payment Statistics 2020), Zagreb, pp 3

[39] IBID, pp 3

Executed payment transactions (1)	Number of transactions	%	Value of transactions in kuna	%
A) NATIONAL PAYMENT TRANSACTIONS				
1 Sent credit transfers (2)	353,354,731	37.18%	2,242,048,903,642	96.11%
1.1 Credit transfers	328,830,660	93.06%	2,183,503,297,201	97.39%
1.2 Standing orders	24,524,071	6.94%	58,545,606,441	2.61%
2 Bill-paying service	13,699,655	1.44%	4,478,590,913	0.19%
3 Direct debits	19,890,023	2.09%	13,274,336,766	0.57%
4 Debits from the accounts by simple book entry (3)	183,589,150	19.32%	2,962,746,537	0.13%
5 Transactions using payment cards issued in the RC (4)	379,811,158	39.97%	69,949,173,180	3.00%
5.1 Debit payment cards	296,901,841	78.17%	49,326,416,784	70.52%
5.2 Credit payment cards	82,909,317	21.83%	20,622,756,396	29.48%
TOTAL NATIONAL PAYMENT TRANSACTIONS (1 – 5)	**950,344,717**	**100.00%**	**2,332,713,751,038**	**100.00%**
B) INTERNATIONAL PAYMENT TRANSACTIONS				
6 Sent credit transfers (5)	4,133,350	5.62%	256,926,278,539	48.74%
7 Received credit transfers (6)	6,792,809	9.24%	249,403,513,225	47.31%
8 Transactions using payment cards issued in the RC (7)	33,622,169	45.72%	10,674,524,281	2.03%
9 Transactions of acquiring payment cards issued outside the RC (8)	28,987,047	39.42%	10,130,244,903	1.92%
TOTAL INTERNATIONAL PAYMENT TRANSACTIONS (6 – 9)	**73,535,375**	**100.00%**	**527,134,560,948**	**100.00%**
TOTAL (A+B)	**1,023,880,092**		**2,859,848,311,986**	

Table 2. Report on cashless payment transactions in the Republic of Croatia in 2020

National cashless payment transactions data in the report are grouped into five categories: Sent credit transfers, bill paying service, direct debits, debits from the accounts by simple book entry and transactions using payment cards issued in Croatia.

6.2 Digital Economy and Society Index – 2019

"The European Commission has been monitoring Member States digital competitiveness with the Digital Economy and Society Index (DESI) reports since 2015. The set of reports includes both country profiles and thematic chapters. The DESI country reports combine quantitative evidence from the DESI indicator across the five dimensions of the index with country – specific policy insights and best practices. The hematic chapters present a European – level analysis of broadband connectivity, digital skills, use of the internet, digitization of business, digital public service, the ICT sector and its R&D spending"[40]

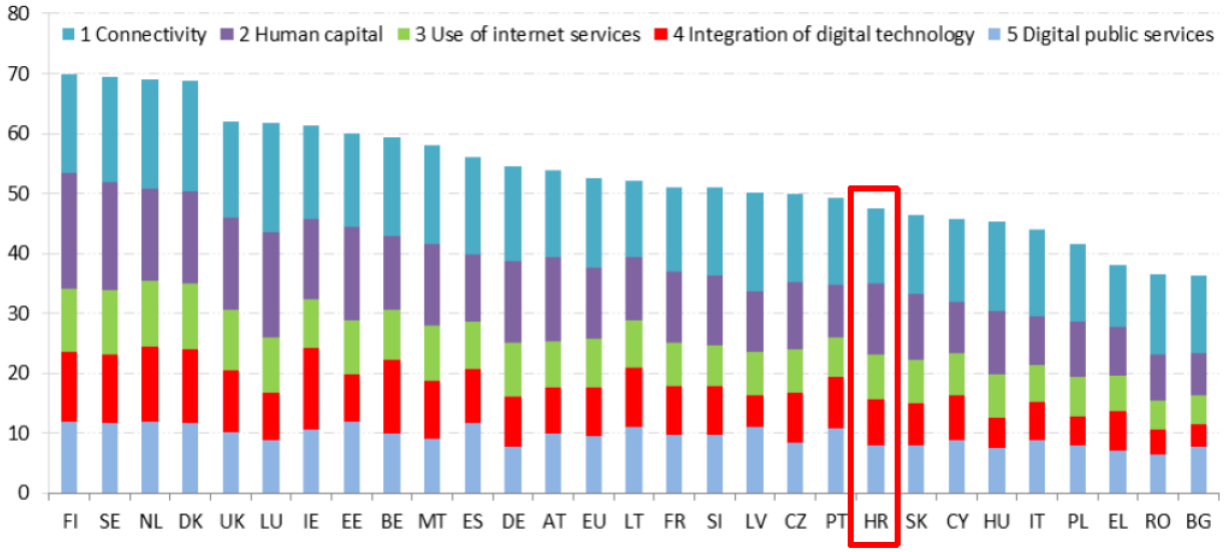

Figure 9. Digital Economy and Society Index (DESI) 2019 ranking

Croatia ranks 20th out of 28 EU states in DESI. Croatia performed well in improved 4G, broadband coverage and NGA. It still performs low in connectivity but made progress in digital public services and internet usage. Croatian companies are using big data, e-commerce, social media and Croats are among the keenest readers of online news.

[40] Economy and Society Index (DESI), 2019 Country Report, Croatia

Connectivity	Croatia		EU
	rank	score	score
DESI 2019	**27**	**50.1**	**59.3**
DESI 2018	27	43.5	54.8
DESI 2017	27	39.0	51.2

Figure 10. Connectivity

Croatia is situated at the bottom of the ranking as there isn't any significant improvement in connectivity. More concrete 5G deployment should improve wireless connectivity.

Use of internet services	Croatia		EU
	rank	score	score
DESI 2019	**15**	**49.7**	**53.4**
DESI 2018	18	46.1	50.7
DESI 2017	12	46.7	47.8

Figure 11. Use of internet services

Croatia is within EU average as Croats engage in a variety of online activities: using social networks, playing games, listening to music, watching videos, reading news.

Integration of digital technology	Croatia		EU
	rank	score	score
DESI 2019	**18**	**38.6**	**41.1**
DESI 2018	18	36.9	39.6
DESI 2017	17	35.9	37.6

Figure 12. Integration of digital technologies

Croatia ranks to 18th on the integration of digital technology within business. 15.5 % of companies are at a high level of digital intensity, 22 % of companies uses cloud and 18% of SMEs sells online.

Digital public services	Croatia		EU
	rank	score	score
DESI 2019	22	53.0	62.9
DESI 2018	23	47.3	57.9
DESI 2017	21	44.5	54.0

Figure 13. Digital public services

Regarding digital public services, Croatia ranks 22. It performs well in online interactions between authorities and citizens (75%) With the development of an e-Citizen system, service has become more transparent as platform allows to access document regarding taxation, insurance, health and pension.

7. Analysis

To complete the objectives of the study, research in the form of a questionnaire has been conducted and 79 solved the questionnaire. The collected data are as opinions, anecdotes, descriptions to determine the factors influencing the adoption of internet banking in Croatia. Research utilized Likert scale to measure variables of perceived ease of use, usefulness, credibility and convenience. Demographic data of respondents includes age and gender

7.1 Research results

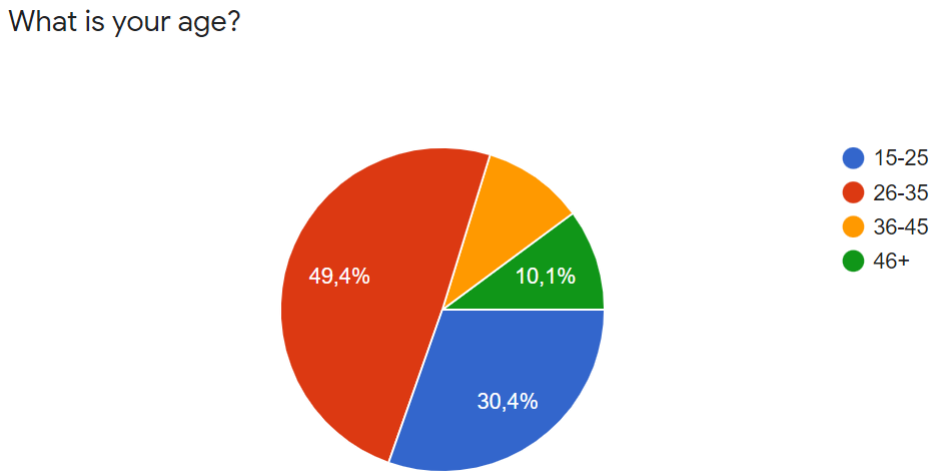

Figure 14. Respondent age

Out of 79 respondents, 49,4% are the age of 26-35, while 30,4% of them are between the age of 15-25 and 20,2% are older than 36. We can see that majority of respondents (79,8 %) are young people between the age of 15-35. Young people are more likely to use technologies to ease their daily needs.

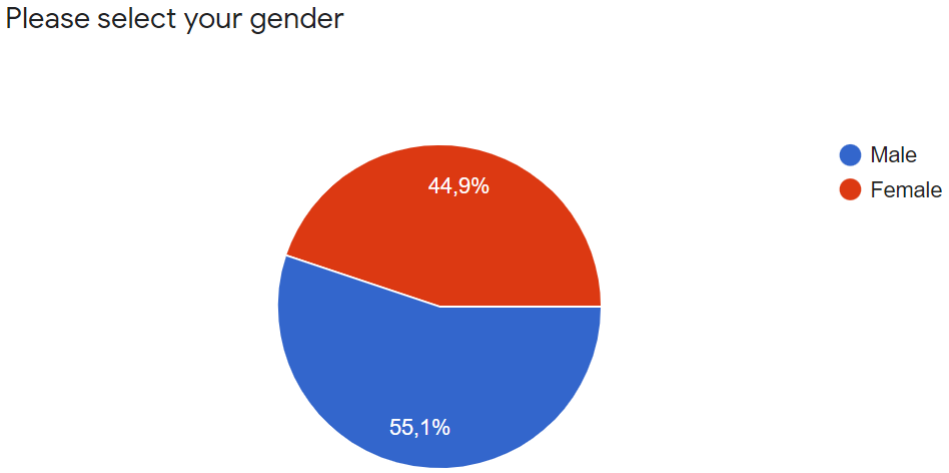

Figure 15. Gender

Figure 15 shows the percentage of respondents by demographic characteristics "Gender". A survey was completed by 55.1% of males and 44.9% of females.

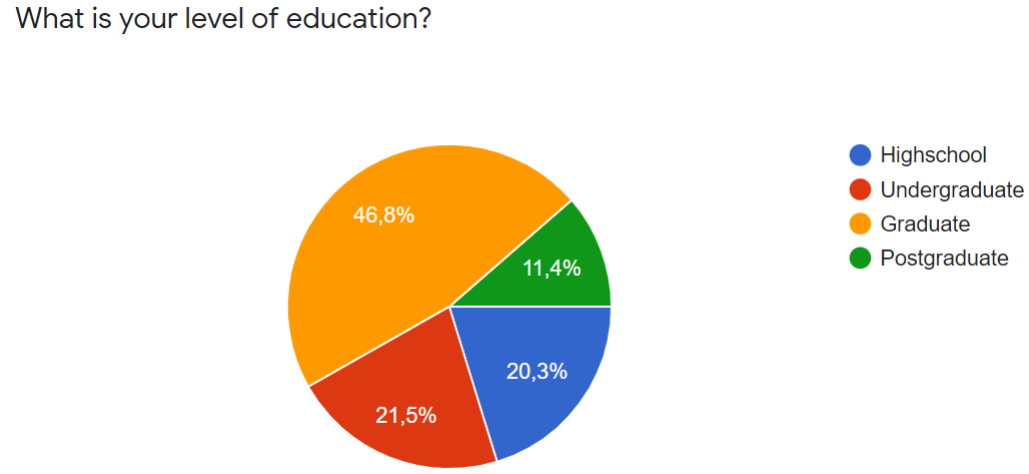

Figure 16. Level of education

Regarding the level of completed education, 46.8% of respondents are graduates, 21.5% are undergraduates, 20.3% are in high school and 11.4% are postgraduates. 79.7 % of respondents are highly educated and those people are prone to accept new technology trends and services. 11.4 % level of education is high school but as the majority of respondents are young people, there is a possibility that some respondents are still attending high school.

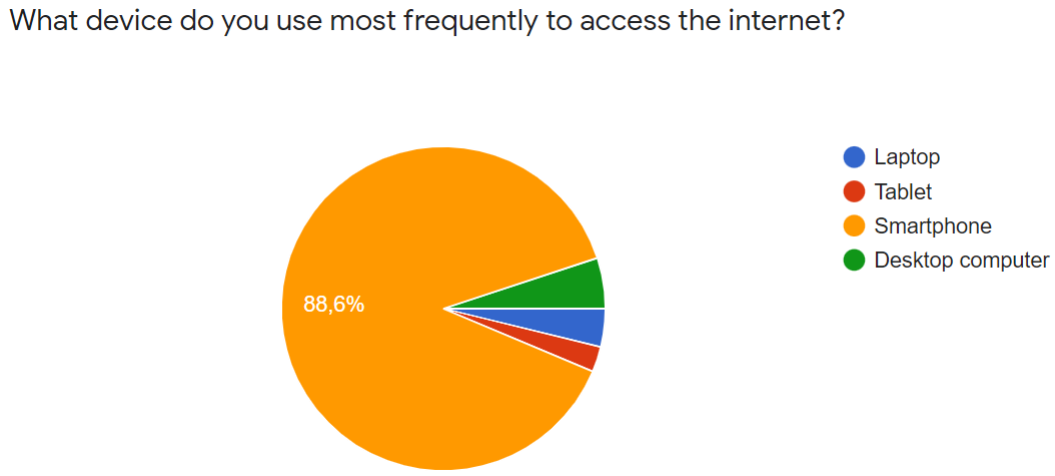

Figure 17. Device preferences to access internet

88.6% of respondents most frequently use a smartphone to access the internet. With the appearance of smartphone technology, banks and FinTech companies focused on developing mobile applications for online banking. Only a small percentage of respondents are still using device such as a laptop or desktop computer to access internet banking. Smartphone has become the most important device for the present and future development of digital banking.

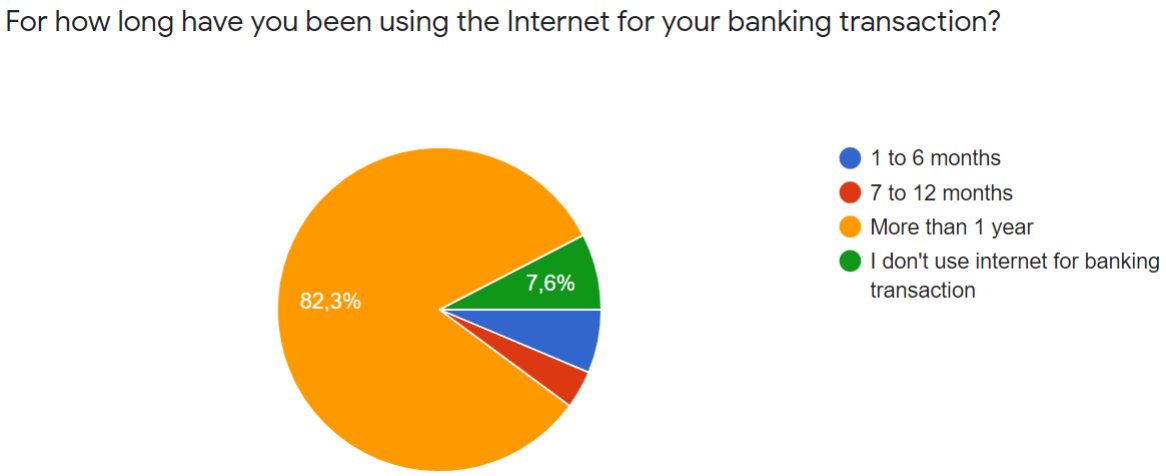

Figure 18. Internet banking duration

82.3% of respondents have been using the internet for more than 1 year for banking transactions while 7.6% (6 respondents) don't use internet for banking. Internet banking has become widely accepted for a long time and any new upgrades or improvements should be quickly accepted by existing customers.

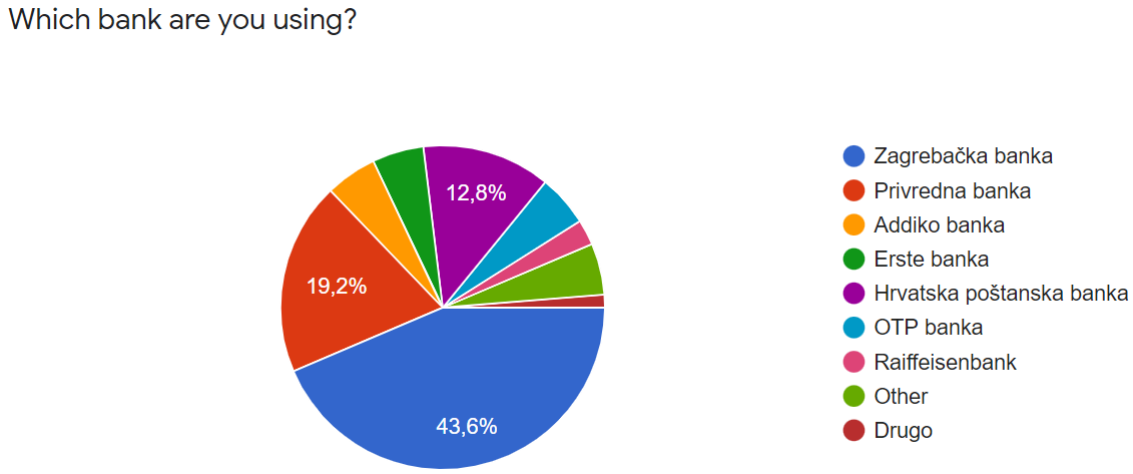

Figure 19. Bank

43.6% of respondents are clients in Zagreb bank, 19.2% in PBZ and 12.8% in HPB. We can conclude that the three most popular commercial banks in Croatia are "Zagrebačka Banka", "Privredna Banka Zagreb" and "Hrvatska Poštanska Banka (HPB)". Those three banks offer the highest quality services based on respondents answers.

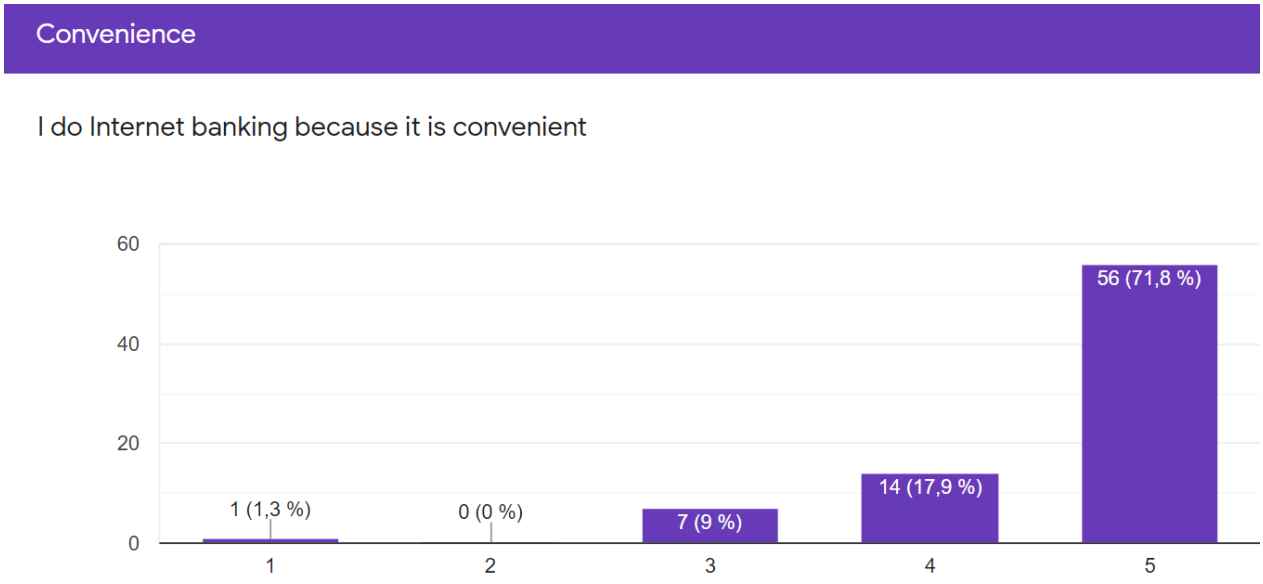

Figure 20. Convenience

89.7% of respondents agree that internet banking is convenient while 9% are not sure and 1.3% thinks internet banking is not convenient. Convenience is the most important factor in implementing digital technology for banking purposes as clients are not required to physically visit banks but can do everything over their smartphone from the comfort of their homes.

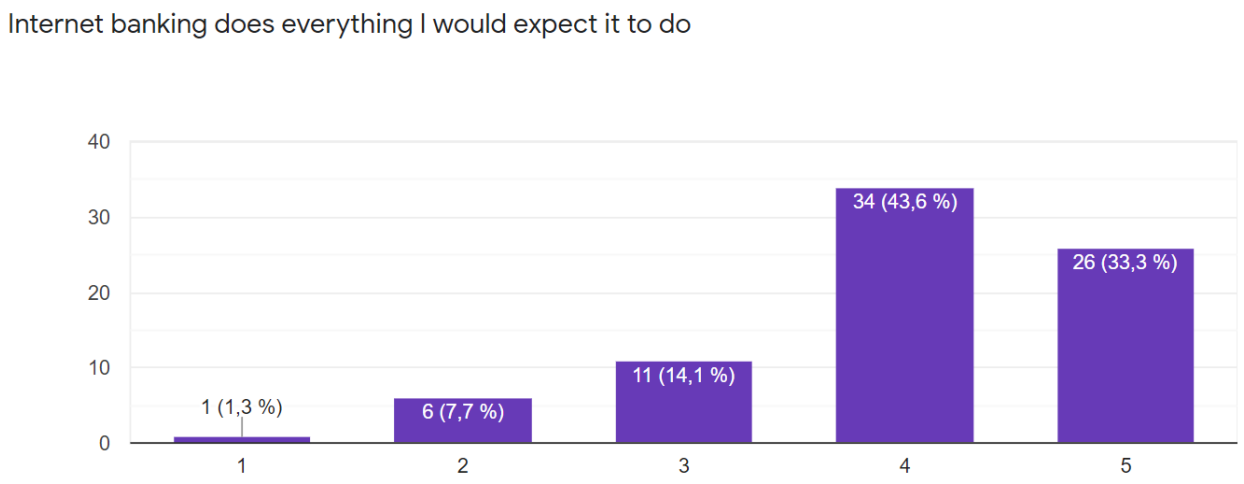

Figure. 21 Expectation

76,9 % of respondents claim that internet banking met their expectation, 14.1% are not sure and 9% disagrees. The majority of respondents are satisfied with the possibilities that internet banking provides them. As technology can only improve, respondents who are not sure or disagrees with the statement are surely be satisfied in the future.

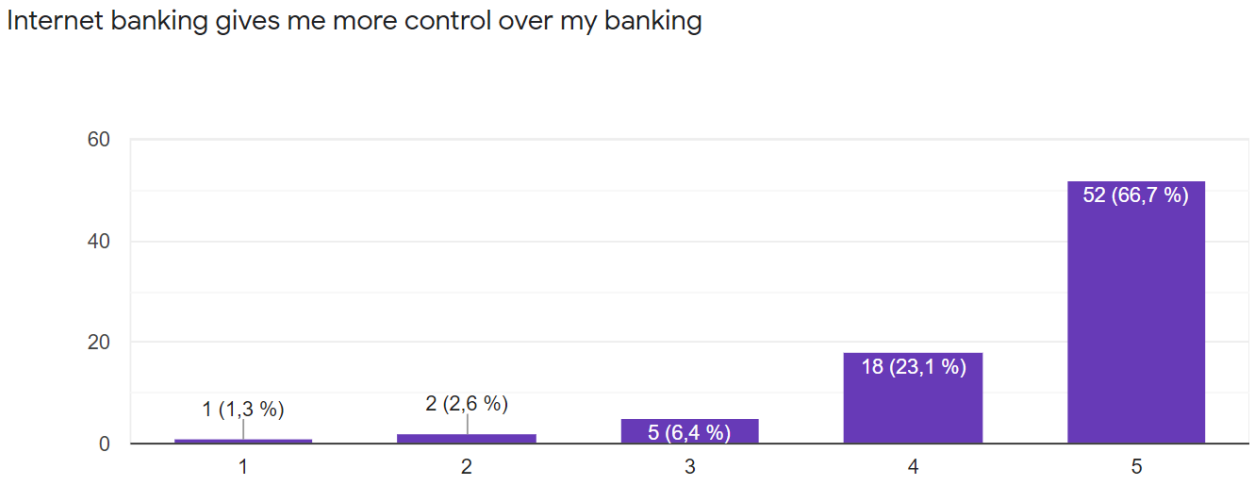

Figure 22. Control

89.8 % of respondents agree that internet banking gives more control over their banking, 6,4 % are unsure and 3.9 % disagrees. With smartphones and mobile application, we have more control over our banking. There is no need to physically visit banks as we can do everything over mobile applications by ourselves.

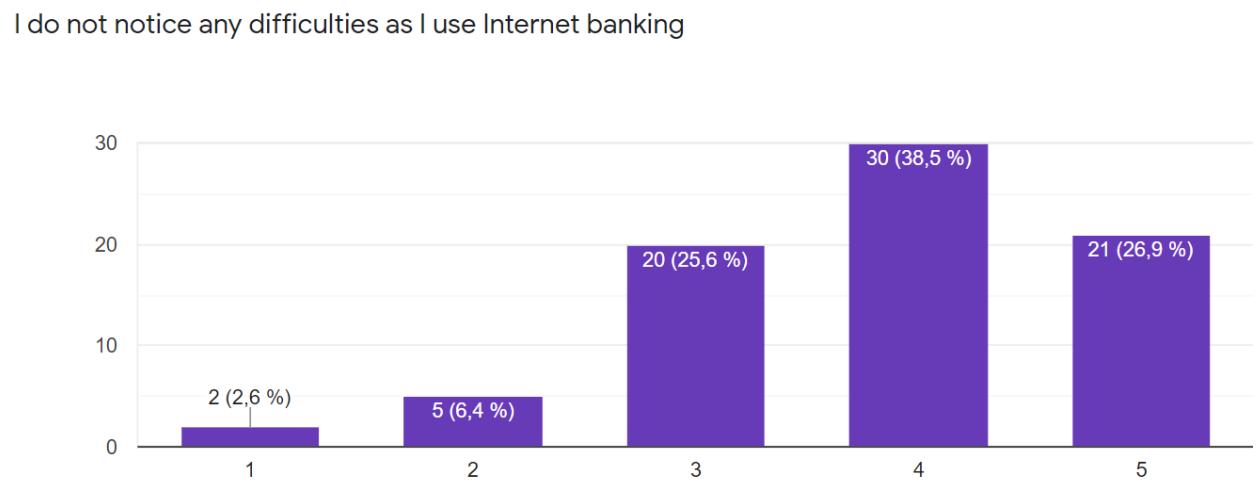

Figure 23. Difficulties

65% of respondents do not notice any difficulties using internet banking, 25,6% are not sure while 9 % noticed difficulties. The majority of respondents do not notice any difficulties which mean they have high understanding regarding technology and the opportunities it brings. Those who are "not sure" or "disagrees" are probably still new to this technology and it takes some for them to learn it.

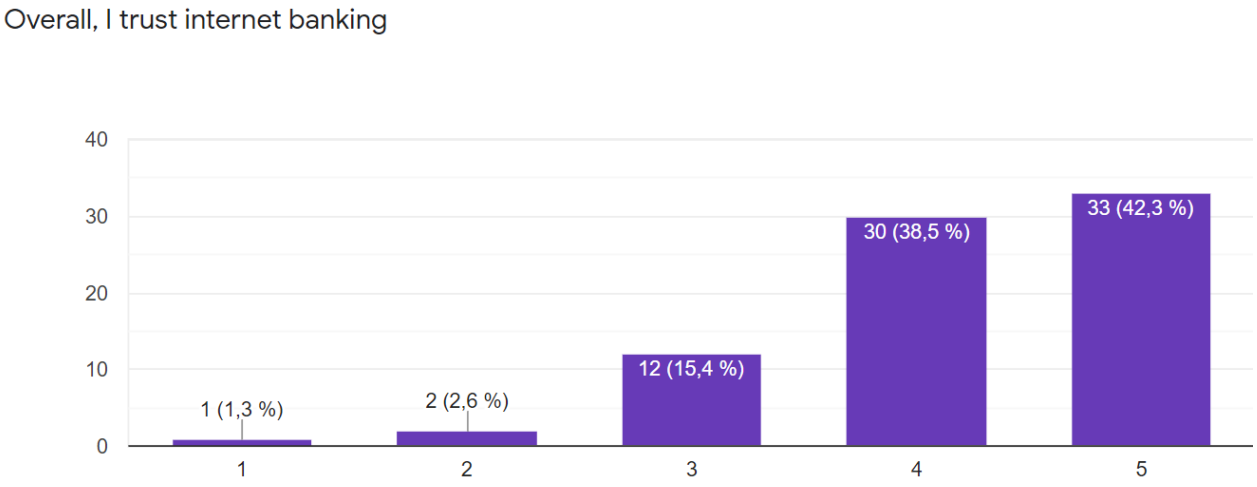

Figure 24. Trust

80.8 % of respondents trust internet banking while 15.4 % are uncertain and 3.9 % do not trust internet banking. The majority of respondents see internet banking as trustworthy and are looking forward to future technology advancement.

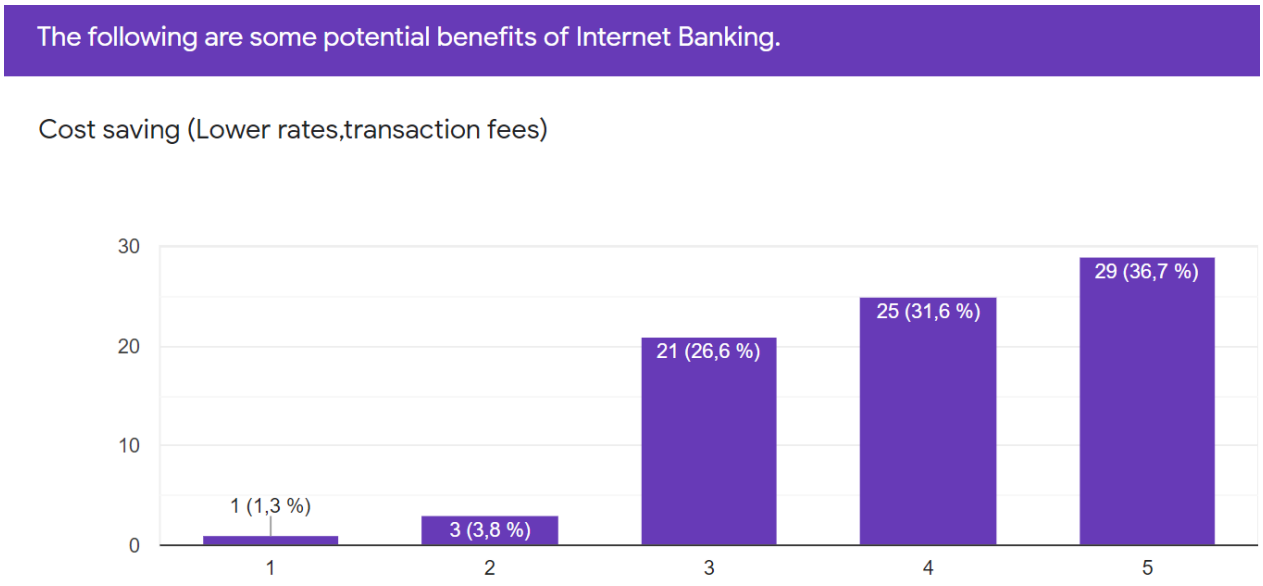

Figure 25. Cost saving

68.3 % of respondents think that using internet banking is cost-efficient while 26.6 % are unsure and 5.1 % does not think that internet banking is cost-efficient. The majority of respondents agree that by using internet banking they will have lower costs. The remaining respondents are not aware of this potential benefit and believe that costs are the same as physically visiting a bank.

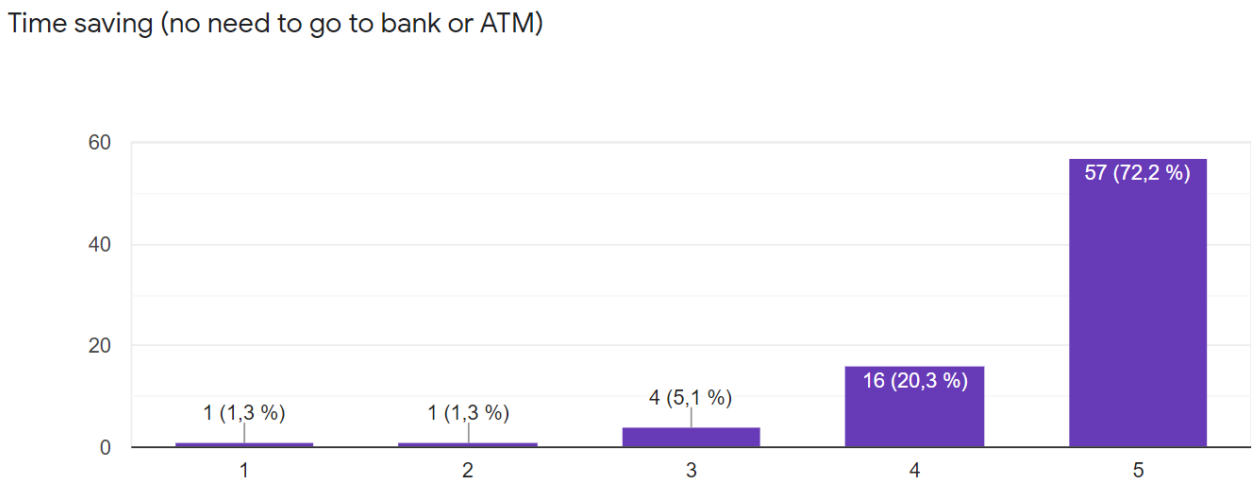

Figure 26. Time saving

92.5 % of respondents agree that using internet banking is time saving while 5.1 % are uncertain and 2.6 % disagree. Respondents are aware that they do not need to often physically visit a bank and wait in line because now they are able to do everything over a mobile application.

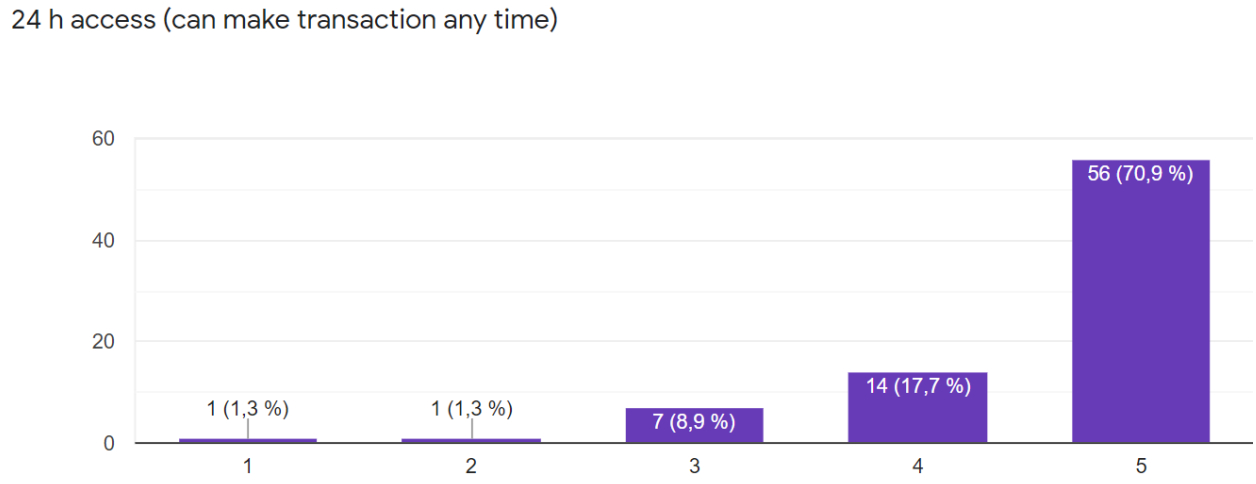

Figure 27. 24 h access

88.6 % of respondents agree that 24 h access to banking is a benefit of internet banking while 8.8 % are uncertain and 2.6 % disagree. With mobile and internet banking we are able to conduct transactions and other services whenever we want.

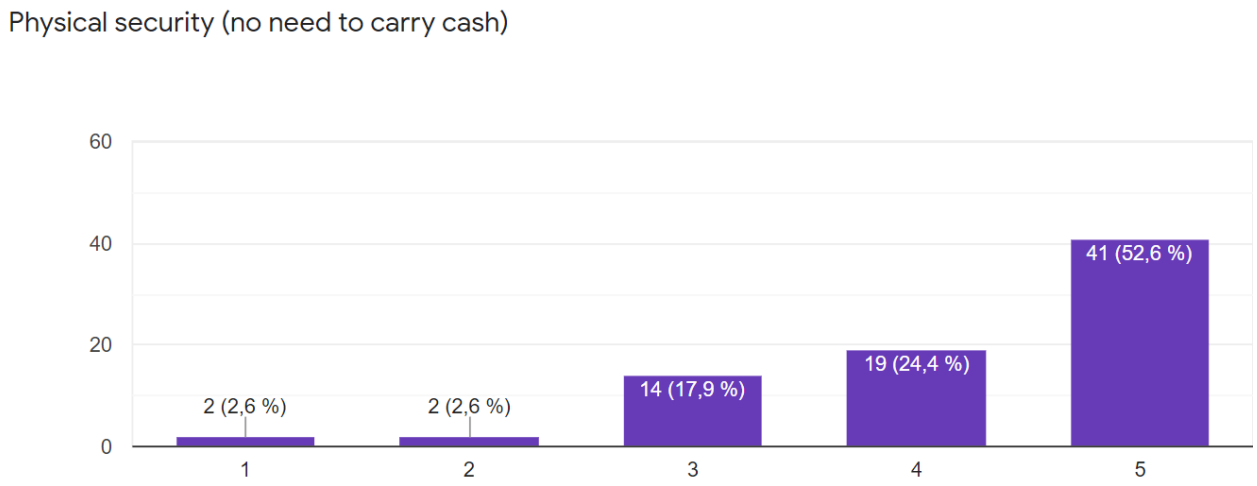

Figure 28. Security

77 % of respondents that internet banking gives them more security while 17.9 % are uncertain and 5.2 % does not agree. We are able to make payments with a smartphone or smartwatch and there is no need to carry cash with us all the time. This gives us more protection over our money.

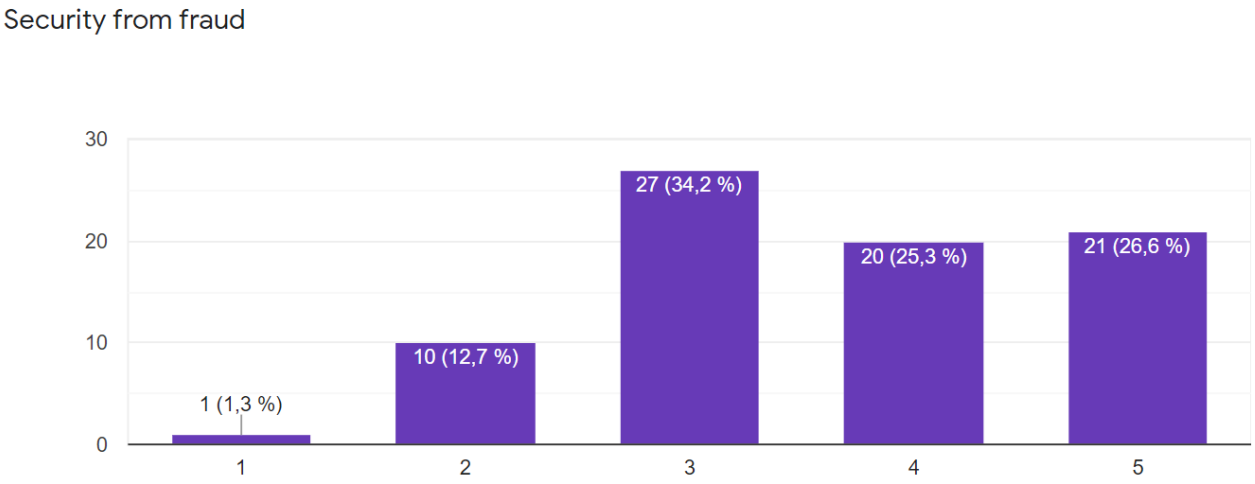

Figure 29. Security from fraud

51.9 % of respondents agree that internet banking gives them more security from fraud while 34.2 % are uncertain and 14 % does not agree. With more control over our banking, we are more protected against possible frauds. Security is an important factor for adopting digital banking and clients should educate themselves regarding security.

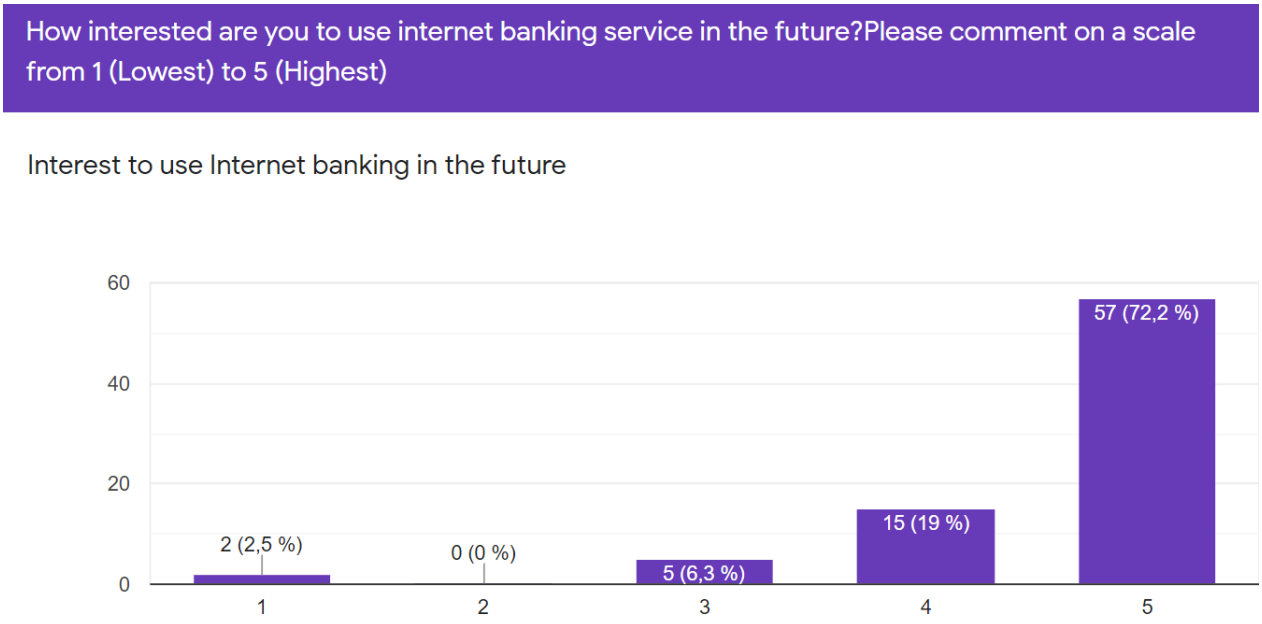

Figure 30. Interest

91.2 % of respondents are interested to use internet banking services in the future while 6.3 % are uncertain whether they will use internet banking and 2.5 % are not interested in internet banking services. The majority of respondents believes in the future of internet banking and are looking forward to what new innovations it will bring.

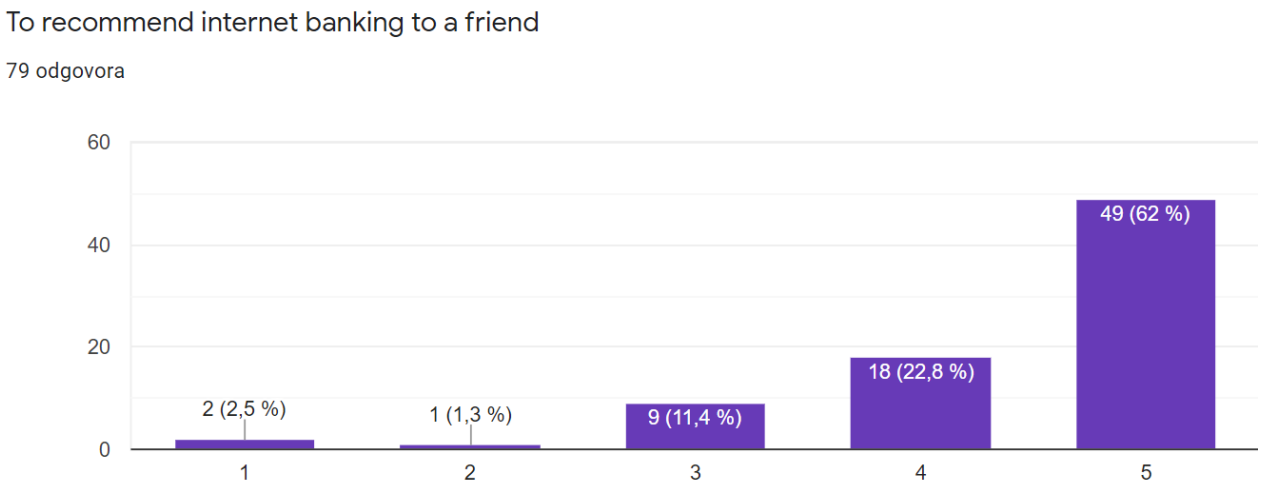

Figure 31. Recommendation

84.8 % of respondents are willing to recommend internet banking to a friend while 11.4 % are uncertain and 3.8 % won't recommend internet banking to a friend. Recommending internet banking to a friend will benefit both parties as they will able to conduct transactions instantly.

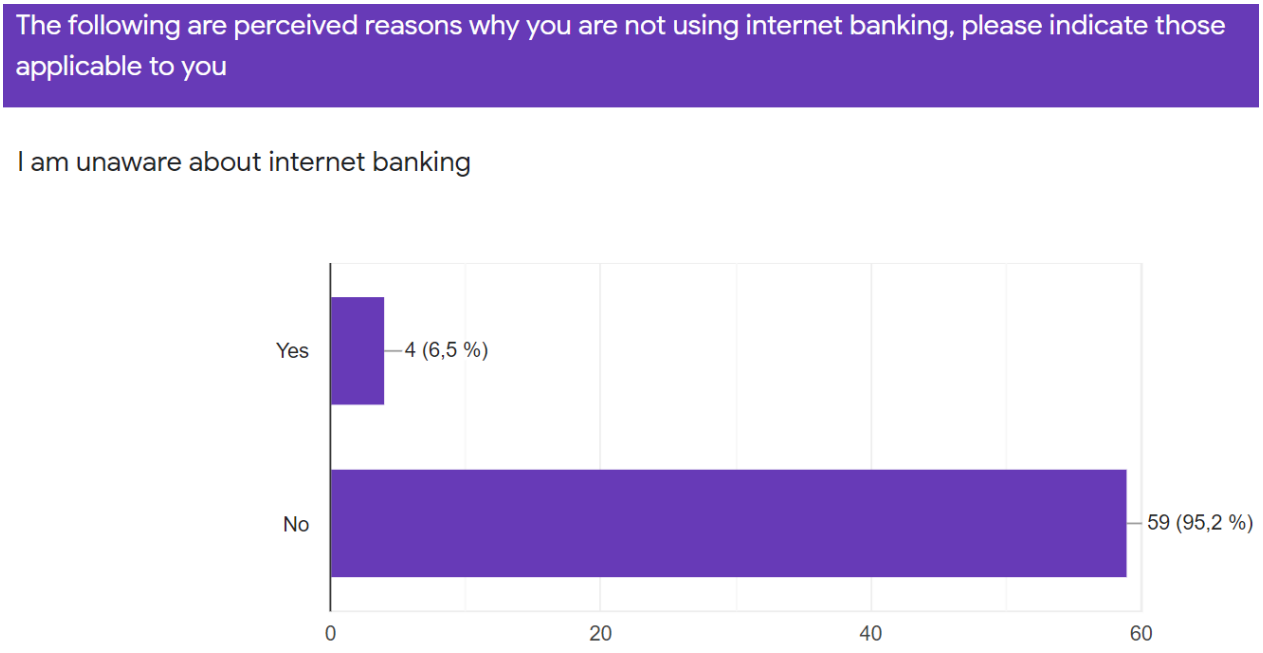

Figure 32. Awareness

6.5 % of respondents are unaware of internet banking. Internet banking is widely accepted and it is no wonder that only a small percentage of respondents are not aware about

internet banking. They are probably older people who have been using traditional banking and are not interested in changes.

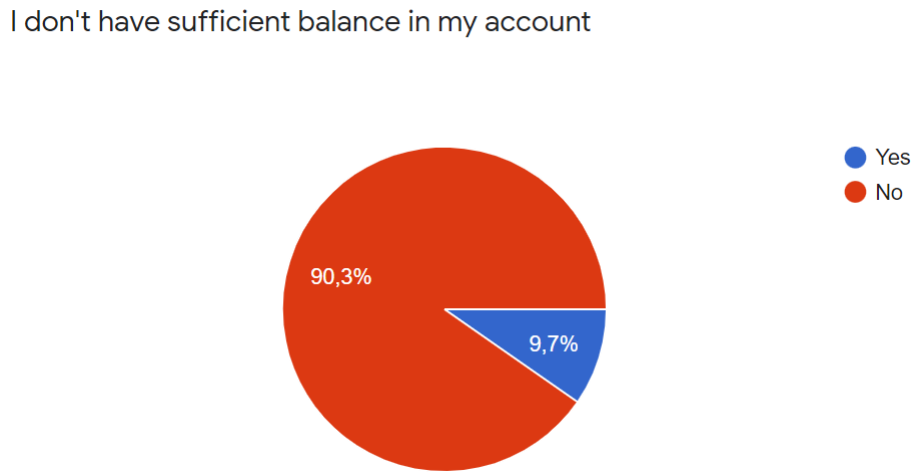

Figure 33. Sufficient balance

9.7 % of respondents do not have sufficient balance in their account. Since they have insufficient balance on their account they think it is unnecessary to use internet banking.

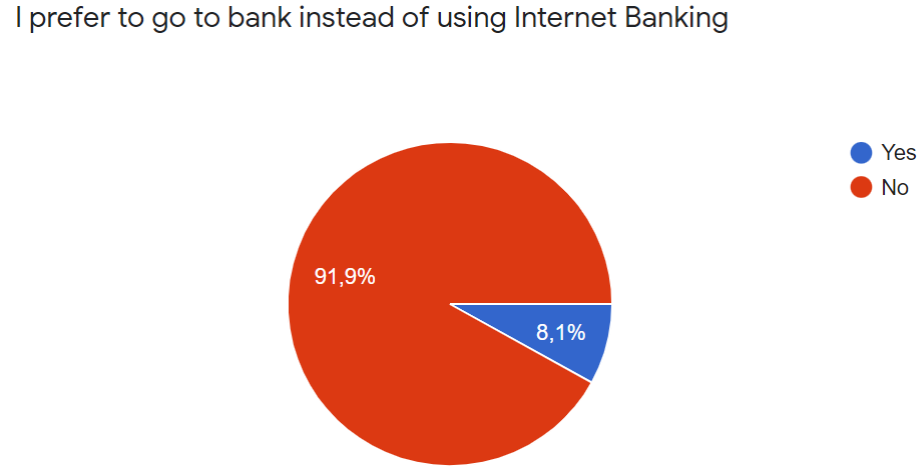

Figure 34. Preferences

8.1 % of respondents prefer to go to the bank instead of using internet banking. They are probably older people who have been using traditional banking for a while and are not interested in changes.

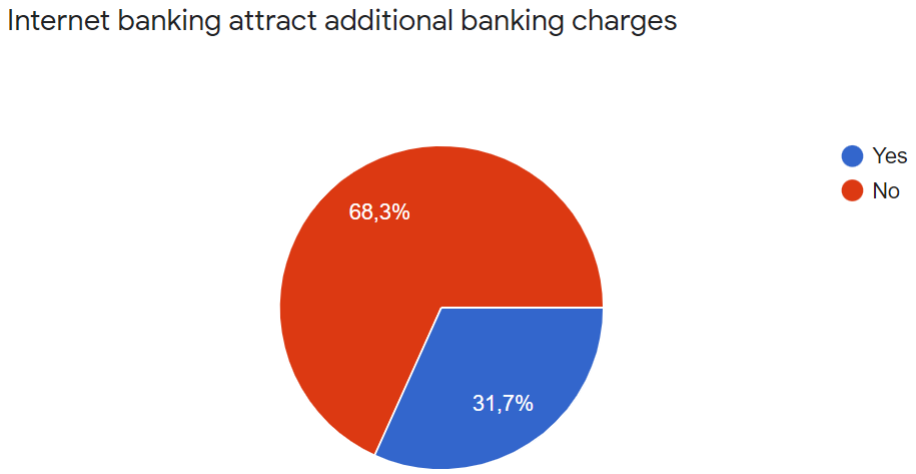

Figure 35. Banking charges

31.7 % of respondents believe that internet banking attracts additional banking charges. Some respondents are sceptic towards internet banking and believe that they will spend more if they use internet banking.

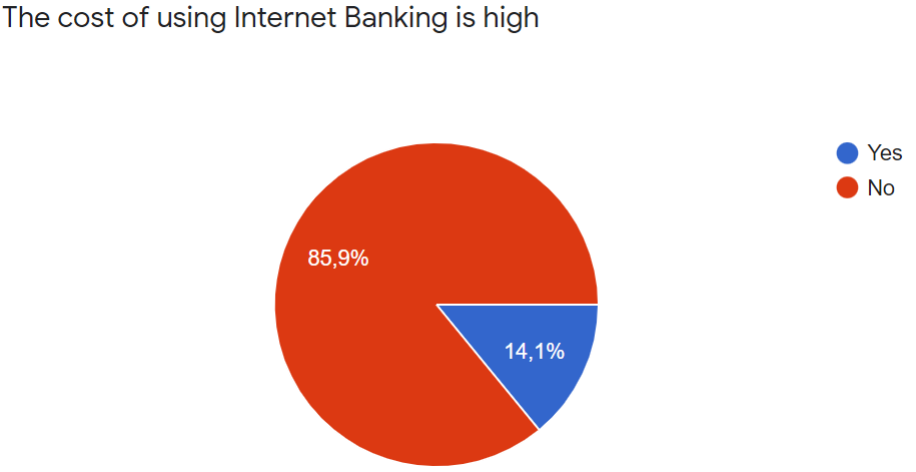

Figure 36. Cost

14.1 % of respondents believe that the cost of using internet banking is high. The majority of respondents believe that cost of using the internet is not high.

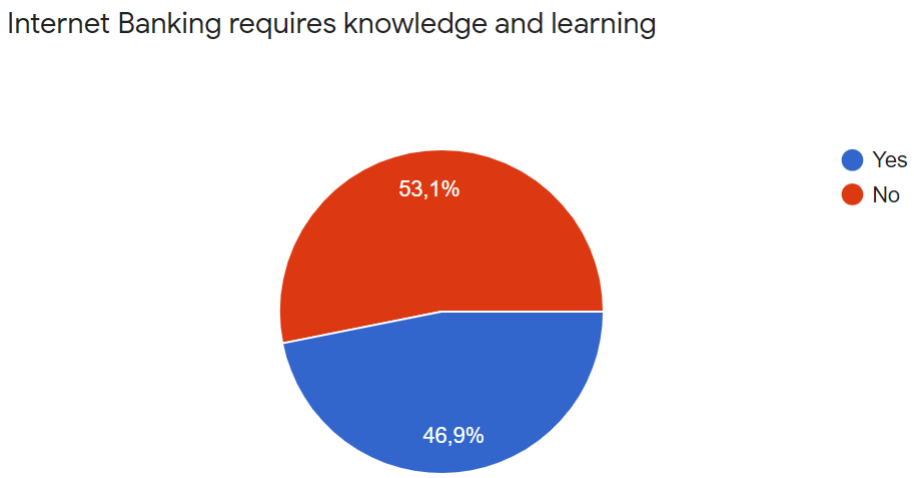

Figure 37. Knowledge and learning

46.9 % of respondents agree that knowledge and learning are required to use internet banking. Many respondents did not face similar technologies and they had to learn to use internet banking. For others, this technology and its complexity were very easy to understand.

7.2 Discussion

The majority of respondents were young people aged from 15- 35 (79.8 %) with higher education (79.7 %). Based on the research data, we can conclude that internet banking is well accepted by a younger generation and more educated people. Younger generations are more exposed to new technologies and there is a higher chance for them to be an early adopter. The majority of people use a smartphone to access the internet (88.6 %), making banks and FinTech concentrate mostly on offering services through a mobile application.

82.3 % of respondents have been using internet banking for more than a year, meaning that people in Croatia are well aware of financial technology and its benefits.

The three main banks that the majority of respondents use are: “Zagrebačka Banka”, “Privredna Banka ” and “Hrvatska Poštanska Banka”, meaning that Croats are most pleased with services offered from these three banks and are users of M-zaba, Mhpb and PBZ mobile banking applications.

The majority of respondents of 89.7 % agreed that they use internet banking because it is convenient. Convenience is the main factor for users to adopt internet banking. The majority of respondents also are pleased with the options that internet banking provides for them such as control over their banking.

Although 65,4 % of respondents do not notice any difficulties as they use internet banking, still 34.6 % do face some kind of difficulties when they use internet banking.

Respondents agreed that cost saving, time saving, 24 h access, physical security, security from fraud are benefits of internet banking.

The majority of respondents are interested to continue using internet banking in the future and recommend it to a friend.

With research from the study, we can conclude that younger generations are well adopted with financial technology, mobile banking and internet banking.

Internet banking has become widely accepted as the majority of respondents have been using internet banking for more than a year.

8. Conclusion

This paper objective was to measure usage and knowledge people have about digital banking, evaluation of customer services, examine the correlation of digital banking with people education and age in Croatia, identify factors that influence the effective adoption of internet banking, provide recommendations for improvement of digital banking services in Croatia and analyse banking services offered by commercial banks in Croatia.

Young and educated people in Croatia are fairly knowledgeable about digital banking and its benefits. The main factor in adopting digital banking is convenience.

Commercial banks in Croatia should put more focus on promoting mobile banking benefits to potential consumers. By educating people, more customers will be able to use the benefits of mobile banking while banks will have more clients. Banks are aware that customer service is important to keep their clients satisfied as competition is high and the client could easily change the bank if he is dissatisfied.

The financial crisis in 2009 damaged the reputation of the banking industry. Banking is going through transformation by using big data, IT and specialized human capital. This transformation brings the development of a new business model and with financial technology, new services are being offered.

Blockchain technology promises immense opportunities to tackle new challenges in the banking industry. It is a digital, decentralized and distributed ledger that record transactions near real time.

Mobile banking eased the banking process as it was not necessary to visit brick and mortar banks. Gen X, Y and millennials are becoming core banking customers as they are quicker to adapt to a digital experience.

Blockchain and Internet on Things are technologies that will make digital banking sector go through extensive development

FinTech, a global business itself and not affected by boundaries of states, developed in Croatia. Financial technology brought financial innovation that could result in new applications, products and processes. FinTech was developing so rapidly that financial services no longer rested with regulated financial institutions. Technology was developing

so rapidly that regulators just could not keep up with the changes but now they are slowly catching up.

The main variables in adopting digital banking are security, lower cost, efficiency, convenience and customer experience. In digital banking, customer service is always available for customers as they want to make digital banking as convenient as possible.

Domestic banking apps are M-zaba, PBZ mobile banking, KEKS Pay, Addiko mBanking, mHPB, MojaRBA and OTP m-banking.

M-zaba, PBZ mobile banking and mHPB are the most popular banking mobile applications in Croatia.

Popular international digital banking platforms are Revolut, Ant (Alipay) and N26. In 2020, consumers in Croatia initiated 37% of the total number of transactions with mobile banking.

According to Digital Economy and Society Index, Croatia ranked 20th out of 28 EU states. Croatia is below the EU average but it is steadily increasing. Croatia performed well in improved 4G, broadband coverage and NGA. It made progress in internet usage and digital public services but performance in connectivity is low.

9. List of Figures

10. List of Tables

11. References

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