Digitalisation of banking products and services

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University of Zagreb
Faculty of Economics and Business
Master in Managerial Informatics

Digitalisation of Banking Products and Services

Master Thesis

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Zagreb, September 2021

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1. Introduction

1.1.Topic and Goals of the Thesis

The topic of the thesis is to examine the effect digitalisation has had, and is having on the banking industry, more specifically, on the products/services offered by banking institutions, and the interactions and relationships between bank and customer. The thesis will also examine the customers‘ evolving banking habits and preferences.
Digitalisation is having a profound impact on the nature of customer product and service provision. And the banking sector is no exception. New entrants (among them BigTech and FinTech firms) are applying competitive pressure on established banks by leveraging new innovative technology and business models. Customers (especially the younger generations) are increasingly expecting these new technologies to be made available to them, as the convenience factor digitalisation brings grows in importance. The development and constant improvement of banking Apps and online banking platforms is therefore crucial.
The Thesis has the following objectives:

- To explain the concept of digital banking services.
- To show current trends in digitalisation of banking products and services
- To identify the factors that induce the customers to prefer digital banking services over conventional banking services.
- To assess the level digital affinity of banking customers in Croatia
- To assess the importance of digital channels to banking customers in Croatia

1.2.Explanation of the methodology

In order to achieve the research goals, literature on the topic will be presented and analysed, mainly stemming from books, research papers, articles and other publications closely tied to the thesis topic, as well as statistical data and graphs taken from the ECP, ITU (and other) web-sites. In addition, primary data collected via an online questionnaire will be presented. The questionnaire should give an insight into the banking habits and expectations of Croatian citizens. The questionnaire consists of following parts: (i) respondents’ demographic characteristics (like age, level of education, gender etc.); (ii) respondents’ banking habits and preferences (including which bank they are using, how often do they use digital channels, how often do they visit bank branches, what is the level of satisfaction with the digital

channels of their bank etc.); (iii) respondents' familiarity with digital banking (which functionalities are they using)

1.3. Structure of the Thesis

The first chapter is Introduction which will include description of Topic and Goal of the Thesis. Furthermore, Data and Methodology will be presented. At the end of the Introduction, Structure of Thesis will be described.

In the second chapter, firstly, a general description of the banking industry (the main focus will be on retail banking) will be given. Next the circumstances which facilitated the movement of digitalisation of banking products will be described, as well as the emergence of FinTech. That will be followed by descriptions of how banks have adopted/are adopting digitalisation, how digitalisation is evolving banking products and distribution channels. In the following subsection the emergence of digital native banks will be discussed. In the final part of the second chapter, possible disadvantages, challenges and risks will be pointed out.

The third chapter will focus on concrete examples of some banks in Croatia which utilized digitalisation to modify their products. The data will mainly stem from the individual banks' websites and publications, qualitative analysis. The fourth chapter will contain the Analysis of the Research Results regarding the banking habits and expectations of Croatian citizens, where the sub-chapters will explain and present the Research Methodology, Research Results followed by a Discussion.

After this, a Conclusion will be brought forth. Followed by the list of references and appendix.

2. Literature Review on the Digitalisation of Banking Products

In this part of the master thesis, the most relevant literature regarding the thesis subject is examined. A short introduction into the banking industry is given, after which an explanation will be given describing factors which facilitated the shift to digitalisation. The term of FinTech companies will be introduced and analysed in detail.
Also, individual banking products and services will be observed to show how digitalisation has, and still is, transforming them. The emergence of banks which operate exclusively digitally will also be discussed. Next, the accelerating effect Covid-19 has had on digitalisation in banking will be shown. Finally, in the last part sub-chapter of this thesis, some disadvantages, risks and future challenges will be discussed in order to give a more complete view of digitalisation in banking.

2.1.Introduction to the Banking Industry

Banks can be defined as licenced financial institutions whose core activity is to receive deposits from savers in order to make loans to borrowers. A banks main source of income is interest that borrowers pay on those loans. Thus, it can be said that banks act as financial intermediaries between savers and borrowers.
Banks are in most countries regulated by central banks or by the national government.

2.1.1. Traditional vs Modern Banking

Over the last (roughly) 30 years, the banking industry has gone through a significant change, to the point that banks have transformed their operations from traditional banking (to modern banking). In traditional banking most of a bank's income came from lending operations. Therefore, the main source of bank profitability was Net interest margins ("*the difference between interest revenues from lending minus the interest cost on deposits"*). The reason for that was not the industry's unwillingness to expand their business model, but rather the fact that, in the past (until the 1990s), banking markets had been a lot more regulated/restricted compared to today's standards. For example, banks in the United Kingdom were not allowed to deal in certain investment banking and securities business until 1986.
In 1992. the EU introduced a new banking directive, defining the so-called Universal Banking Model, under which the banking business was defined to include all aspects of

financial service activity[1]. Similar examples of deregulation can be found in other markets, such as the US. Such deregulatory trends were also accompanied by advancements in technology which significantly improved back-office processing and the delivery of banking services to the customer.

The following figure illustrates the changes from traditional to modern banking.

Figure 1: Traditional vs Modern Banking (Source: Casu, B. Girardone, C. Molyneux, P. (2015.): "Introduction to Banking", 2nd edition, Pearson)

Traditional banking	Modern banking
Products and services: LIMITED • Loans • Deposits	Products and services: UNIVERSAL • Loans • Deposits • Insurance • Securities/investment banking • Pensions • Other financial services
Income sources: • Net interest income	Income sources: • Net interest income • Fee and commission income
Competitive environment: • Restricted	Competitive environment: • High competition
Strategic focus: • Asset size and growth	Strategic focus: • Returns to shareholders • Creating shareholder value (generating Return-on-equity, ROE, greater than the cost of capital)
Customer focus: • Supply led	Customer focus: • Demand led • Creating value for customers

2.1.2. Retail or Personal Banking

Relates to the provision of banking services to consumers and usually is small-scale in nature. All large banks usually offer a wide range of personal financial services, among which are payment services, mortgages, loans, savings and other services. Some of the types of banks which offer personal banking services include: commercial banks, savings banks, credit unions and cooperative banks.

[1] Source: Casu, B. Girardone, C. Molyneux, P. (2015.): "Introduction to Banking", 2nd edition, Pearson

The digitalisation of personal banking services will be the prime focus of this paper.

Commercial banks are the most common among them and are the principal providers of loan and deposit services. Although commercial banking refers to banks whose main business revolves around taking deposits and giving loans, it is important to note that the largest commercial banks operate in insurance, investment banking and other financial areas as well.

2.1.3. Private Banking

Private banking is another segment of banking, which is closely related to personal banking. Private banking relates to high quality provision of financial services to clients with substantial amounts of investable funds at their disposal. Usually, the offered services include a combination of retail banking services like payment and deposit facilitation, as well as a wide range of up-market investment-related services. Key traits of private banking include: personal contact, tailoring services to individual client requirements, long-term relationship orientation, anticipation of client needs, and discretion.

2.1.4. Corporate Banking

Corporate banking is a term which is typically used to describe banking services which are provided to (generally large) companies. Although some sources use it for all companies. Banking service which are provided to small and medium-sized companies are in many ways similar to the services provided in personal banking. The range and complexity of the product and services offered increases with the size of companies. Some of which include securities underwriting, guarantees, foreign exchange and interest rate-related transactions, etc. In this paper we will not go deeper into the intricacies of those services, as the paper focuses mainly on retail banking.

2.1.5. Investment Banking

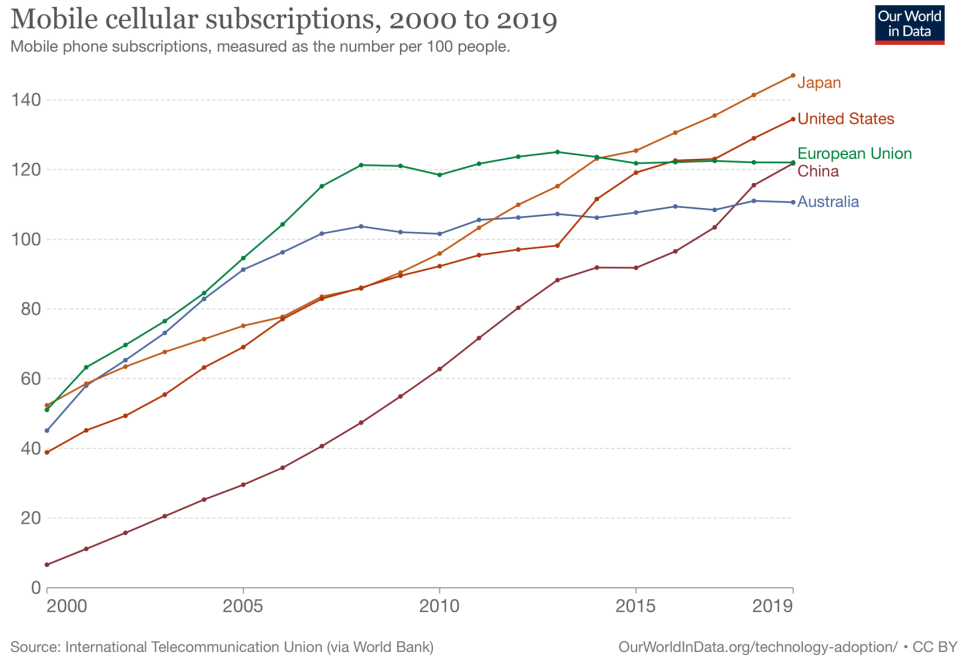
Investment banking mainly deals with the raising of capital for companies, governments and other large entities. This is achieved either by issuing stocks (equity) or bonds (debt). Unlike the banking institutions discussed in the subchapters above, investment banks typically do not deal with retail banking services. Other services of investment banking include providing corporate advisory on mergers and acquisitions and other kinds of corporate restructuring.

2.2.Changes in Demand and Supply

2.2.1. Changes in Demand

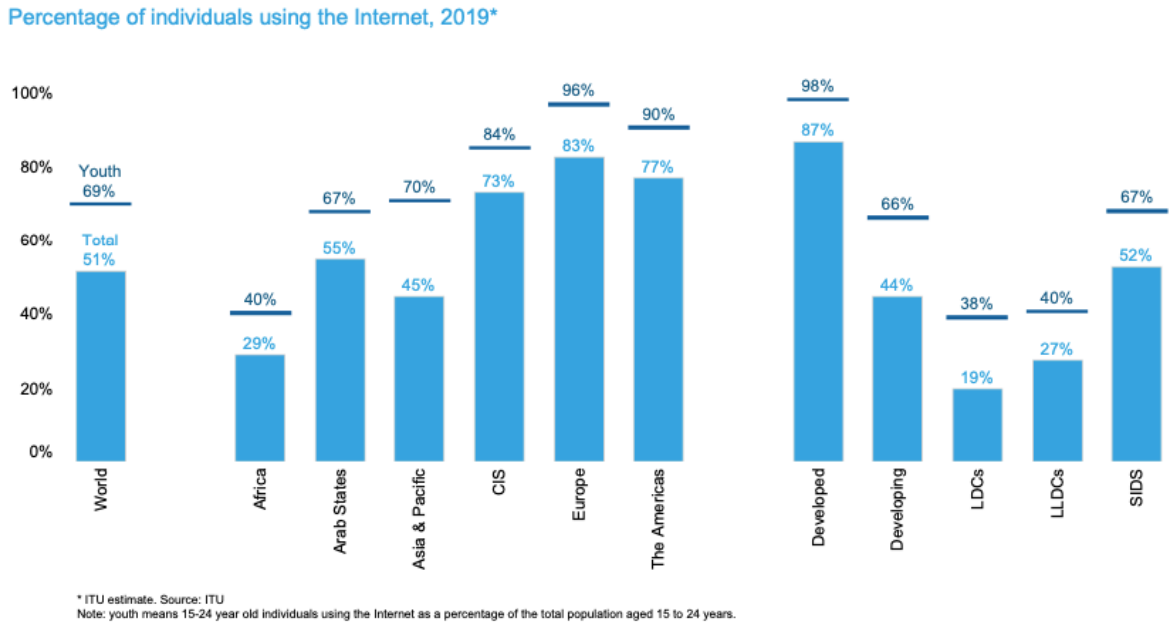
When talking about changes in demand, what is meant is the changes in consumer demand, more specifically, what kind of service and innovation consumers expect from their banks. The ever-growing innovations in technology available to the general masses has caused a significant transformation of consumer preferences and habits. The growth of the availability and ever-increasing speed of the internet and smartphones has been especially significant. Consumers are becoming increasingly used to interacting, shopping and doing business via the internet. Modern smart phones and portable computers eliminate (or significantly reduce) the need for a fixed location to conduct their business. Consumers have become accustomed to digital interaction in wide areas of their lives. They are increasingly demanding for financial (as well as other) services to be available on user-friendly digital platforms (such as online sites and mobile apps), and also importantly, those services should be available 24/7. The factor of convenience has become greatly important to the modern consumer. These trends are especially pronounced among the younger generations and in developed countries. The graph in figure 2 shows the increase of mobile phone subscriptions in some representative countries over a period from 2000 to 2019.

Figure 2: Mobile cellular subscriptions, 2000. to 2019. (per 100 inhabitants) (Source: ITU.com,)



The graph in figure 2 shows the percentage of individuals around the world using the internet in 2019. (LDC stands for Least developed countries, LLDC – Landlocked developing countries, SIDS – Small island developing states).

Figure 3: Percentage of individuals using the internet in 2019. (Source: ITU.com)



The internet has also had the empowering effect of giving consumers an easier way to gather information and compare different product/service providers and read online reviews of the same.

2.2.2. Changes in Supply

With all these new trends, technological innovations and changes in demand, new competitors have emerged, hoping to capitalise on the new demand and the sometimes outdated services which traditional banks offer.

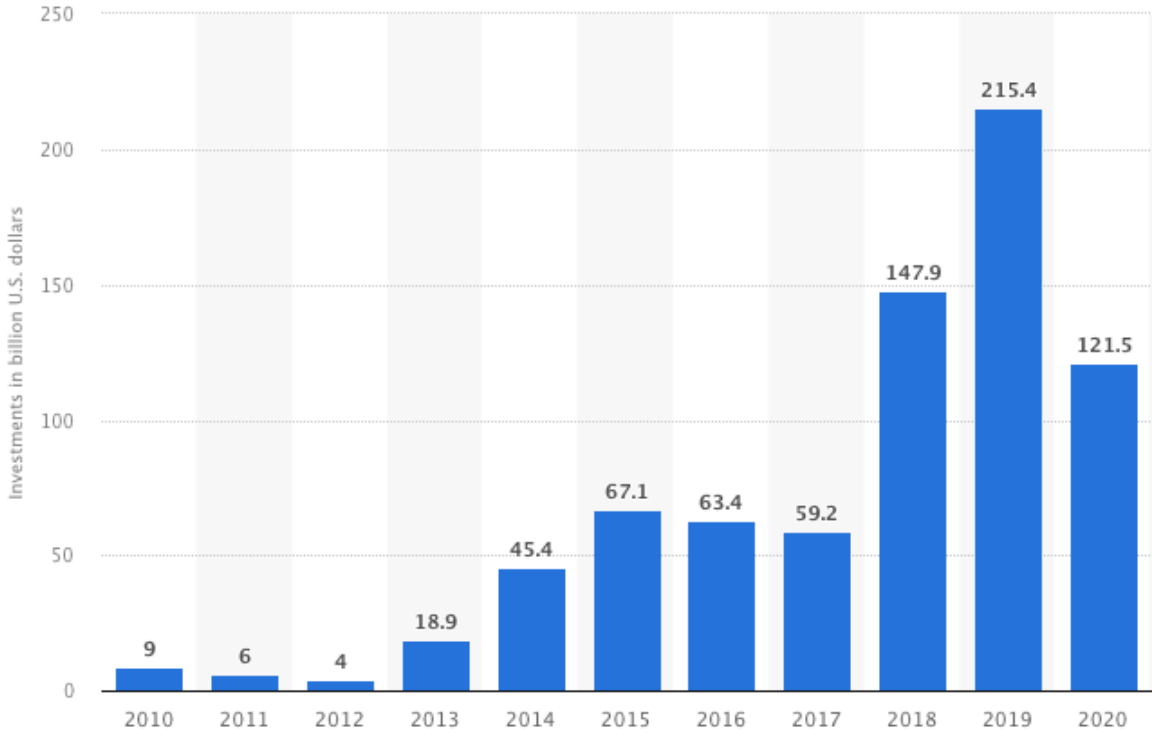
These new start-ups, which are built around new technology solutions are known as FinTech companies, and often specialise in different banking components (such as foreign exchange, capital market access, payment systems, financial advisory and other services), thereby unbundling the banks' value chain.

Such companies are usually very flexible, swiftly introducing changes as they develop and typically have low cost-structures. They typically also have new, innovative business models which have a disruptive effect on the traditional business models. Some examples include the so-called crowdfunding platforms and virtual currencies, which could potentially, at least

partially, replace bank intermediation from the system.

FinTech companies have attracted large investments in the recent years, which can be seen in the following graph:

Figure 4: Total value of investments into fintech companies worldwide from 2010 to 2020. (Source: Statista.com)



FinTech will further be discussed in chapter 2.3.

However, FinTech companies aren't the only competition banks have to face. Large established technology companies - Big Tech companies (like Apple, Amazon, Google and others), have started to expand in market of financial services provision, mainly in the areas of payment and lending. Apart from their level of technological development, they also have the advantages of operating globally (often across multiple continents), substantial economies of scale, and they already have established customer bases, benefiting from brand recognition and trust.

Firms from different sectors, for example mobile phone carriers, have also been looking at financial service provision as a potential new source of revenue. Considering that smart phones are arguably the digital channel with the most promising future, mobile phone carriers started offering payment services, through applications, installed on these devices.

To summarise, new entrants to the financial services market are emerging, who are offering services similar to those of customary banks, but are not yet under the same regulatory scrutiny, as most current licensing and supervisory frameworks were established before the appearance of those new entrants to the market.

2.3.Fintech

The word Fintech is derived from the term “financial technology”, and it is broadly used to describe new technology which aims to advance and automate the use and delivery of financial services. Fintech companies typically attract customers with financial services which are envisioned to be more convenient, user-friendly, automated and efficient than those currently available on the market. The Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) define fintech as *“technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions, and the provision of financial services.”* This is a relatively broad definition, however it is difficult to give a more narrowly defined one because, although most fintech companies have certain traits in common, there are always enough differences which make it problematic to offer a more clear, restrictive definition.

FinTech is centred around providing specialised products/services through the creation of digital platforms (for example, apps or web-based). This enables customers to consumer financial services directly, without the need of relying on regulated financial intermediaries like banks. Which leads to FinTech often being perceived as enabling “banking without the bank”.

In the last couple of decades, FinTech has been the main driving force concerning innovation in retail banking. Acting as a digital disruptor, it has forced incumbent institutions (banks) to undergo digital transformation of their products and services, in order to meet changing customer expectations, or be left behind.

2.3.1. Distinction from, and the Impact of -BigTech Firms

According to the book “FinTech, BigTech and Banks” from the authors A. Tanda and C.-M. Schena, FinTech companies are often start-up firms specialised in a specific financial service sector and which initially set up to offer financial services. TechFin companies, including BigTech (like Google, Amazon, Apple, etc.) on the other hand, are technology-based firms whose core business was in other industries, and who only later started distributing and developing financial services.
So, while both company groups share the similarity of both being digital native firms which

are using technology in order to provide innovative financial services, there are distinctions between the two. Other than the difference in origin, there are also other differences worth mentioning. For example, FinTech firms will naturally strangle building up their databases during their start-up period, especially when compared to incumbent organisations. BigTech companies on the other hand, have the advantage of already having an established client base and can leverage data assets (big data) from their pre-existing businesses, in order to potentially offer the same customers financial services as well. The customers' vast (spending habits, payment methods, etc.) information that can be acquired in such a way is invaluable as it is used by algorithms which automatically analyse it and can produce financial service proposals for the same customers. By doing so, BigTech companies can anticipate customers financial needs quickly and encourage more spending. While banks in the past have been known to fail to see the value in customer data, viewing it as more of a liability (something they are liable to protect), for tech companies it is an asset.

The Following table illustrates financial activities of some of the most relevant BigTech companies:

Table 1: Financial Activities of BigTech Companies (Source: FSB (2019, February 14): "FinTech and market structure in financial services: Market developments and potential financial stability implications.")

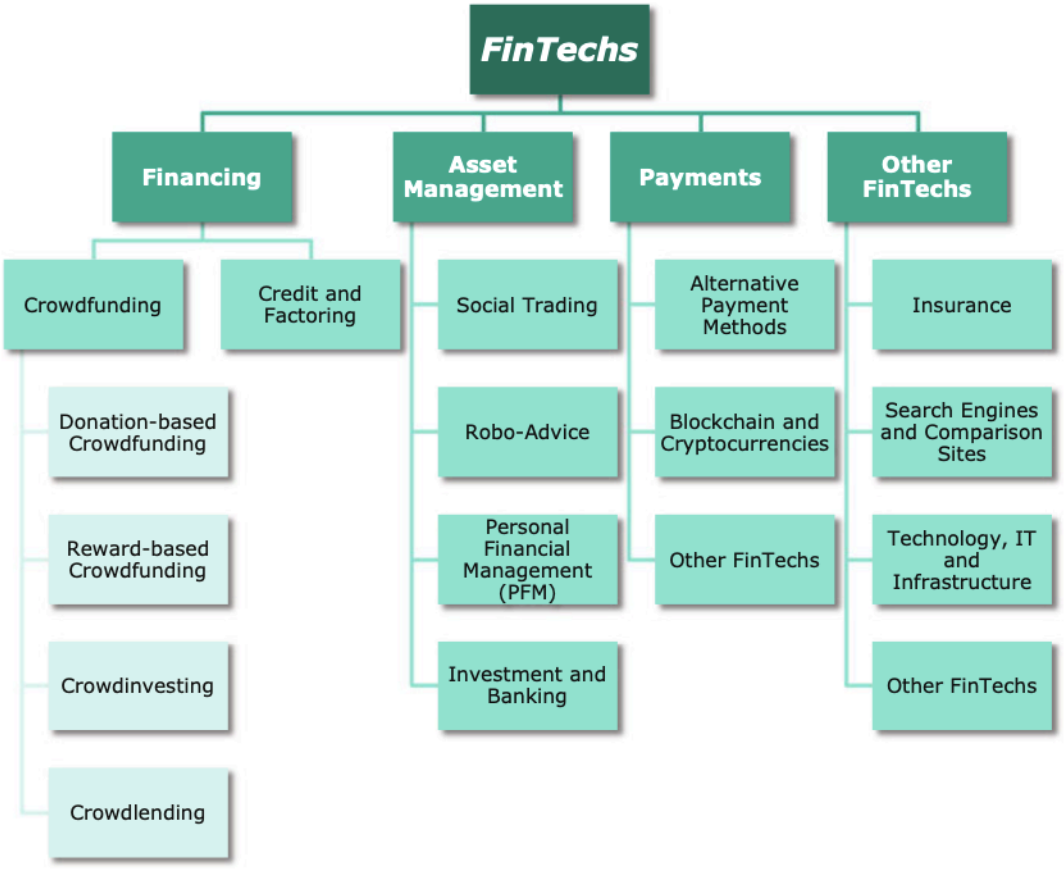
	Alibaba	Tencent	Baidu	Google	Amazon	Facebook	Apple	Samsung	Microsoft	Vodafone	Mercado Libre
Payments	AliPay (largest mobile paymensts platform in China)	Tenpay (#2 mobile payments platform in China)	Baidu Wallet – cooperation with PayPal	Google Pay – layers over existing card network	Amazon Pay – layers over existing card network	Messenger Pay – layers over existing card network	Apple Pay – layers over existing card network	Samsung Pay – layers over existing card network	Microsoft Pay – layers over existing card network	M-Pesa (32 million active users in East Africa and India)	Mercado Pago (offered in 8 markets in Latin America)
Lending and short-term credit	MYBank (SME lending for rural areas and online merchants)	WeBank (Personal micro-loans)	Baixin Bank (financial products and small loans)	Collaboration with Lending Club	Temporary financing in Amazon Lending; direct lending to merchants	Pilot in collaboration with Clearbanc	n/a	n/a	n/a	Offered through M-Shwari mobile banking service	Mercado Crédito (small loans to retail and SME clients)
Current accounts	Offered through MYBank	Offered through WeBank	Offered through Baixin Bank	n/a	Reports of talks with banks	n/a	n/a	n/a	n/a	Offered through M-Shwari	n/a
Asset management	Yu'e Bao (world's largest MMF)	License to offer mutual funds	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pilots ongoing in 2018
Insurance	60% stake in Cathay Insurance China, founding stake in Zhong An Insurance	Online insurance service in life and property insurance	Joint venture with Allianz, and Hillhouse Capital announced	Insurance on Google Compare (discontinued)	Partnership with JPMorgan Chase and Berkshire Hathaway on health insurance	n/a	Cooperation with Allianz or cyber insurance discounts	n/a	n/a	n/a	Pilots ongoing in 2018

2.4.Segments of FinTech and the Digital Evolution of Banking Products

This chapter will try to analyse the change of existing banking products and introduction of new products (which are often expand on the existing ones), through the segmentation of FinTech technology.

According to their business model, FinTech firms can be divided into four main segments: Those involved in *financing, payments, asset management* and *other FinTechs*[2].

Figure 5: Segments of the FinTech Industry (Source: Dorfleitner, 2017.)



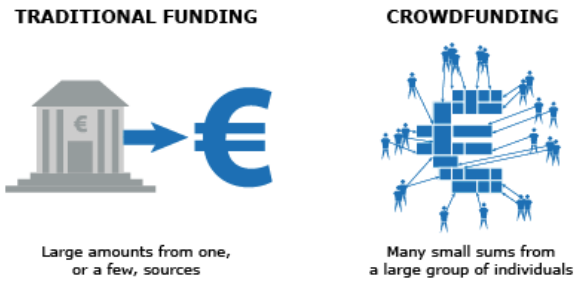
[2] Dorfleitner, G. Hornuf, L. Schmitt, M. Weber, M. (2017): "Definition of FinTech and Description of the FinTech Industry", Springer

2.4.1. Financing

The financing segment provides financing solutions through digital marketplaces accessible to both lenders and borrowers. It is available to both private individuals and businesses (usually SMEs).
The financing segment can be divided further to the *crowdfunding* subsegment, which relies on a large number (crowd) of contributors to enable financing, and the *credit and factoring* subsegment, which does not rely on a large number of participants.
FinTech companies in that subsegment, usually cooperate with partner banks to offer credit to customers. Loans can be given via mobile app, sometimes over a short-term period like a few weeks or days. FinTech companies in this subsegment also deal in factoring services, such as selling claims online. It is typical for firms in this segment to automate most of their processes in order to foster cost-effectiveness and efficiency (faster service).
Banks have also started recruiting FinTech companies to help them set-up digital (web-based) onboarding platforms for opening bank accounts and applying for financing. On these online platforms, customers can register, select the product they seek and fill out the required information about the product (like type of bank account, type and amount of loan) and information about themselves as well as upload any necessary documents. That date then goes through computer automated processes to determine the validity of the potential client. The potential client can then either be immediately rejected or the request is passed to a human employee for further processing.

We can describe crowdfunding as an alternative type of financing where a vast number of backers (contributors) provide funding in order to achieve a common objective (for example a new product, business, project or idea).

Figure 6: Traditional Funding vs Crowdfunding (Source: ec.europa.eu)



The crowdfunding subsegment can be divided further according to the way investors are

being compensated for their funds. *Donation-based crowdfunding* is a form of crowdfunding in which backers receive no financial or material returns for their contributions. *In reward-based crowdfunding*, they receive non-financial rewards (often at a later stage) in exchange for their contribution. Usually, initiating projects in donation and reward-based crowdfunding carries no costs, although some platforms do charge a fee for successful campaigns. That fee would be 5% to 11% of the total amount collected (depending on the platform). A crowdfunding campaign is successful if the minimal (initial) amount of funds has been reached. Most Crowdfunding platforms (CFPs) have the policy that, if the defined minimal amount has not been reached at the end of the campaign, the funds are to be returned to the investors.[3]

In the *Crowdinvesting* subsegment, investors receive a stake in the business, debt-security issued by the borrower or a share of future profits. Some sources divide this type further into equity *crowdfunding, debt-securities crowdfunding* and *profit sharing crowdfunding.* An example of an equity based crowdfunding platform would be *"Crowdcube"* (which is based in the UK). Like most crowdfunding platforms, it has no listings or membership fees, but it does charge a 5% fee on the total amount raised (plus VAT) if the campaign is successful.

In the *Crowdlending* (also called peer to peer (P2P) lending) subsegment, the crowd lends money (using CFPs) to individuals or businesses and in return receives a predetermined interest rate.

2.4.2. Asset management

The segment asset management contains FinTechs whose financial services include management of assets, offering investment advice, personal financial data analysis and presentation. The segment can also further be divided into the *Robo-advice, Social trading, Personal financial management* and *Investment and banking subsegments*.

Robo-advice refers to systems (in apps, web-portals, etc.) which use automated procedures and complex algorithms to analyse clients' personal investment preferences (such as risk aversion, profit goal, preferred investment duration and other factors) and deliver

[3] Belleflamme, P. Omrani, N. Peitz, M. (2015): "The Economics of Crowd- funding Platforms", Information Economics and Policy

personalised, algorithm-based investment proposals. It is also worth noting that those investment suggestions can be a FinTech company's own investment products (like investment funds) or products from a third party, which may or may have a partnership or cooperation agreement with the FinTech company.

Social trading (in some sources also called *copy trading*) is the service of providing customers the possibility of seeing, commenting and copying financial trading strategies or portfolios of other traders, in a digital environment.

In the *Personal financial management (PFM)* subsegments, FinTech firms which offer PFM software are encompassed. Personal financial management (PFM) software enables users an easy, visual and user-friendly way to track their financial data (like expenses, income sources, savings, etc.), transaction categorisation, set up budget planning for the future, and use other functionalities. Of course, different PFM systems can differ in design and functionalities. Some can source data from multiple financial institutions (for example if you have deposits in multiple banks). All encompassed in one application. To achieve the integration of multiple providers into one PFM app, PFMs use application programming interface (API) technology. Application programming interface (API) can be defined as:

"a set of rules and specifications followed by software programmes to communicate with each other, and an interface between different software programmes that facilitates their interaction."[4]

Banks have in the recent years begun introducing PFMs into their banking applications and online banking. In order to achieve that, they often contract external (mostly FinTech) companies which specialize in that particular service. Such an example of a FinTech company offering their services to banks would be the company Strands (Strands Personal Finance) which describes itself as a leading provider of PFM solutions to global financial institutions and consumers. They offer their services to banks like BBVA, HSBC, Santander and many others. In the following figures (figure 7 and figure 8) we can see examples of some functionalities offered by Strands in their PFM system.

[4] Source: FSB (2019, February 14): "FinTech and market structure in financial services: Market developments and potential financial stability implications."

Figure 7: Strands' PFM example, expenses analysis (Source: backbase.com)

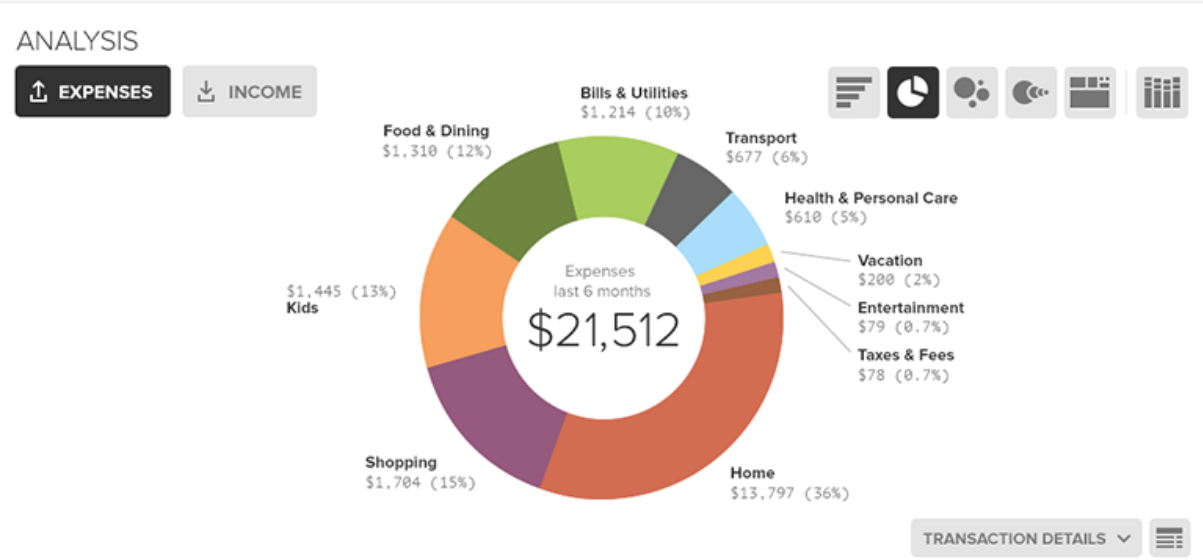
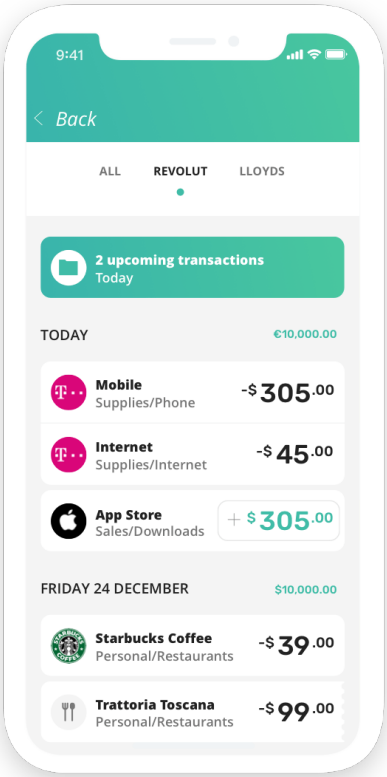


Figure 8: Strands PFM example, cross-bank transaction tracking (source: Strands.com)



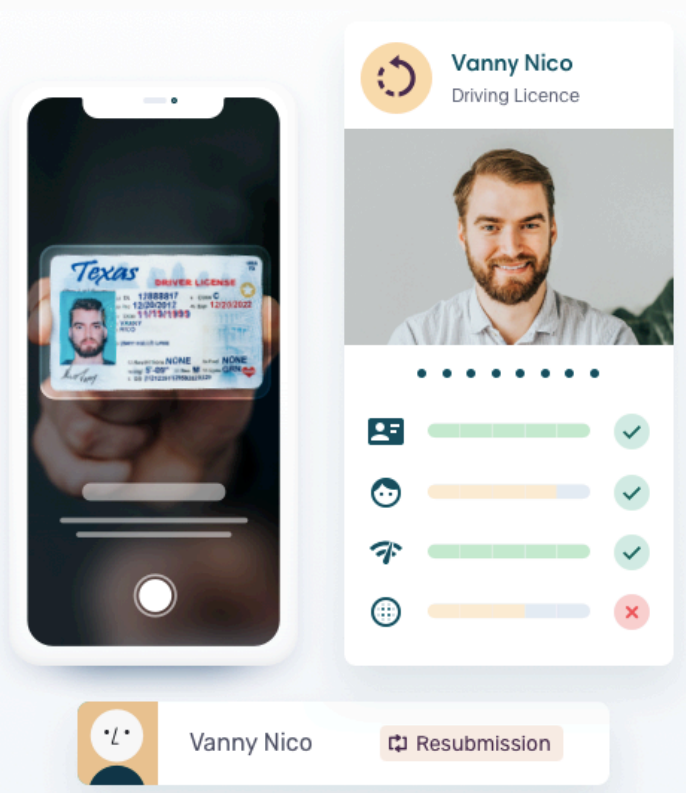
FinTechs which are included in the *Investment and Banking* subsection (according to Dorfleitner, Hornuf, Schmitt and Weber) are Fintech firms which offer advanced models for

managing assets or advising, which don't fall under the three subsegments previously mentioned. These include services such as online-based asset management where human advisors actively interact with clients (although processes are at least partially automated).

Additionally, this subsegment includes traditional banking products, like bank accounts, which have been improved through digitalisation. For example, banks have started offering banking accounts which customers can open end-to-end online or via app, without the need of ever visiting a brick-and-mortar bank branch. The greatest hurdle for this has been the legal requirement of customer identity verification, where banks are required (by regulators) to verify the identity of new customers in order to open a bank account. Moreover, only certain methods of customer identity verification are permitted by regulators (differs from country to country). For example, in Austria, the current methods accepted by regulators are: verification in bank branches, via EPS[5] transfer from an existing Austrian bank account or Video-verification (where the pintail customer's identity is verified over a video call by licenced personal. Banks often outsource this service to external firms.) However there have been sings that new methods of verification, such as through virtual ID or software-enabled verification might be legally possible in the near future.
Some banks (like Revolut) already use software-enabled verification to verify the identity of new customers. The process consists of two parts: ID-document verification and biometric face authentication (with included liveliness check), both done through app-based software installed on camera-equipped smartphones (or similar). These software solutions are most of the time provided by external FinTech companies which specialise in that particular service. An example of such a FinTech company would be a company called Veriff. In the figure bellow, we can see an example of their product.

[5] EPS (electronic payment standard) is an online transfer system developed jointly by the Austrian banks and Government.

Figure 9:Veriff'S Identity Verification platform (Source: Veriff.com)



2.4.3. Payments

The Payments segment encompasses FinTechs whose systems and platforms have to do with payment transactions. This financial service area is where Fintech first developed globally and includes transfers of both fiat money and virtual currency.

The first notable subsegment in this area of financial activity would be the *alternative payments* subsegment, under which digital payment services like mobile (facilitated via smartphone applications) and online payment and money transfer services are offered. Those include both domestic and foreign transfers and of course peer to peer (P2P) interactions as well. Digital payments enable banks to reach a wider pool of clients, at significantly lower costs. For the customer, on the other hand, digital payment methods mean he/she is no longer required to visit his/her local (bank) branch to make money transfers, but can conduct them at any time he prefers (as these services are available 24/7) and from any location in the world (provided internet access is given).

In addition to that, through digital payment platforms, customers have been given a multitude of new functionalities in their financial service provider's platforms to make transfers.

Some of these functionalities include making multiple payments at once, P2P money transfers, instant transfer of funds between your own accounts, paying bills and invoices by scanning a QR code with your smartphone's camera, thereby avoiding having to manually enter the transfer recipients banking information.
It is important to mention that for security reasons banking apps ant online platforms typically require 2 factor authentication to confirm that it is really the customer who is making the transfer request. This is often done through a separate application (often called token application), I which the customer has to log-in with his user and password and confirm the transfer request. Biometric (Face and fingerprint) identification can also be used in order to speed up the process, more specifically, to avoid having to enter the user and password each time.

The so called "eWallets" are also included in this subsegment. eWallets can be described as digital wallets. It is a (software-based) digital payments system whose function it is to contain the payment information and passwords of the buyer. When the buyer reaches the payment page (on a website or in an application), the e-wallet can be used as a payment option in order to deliver the buyers payment information instantly (eliminating the need for manual entry of payment information like card number, CVV code, name and address of the card holder, etc.). The most relevant information which can be stored in an eWallet includes debit card data, credit card data, banking information and connectivity to other payment platforms. Digital coupons and loyalty card information can also be stored.
As the spectrum of functionalities offered by eWallets has broadened in the recent years, this paper will use a division of eWallet types found on Business.ebanx.com. According to which, there are three types of e-wallets in ecommerce: digital wallets, mobile wallets and e-wallets. Digital wallets are simply technologies which keep the buyer's payment information he will need to conduct online purchases. Generally used online but some also function on mobile apps. Mobile wallets are strictly (mobile) application-based wallets, mainly used on smartphones but also on other mobile devices such as tablets or smartwatches. They can be described as digital card holders, as they enable making purchases on POS (point of sale) devices in stores, just like one would do with a traditional credit or debit card. This is made possible through near-field communications (NFC) technology.
An e-wallet preforms both functions mentioned in the two types above. What differentiates it from digital wallets, is its function to store balance, which means that a connection to banking accounts doesn't have to be the buyer's only payment option. Funds may be

deposited from a bank account or cash to maintain that credit. E-wallet has so many functionalities that it transformed into the general term for all wallets.
All of this saves time for buyers and reduces the need for carrying a physical wallet or cards.

A good example of an eWallet provider would be Apple, which offers their eWallet "*Apple Pay"* to customers which are using one or more of their hardware products (MacBooks, iPhone, iWatch, iPad, etc.). Apple pay can be used by its users as a payment method when conducting online purchases, as well as a mobile wallet through its wallet app (shown in figure 9 bellow)

Figure 10: the Wallet app by Apple



Google has a similar eWallet platform for Android users (Google pay). As can be seen, BigTech is very much involved in the digital payments area of financial activities. And due to the significant popularity of services like Apple Pay, have been compelled to cooperate with companies like Apple in order to secure those services (in this case Apple Pay) for their clients. For which of course, they have to pay Apple so-called transactional fees. Those fees are for the banks (financial institutions) to pay, rather than the clients. In the USA for example, according to a news article from 2017, issuers must pay 0.15 percent of a credit card transaction and 0.5 cents for each debit card transaction, and 7 cents to Visa and 50 cents to MasterCard for each card that is added to an Apple wallet.[6]
The banks' clients however, pay monthly or annual credit (debit) card fees to banks, as well as for the online and mobile (app) banking services facilitated by the bank.

[6] Source: Coyne, A. (2017): "Banks surrender in Apple Pay fee fight", IT news

It is worth noting that because eWallets are not exclusively facilitated by supervised intermediaries (like banks), customers are not legally protected in case of, for example, bankruptcy of the (unregulated) provider. Where clients of banks on the other hand, are in such cases legally protected by guarantees of monetary repayment in the amount of 100,000€.

The *cryptocurrency* subsegment includes FinTechs which have specialised in offering crypto currencies (virtual money) as an alternative solution to fiat money. The most wide-spread crypto currency is Bitcoin. While there is currently only one country (El Salvador) which accepts a cryptocurrency (Bitcoin) as legal tender, in most countries payments using cryptocurrencies are also not illegal (if a company is willing to accept it as a payment method). For example, Microsoft has started accepting bitcoin as a payment method in their online gaming store. Tesla has announced they had purchased bitcoin in the amount equal to 1,5 billion USD and was willing to accept it as a form of payment as soon as bitcoin mining became more environmentally friendly. Specific regulations for crypto currencies have so far only been introduced in some countries, while the rest have taken the "wait-and-see" stance.

2.4.4. Other FinTech

FinTechs which aren't described in the previous three traditional banking areas fall under this segment. Its subsegments include FinTech technology which offer insurance services, sometimes referred to as InsurTech, FinTechs offering web-based search engines and comparison sites for financial services and products and FinTechs that provide technical solutions for financial services providers.

2.5.Bank Methods of Adopting Digital Innovation

Incumbent financial institutions are adopting digitalisation of their products and services through a number of strategies, which are not mutually exclusive, meaning more than one strategy can be used. Large banks are generally utilising the following 3 strategies:

- buying shares in FinTech companies,
- partnering with FinTech (or TechFin) companies, and/or
- developing in-house

Smaller banks have further challenges due to their lower revenue and regional client base which leads to a smaller investment potential.

In the strategy of buying shares (in FinTech firms) incumbent banks acquire a minority or majority stake in FinTech firms to gain access to their technology and expertise. In case of a complete acquisition of the FinTech firm, banks will often keep the same separate and independent to make sure the innovative thinking and agility of the acquired firm is kept intact.

In the Partnership approach small FinTech companies and banks partner up in a symbiotic relationship where banks benefit from FinTech technological assets and innovative approaches to financial services (as well as all the other benefits mentioned throughout this paper), while FinTech companies get the benefits of the banks' established client base, large investment capabilities for future development, legal/regulatory know-how and lastly, through partnering with established banks FinTech firms gain credibility with customers who might be sceptic towards these novelties in financial services.

In-house development is the strategy where banks on their own or in their groups, internally introduce initiatives to develop digitalisation solutions. This is done through increased investment in ICT, reorganisation of company divisions and the interlocution of new division focused on digitalisation, digital project management, R&D, Development (programming), creation of subsidiaries within the group with the specific focus on digital development, which can include setting up an exclusively online bank within the bank (a bank within a bank), etc.

Tanda and Schena, in their book "FinTech, BigTech and Banks" give a case study analysis on a sample of 32 large incumbent banks (24 of which European), which have been implementing the above-mentioned digitalisation strategies. In the following table (Table 2) we can observe the results of their research:

Table 2: Digitalisation strategies adopted by sample banks and the level of diversification (source: Tanda, A. Schena, C. (2019): "FinTech, BigTech and Banks")

	Main strategy adopted by the bank				**Number of banks**
Degree of diversification (according to areas of activity)	**Shareholding-oriented**	**Partnership-oriented**	**In-house developer**	**Mixed strategy**	
Low				BB	**1**
Medium-low	**BPCE, NAT**		MUFG	**CS, NOR**	**5**
Medium	**BBVA**	BNY	BC, **LL**	**SC**	**5**
Medium-high	**ABN, CZ, CM, DB, ING**		**DZ, ISP**	**BAR, CA, RABO, RBS, UBS**	**12**
High	CITI, GS, **SAN**			**BNP, HSBC,** JPM, MOSL, **SOGE, UC**	**9**
Number of banks	**11**	**1**	**5**	**15**	**32**

Key

European banks

ABN	ABN AMRO	**DB**	DEUTSCHE BANK	**LL**	LLOYDS BANKING GROUP
BBVA	BANCO BILBAO VIZCAYA ARGENTARIA	**DZ**	DZ BANK	**RABO**	RABOBANK
BAR	BARCLAYS	**BPCE**	GROUPE BPCE	**RBS**	ROYAL BANK OF SCOTLAND
BNP	BNP PARIBAS	**HSBC**	HSBC	**SAN**	SANTANDER
CZ	COMMERZBANK	**ING**	ING	**SOGE**	SOCIETE GENERALE
CA	CREDIT AGRICOLE	**ISP**	INTESA SANPAOLO	**SC**	STANDARD CHARTERED
CM	CREDIT MUTUEL	**NAT**	NATIXIS	**UBS**	UBS
CS	CREDIT SUISSE	**NOR**	NORDEA BANK	**UC**	UNICREDIT

Non-European banks

BB	BANCO DO BRASIL	CITI	CITIGROUP	MOSL	MORGAN STANLEY
BC	BANK OF CHINA	GS	GOLDMAN SACHS	MUFG	MUFG-BANK OF TOKYO
BNY	BANK OF NEW YORK MELLON	JPM	JP MORGAN CHASE		

The "degree of diversification" column denotes the level of variety of FinTech areas of activities the banks chose to target in their process of digitalisation. The table shows us that

most of the sample banks (21 from 32) implement medium-high or high level of diversification, meaning they are investing in the digitalisation of multiple areas of financial activities (or technological activities relevant to the development of financial activities.)
In the bottom end of the table we can see the list of banks used in the casa study and their abbreviations. As can be seen, the main focus point were European banks (whose abbreviations were also written in bold).
The mixed strategy column refers to banks which utilise a combination of 2 or 3 previously mentioned strategies. As can be seen from the table, almost half of the sample banks (15 from 32) have adopted multiple strategic approaches to digitalisation.

It should be noted that this case study stems from the year 2019, therefore it is possible that some of the listed banks have adjusted their strategic approach.

2.6.Digital Native Banks

Another phenomenon that has appeared in this age of banking digitalisation is the emergence of a large amount of newly formed digital native banks, sometimes also referred to as "challenger banks" as they challenge incumbent institutions through technological and business model innovations, improved customer experience and a better understanding of customer preferences (especially the younger generations). They often start out as MVBs (minimally viable banks) which offer customers only a few products, for instance with the focus on bank accounts and payments, and augment their product offerings as they grow and gain customers. The business model of these challenger banks does not depend on physical (brick and mortar) bank branches, but rather on delivering financial services to their clients via exclusively digital channels.
Another trait of digital native banks is their customer-oriented and minimalistic online banking and application interface. The applications are especially optimised to enable user-friendly phone and tablet viewing.

Banks which offer online services have been around for a few decades. For instance, ING established an exclusively online bank called "ING Direct" (built in-house) as early as 1991. However, this new generation of online digital banks leverage their expertise with the newest technologies and innovative approaches to customers to differentiate themselves from incumbent banks and old generation online banks. Incumbent banks which wish to compete with these newcomers and set up their own exclusively online banks face the difficult task of transforming their information and communication technology in order to adopt the newest technology. Which some incumbents have successfully managed, developing their own online-based banks or acquiring existing ones and incorporating them within their organisations. Some BigTech companies also have digital native banks, for example, the Chinese BigTech company Tencent has founded WeBank.

Generally speaking, the main area of activity of digital native banks centres around account deposits, payment and transfer services, rather than loans (although some digital banks do offer loans to an extent). Meaning, the source of revenue for these banks stems from commissions/subscriptions rather than interest (from loans), which on the other hand, limits their exposure to credit risk.

This trend is especially visible with start-up FinTech digital banks in contrast to digital banks owned by large incumbent banks or BigTech.

2.6.1. Examples of Native Digital Banks

"Revolut" was founded as a FinTech company in the United Kingdom and is today one of the best known and largest digital banks in Europe, with more than 10 million users. They offer most of their services under four different subscription plans: "Standard" (which is free), "Plus" (which costs 2,99€ per month), "Premium (7,99€ p/m) and "Metal (13,99 p/m). The difference between the plans lies in the features and fees they entail, such as the amount of money customers are able to withdraw fee-free from ATMs within its network (in more than 30 Revolut-supported countries), the types of purchase protection and travel insurance provided, commodities and cryptocurrencies exchange fees and other.
Revolut also has a similar subscription plan model for SME customers, an also offers personal loans (up to 15000€).

"N26" is another popular European (standalone) digital bank, based in Germany, with more than 5 million users. It provides customers with free, fully insured (up to 100,000€) business and retail accounts, with no hidden fees, free SEPA transfers and EUR withdrawals. N26 also has a similar (four tier) subscription model as Revolut, offering more functionalities with each subscription tier. And as Revolut, it has also a free (basic) membership tier. They also have a distinctive "Space" feature which allows for the creation of sub-accounts which can, for example be used for setting financial goals for a specific purpose and tracing the progress. N26 also offers personal loans (up to 50000€), but that service is for the time being, limited to only France and Germany. It is worth noting that they have partnered with 2 other banks in Germany and France to give loans, rather than providing this service on their own.

The third example given in this paper is "Hello Bank" which is a digital bank founded in Belgium by an incumbent bank, BNP Paribas. Despite the fact that it was created by an incumbent bank, Hello bank is widely regarded as one of Europe's more technologically sophisticated digital banks, and they have been praised for their modern and user-friendly banking app design. Unlike the previous two examples, they do not offer any free products (except for a few exemptions), however their basic banking account is available for 1€ per month and it includes online, mobile and phone banking, a debit card, and enables making

standing orders. They also offer loans, insurance, savings and brokerage services. Hello Bank operates in Germany, Belgium, the Czech Republic, Austria and Italy.

2.7.The Accelerating Effect of Covid-19

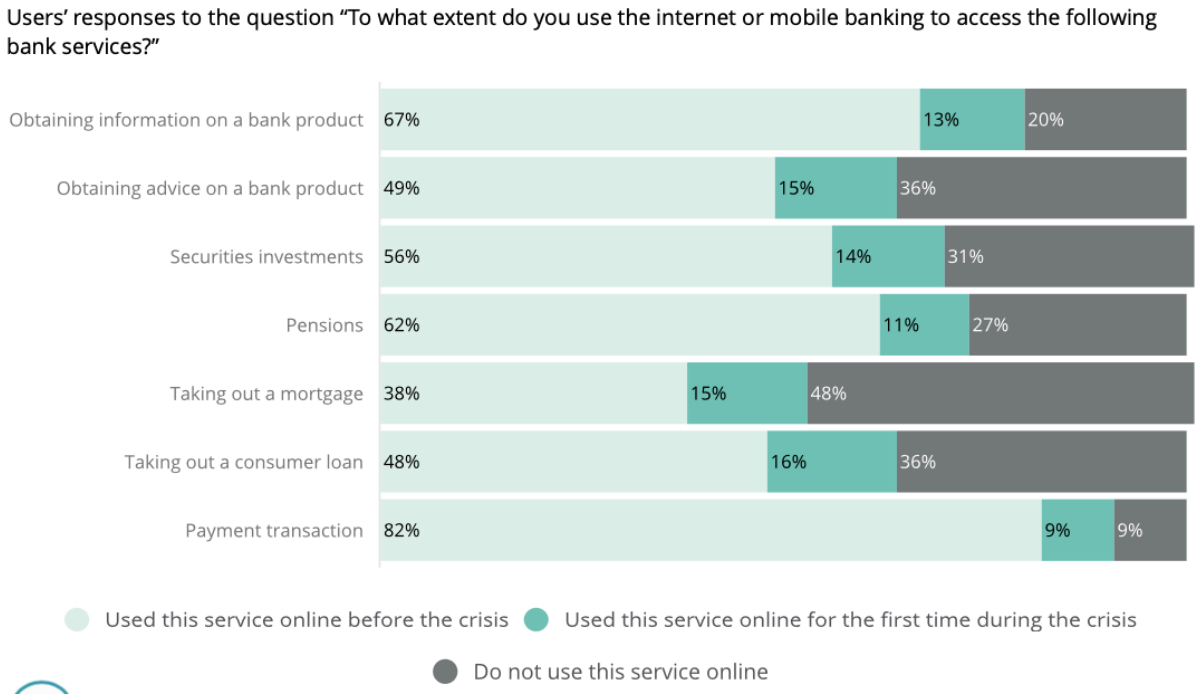
The movement of the digitalisation of banking products and services had already been happening well before the emergence of the Covid-19 caused pandemic. As digital channels have become a vital component of retail banking. The crisis caused by Covid-19 has accelerated this movement, as customer preference towards digital channels was supplemented with the necessity to switch to digital channels since visiting bank branches and personal bankers became very difficult due to lockdowns, restrictions to the number of people allowed inside bank branches, reduced working hours of branches and the general risk to the population. Many customers with little digital affinity and mistrust towards consuming financial services online were forced to switch to digital banking. The question emerged how many of them will continue using digital channels and to what extent.

To try to give an insight into that question and analyse how much of an impact the pandemic has had on the use of digital channels in banking, a survey performed in Switzerland in 2020 by Deloitte, where 1500 working-age persons took part will be reviewed.[7]
According to the survey, 20% of the interviewed retail-bank clients have used one or more digital banking services for the first time during the pandemic. Regarding first time digital banking users, most have stated they would continue using digital banking (at least to some degree) after the pandemic ends.

The following figure (figure 11) illustrates the increase in the use of digital banking services in the period since the pandemic started until the day the survey took place (in 2020):

[7] Source: Deloitte (2020): "COVID-19 boosts digitalisation of retail banking"

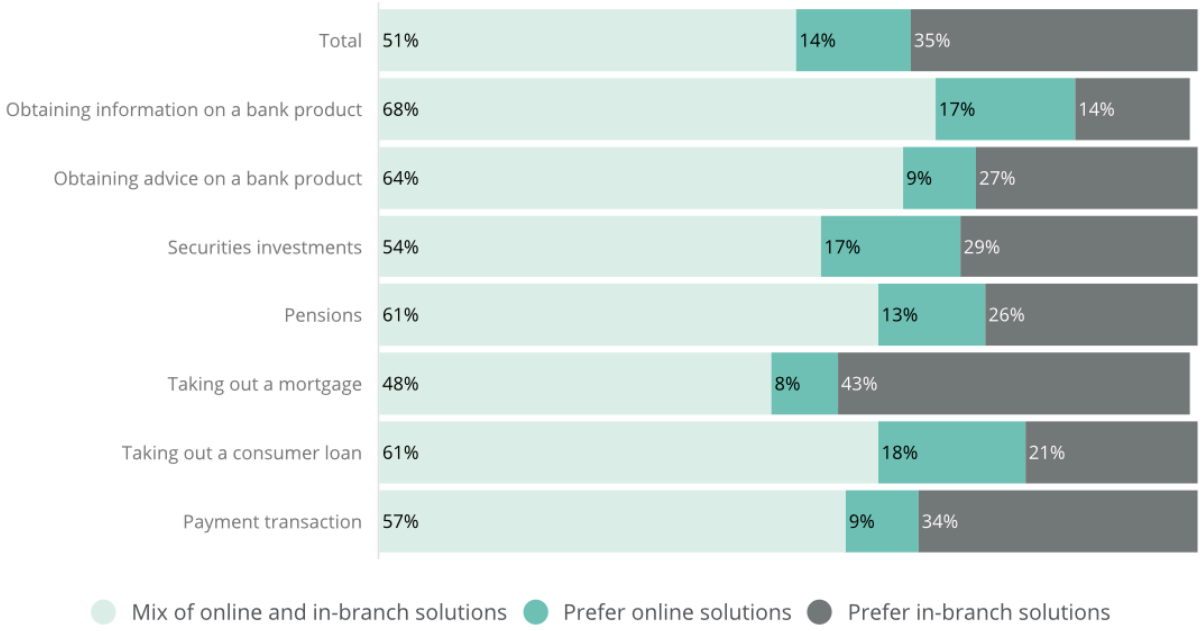
Figure 11: Use of services before and during the COVID-19 crisis (Source: Deloitte.com)



As can be seen, there was an increase (between 9 and 16 percentage points) in each of the stated banking services. The lowest increase was in payment transactions, with only 9% of the participants saying they used this service for the first time during the pandemic. This however is understandable considering that transactions are a core service which was already being used extensively even before the pandemic started. Only 9% of the survey participants stated they are continuing to use non-digital methods of payment. Under the sections consumer loans and mortgages, online application is also included, as these services are still rarely digitally available end-to-end (especially mortgages). They are more complex and times-consuming services and customers often feel more comfortable discussing those with a bank employee in person. However due to the pandemic, customers were pushed to consider digital channels. It is because of that we can see an increase of 16 percentage points in online consumer loan applications and 15% in mortgages.

The figure bellow (figure 12) shows the answers of customers which had previously stated that they had used a banking service online for the first time, when asked how they would use these services after the pandemic:

Figure 12: Post-crisis conversion rate of customers using specific online banking services for the first time (Source: Deloitt.com)



The results suggest that these first-time users will continue using digital channels for banking services. Only 14% will however use exclusively digital channels, while 51% will use a combination of in-branch and digital solutions. 35% of the sample stated that they would return to in-branch banking as soon as possible.

One positive effect his Covid-19-caused crisis is having, is that it has given banks the opportunity to convince clients of the advantages of digital banking, as well as convincing the banks themselves of the importance of digital banking solutions.
The results of this survey confirm the changing preferences of customer towards digital banking solutions and highlighted the importance of continued investments in technological innovation in banking. On the other hand, it is also evident that in-branch banking still has a future, as most of the survey participants leaned towards a hybrid solution of digital and in-branch banking. This is a clear advantage of incumbent banks compared to digital-exclusive challenger banks which have no physical branches.

2.8.Disadvantages, Challenges and Risks

2.8.1. Cyber Security

The banking industry has seen in the recent years undergone a big shift towards digital channels, which in turn has led to an increase in cybercrime. Cybercriminals are trying to exploit banking customers in a multitude of ways, some of which include:

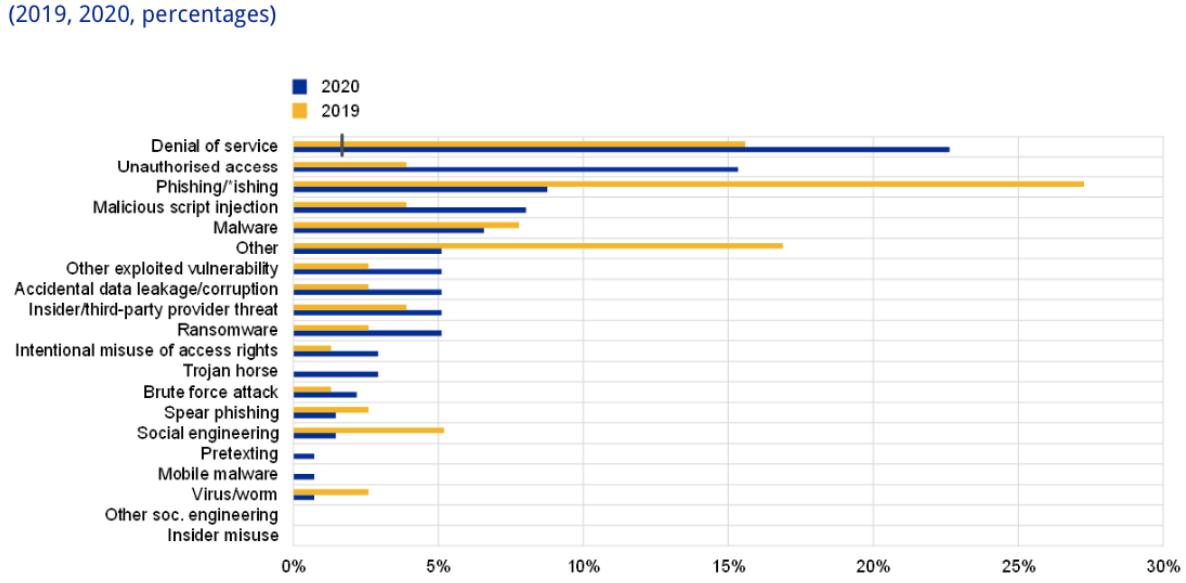
- Malware, where harmful software is installed on the end-user's device and can be programmed to retrieve confidential information (such as passwords, banking credentials, etc.) from the unsuspecting user and forward it to the attacker. The victim can encounter malware through false advertisement, text messages, emails and other methods.
- Phishing, where attackers contact the victim through email, phone, text messages (or some other way) and falsely present themselves as a trustworthy entity (for example, as bank employees) and try to extract sensitive information from the victim
- URL Spoofing, where cybercriminals set up a fake website which looks and functions same as or similar to the victim's bank real website. When the victim enters his or her log-in information, that information is stolen and the victim is forwarded to the real website of his bank, in order to reduce the risk of discovery.
- DDoS (distributed denial of service) attacks. This is a type of cyberattack which targets the banks themselves and has the goal of making an institution's (in this case the bank's) network platforms unavailable to the end-users by flooding the institution's platform with unusually high volumes of data traffic.

Banks are implementing multiple measures to protect their customers from cyber-attacks. For example, multi-factor authentication (MFA), where additionally to simple text passwords, one more additional forms of user verification is required when logging in, preforming a transaction (or another functionality). Some forms of MFA include biometric (face, fingerprint) scans to confirm the customers identity, time-based one-time passwords (TOTPs), where a code is sent to the customer via SMS or via authenticator applications. Those codes can only be used one time and expire after a short time.
The importance of educating bank customers as well employees on cybersecurity should also not be understated.

According to a report of the European Central Bank Banking Supervision, in the year 2020, European banks have seen an increase of 54% in the amount of cyber incidents, compared to 2019. The ECB reports that most of these incidents were DDoS attacks. The attackers later threatened banks with further attacks unless they paid them a ransom. The report further stipulates that in 2019, 40% of banks suffered at least one successful cyberattack, which represents an increase of 28% compared to 2018.[8]

Figure 13 shows the distribution of reported cyber incidents by type

Figure 13: Cyber incidents in 2019 and 2020 by type (source: ECB)



2.8.2. Increased need for customer support

While digitalisation of banking products has decreased the workload bank-branch employees regarding day-to-day banking activities such as payments, some of the workload has been transferred to other areas. Due to the ever-increasing number of services banks are offering customers through digital channels, the amount of required customer support has also increased. As is often the case with IT-related products, the users often need help learning all the functionalities of digital channels. The financial institutions' customer support departments have therefore seen an increase inactivity, especially since the emergence of the Covid-19 crisis, with older generations of customers trying to adapt to the new technologies.

[8] Source: ECB Banking Supervision (2021): "IT and cyber risk: a constant challenge"

To reduce this vast new workload, banks are trying to automate some of the customers' inquiries by introducing rule-based and AI-powered chat bots within their website and apps. Those are programmed to offer answers to questions a customer may have. For example, "how can I install mobile banking on my device". If the question is more complex, the customer might be forwarded to a (human) customer support agent. Written or video user-manuals are also made available for customers on their digital platforms. Nevertheless, banks still have to invest in hiring and educating additional customer support agents to cope with the increasing need for customer support.

2.8.3. Rules and Regulations

The introduction of new technology often attracts individuals who search for exploits in the new systems and illegally profit from them. For example, digital banking services can offer relative anonymity and FinTechs are still fairly unregulated in many countries, which makes them popular with money launderers. Financial regulators have started reacting to such risks, by introducing regulations with a greater emphasis on digital banking.
Banks are required by regulators to make sure their digital banking services comply with AML (anti-money laundering) and CFT (Countering the Financing of Terrorism) rules and regulations. Banks also have to implement internal compliance programs, within their organisation, which entail:

- Customer due diligence (CDD), procedures of collecting and evaluating relevant information about potential and existing customers
- Monitoring measures, which have the purpose of detecting suspicious customer (digital) transaction activities. For example, transactions to nations which are classified as high-risk, strange payment patterns, transactions above the reporting level, etc.
- Screening and monitoring for PEPs (politically exposed persons), customers with a criminal record or other medium or high-risk customers.

Naturally, incumbent banks are not the only ones to use technological innovations in financial sector. FinTech companies are also present in the sector. The ECB feels that such companies do not necessarily need to be regulated at the level banks are being, however the ECB also

states that, if they wish to take deposits and grant loans, they have to be treated same as banks, meaning they have to attain a banking licence.

3. Examples of Digitalisation of Banking Products and Services

This chapter will give examples of how some banks in Croatia offer digital banking services to their retail customers. The banks which will be reviewed are: Erste Banka, Privredna Banka Zagreb, Raiffeisen bank and Zagrebačka banka. The source of the data is the public information available on the websites of the listed banks, the use of bank applications or demo applications.
As it would be too complicated to list every single functionality of each of the banks‘ digital banking platforms, only the more relevant will be presented. It should also be noted that a bank operating in multiple countries will not necessarily offer the same services in each country. For example, Erste bank’s newest digital banking platform launched in Croatia a few years later than in Austria.

3.1.Erste bank

Erste bank is a part of the Austrian financial institution Erste Group, which is the largest financial services providers in Europe, operating in seven European countries including Croatia. They describe themselves as Austria’s most modern bank.

As all of the other banks on this list, its digital banking includes both internet banking as well as a banking application. Erste has recently launched a new (more modern) banking platform (for both web-banking and application) in Croatia, they have named “George” and is currently transferring customers to the new platform, while the old online banking and banking app are still available. Additionally, Erste has another, separate application called “Keks Pay” for even faster transfer of funds: the app connects to the user’s contacts and in that way enables sending money to those contacts as well as sending payment requests. It is worth noting that that is also possible for the user’s contacts of different banks, which some other platforms don’t allow. (Keks Pay also has some other functionalities like sending payment request, paying for parking, etc.)

The functionalities of Erste’s digital banking include:

Onboarding for new customers: possible end-to-end digitally, via video-identification through the app

Payment functionalities: making payments is possible: by manually filling out a payment order (in the app or online banking), via (premade) templates and by scanning the payment slip or QR code (through the app). Also, through the (before mentioned) Keks pay application.

Standing orders can also made. It is also possible to send transfer requests to other individuals. Apple Pay is also supported, which means the debit and credit cards of the bank can be used with the Apple Pay wallet.

Financing: It is possible to apply for a loan (or mortgage) online. All types of loans for which one can apply in a branch, are available.

Asset management: it is possible to invest into savings (such as fixed term savings) and investment fonds end-to-end through the app or internet banking (this is made possible with electronic signatures, which have the legal strength of a customer's actual signature). Erste also offers e-broker services.

Other: App Log-in via biometric scan (fingerprint or face-scan). George also enables applying for insurance with a partner company (Wiener insurance)

3.2.Zagrebačka Banka

Zagrebačka Banka (ZaBa) is the largest bank in Croatia, and it is owned by Italian financial giant UniCredit Group.

The digital banking functionalities of Zagrebačka Banka include:

Onboarding for new customers: currently not possible digitally – must be done in-branch

Payment functionalities: making payments is possible: by manually filling out a payment order (in the app or online banking), via (premade) templates and by scanning the payment slip or QR code (through the app). Where Erste Bank has Keks Pay, Zagrebačka Banka has "IziPay" which, unlike Erste's Keks pay isn't a stand-alone application, but integrated within ZaBa's banking app. It is however, less sophisticated than Erste's solution, offering fewer functionalities and no options of transferring funds for non-clients.

Standing orders can also made. It is also possible to send transfer requests to other individuals via QR code. Zagrebačka Banka does not support Apple Pay.
Financing: Possible to take out a personal loan (end-to-end) of a maximum 50000 HRK
Asset management: it is possible to invest into savings (such as fixed term savings) and investment fonds end-to-end through the app or internet banking. Zagrebačka Banka also offers e-broker services through its ZB Trader platform, which is even available in the app (although in a limited capacity).
Zagrebačka Banka is the only bank on this list to offer a PFM (personal finance management) software within its online banking.
Other: App Log-in via biometric scan (fingerprint or face-scan). ZaBa's online banking platform also facilitates an "online branch", which enables communication with a banker via video call.

3.3.Raiffeisen Bank

Raiffeisenbank Austria d.d. (RBA) started operating in 1994 and was the first bank in Croatia to be established with foreign capital. The RBA is part of a strong international financial group and is 100% owned by Raiffeisen Bank International AG in Vienna.

Onboarding for new customers: possible end-to-end digitally, via video-identification through the app
Payment functionalities: making payments is possible: by manually filling out a payment order (in the app or online banking), via (premade) templates and by scanning the payment slip or QR code (through the app). Raiffeisen's banking app also has a functionality which enables fast payments via the device's contacts.
Standing orders can also made. It is also possible to send transfer requests to other individuals. Apple pay is not supported, Raiffeisen has their own e-wallet called RaiPay which is a separate app (not integrated into Raiffeisen's main banking app). However, it is only supported on android operating systems.
Financing: Possible to apply for a personal loan (max 300,000 kn)

Asset management: Investing in savings (such as fixed term savings) and investment fonds (end to end) via internet banking (but not app-mobile banking). Raiffeisen also offers e-broker services.
Other: App Log-in via biometric scan (fingerprint or face-scan). Raiffeisen also has an online branch (though, only for premium clients).

3.4.PBZ (Privredna Banka Zagreb)

PBZ (Privredna Banka Zagreb) is the second largest bank in Croatia. It is owned by Italian international banking group Intesa Sanpaolo group. It is the last bank on this list and has a modern looking banking app and online banking platform. However, the online banking platform, which typically should offer a wider range of functionalities compared to the app, offers little to no additional functionalities.

The digital banking functionalities of PBZ include:
Onboarding for new customers: currently not possible digitally – must be done in-branch
Payment functionalities: making payments is possible: by manually filling out a payment order (in the app or online banking), via (premade) templates and by scanning the payment slip or QR code (through the app). Standing orders can also made. Like all other banks on this list, PBZ also offers fast payments via the devise's contact list, with the difference that it requires the receiving party to also use the PBZ banking app. The PBZ banking app also enables users to withdraw cash from an ATM without a debit card, instead the user can generate a code (using the app) and enter it into the ATM to withdraw cash.
Asset management: it is possible to invest into savings (such as fixed term savings) and investment fonds end-to-end through the app or internet banking. PBZ users can also use e-broker services through its "PBZ Investor" platform.
Other: App Log-in via biometric scan (fingerprint or face-scan).

3.5.Comparison

Comparing the four listed banks, we can conclude that the digital services/products they offer are very similar. It is likely that as soon as one bank introduces a new functionality, the other banks in the market consider offering it to their customers as well.
Although the functionalities the banks offer are very similar, there is of course a difference in the visual appearance of the respective digital banking platforms.
Table 3 shows a comparison of the functionalities offered by each bank's digital banking platforms.

Table 3: Comparison of digital banking functionalities

		Erste bank	Zagrebačka banka	Raiffeisenbank	PBZ
Functionality segment	Functionality				
Payment functionalities	Use of Templates	+	+	+	+
	Scan and pay	+	+	+	+
	Standing order	+	+	+	+
	Foreign currency exchange	+	+	+	+
	Cardless ATM withdrawal	-	-	-	+
	Fast payments using the device's contacts	+	+	+	Available (but only with other PBZ app users)
	Apple pay supported	+	-	-	+
Financing	Applying for loans online	Everyone can apply for all types of loans on the bank website	Bank clients can take out Personal loans (end-to-end) online (up to 50,000kn)	Everyone can apply for a personal loan (up to 300,000 kn) on the bank website	-
Asset management	Opening savings digitally	+	+	+	+
	Investing in fonds	+	+	+	+
	e-broker platform	+	+	+	+
	PFM	-	+	-	-
Other	2-factor authentication when logging-in	+	+	+	+
	Log-in via biometrics (App)	+	+	+	+
	Online branch	-	+	+	-
	Applying for insurance	+	-	-	-

4. Analysis of Research Results regarding Consumer Banking Habits

4.1. Research Methodology

In this part of the thesis the research method used was online survey, conducted via Google Forms. The method of online survey is one of the most used sources of data collection. It consists of a set of questions which are sent to the survey participants through the internet (using social media platforms, websites, email and other mediums). The respondent's answers are saved, and the data is available for further analysis. This method is widely used due to the low costs and the fact that it is a fast method to reach the target sample. Also, the feedback is received in digital form, so the results are analysed in real-time, as they arrive.[9] This is a quantitative research method. The goal of this method is to collect numerical data from the group of respondents in order to gain insight into the respondents' habits and preferences regarding digital banking.

This particular survey consists of 17 questions, first of which was an elimination question ("Are you using digital banking?") which if answered with "no" skips to the end of the last questioner. This was necessary in order to filter out participants which do not use digital banking. The remaining 16 question are divided into 3 sections. In the first section, the survey participants answer questions regarding demographics. The second section focuses on the digital banking preferences and opinions of the participants, and the third and final section on the respondents' familiarity with digital banking, which functionalities of digital banking they use. The objective of this survey is to gain insight into the respondents digital banking habits, preferences and know-how. The initial sample of the survey consisted of 63 participants. However, 8 participants stated that they do not use digital banking, therefore the size of the adjusted sample is 55. The survey took place in the period from 20.9.2021. to 22.9.2021.

[9] QuestionPro: "Online Surveys: Definition, Characteristics, Examples, Advantages and Disadvantages"

4.2.Research Questions

In the next part, all 17 questions will be presented along with their possible answers.

Are you using digital banking (online banking or banking app) *

- Yes
- No

Gender *

- Female
- Male

Age *

- <20
- 21-30
- 31-40
- 41-50
- 51 or older

Level of education *

- Highschool
- Undergraduate
- Graduate
- Postgraduate

Employment status

- ○ Student
- ○ Student and employed
- ○ Employed
- ○ Unemployed
- ○ Retired

How long ago have you started using online and/or mobile banking *

- ○ 1-12 months ago
- ○ 1-3 years ago
- ○ 3-5 years ago
- ○ longer than 5 years

Please select the banks(s) you are using *

- ☐ Privredna Banka Zagreb (PBZ)
- ☐ Zagrebačka Banka
- ☐ Erste Banka
- ☐ OTP Banka
- ☐ Raiffeisenbank
- ☐ Hrvatska Poštanska Banka
- ☐ Addiko
- ☐ Revolut
- ☐ Other

How often, on average, do you visit your bank's branch *

- ○ 6 or more times per month
- ○ 3-5 times per month
- ○ 1-2 times per month
- ○ once every 2 months
- ○ twice a year or less

On a scale from 1-5, how important is online banking (and other digital banking solutions) to you as a bank customer?

	1	2	3	4	5	
Not importan	○	○	○	○	○	Crucial

On a scale from 1-5, how satisfied are you with your (primary) bank's online banking and App services? *

	1	2	3	4	5	
Dissatisfied	○	○	○	○	○	Very satisfied

For the following 5 questions, the survey participants were asked to state how strongly they agree with the given statement (on a scale from 1 to 5):

Online banking makes banking cheaper *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Online banking is a safe *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Online banking saves time *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Walk-in bank branches are essential *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

I would consider switching banks if another bank would offer better online/mobile (app) banking *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Which channel of digital banking do you use? *

- ○ Online banking
- ○ Banking app
- ○ Both

Do you use Online or Mobile Banking for the following: *

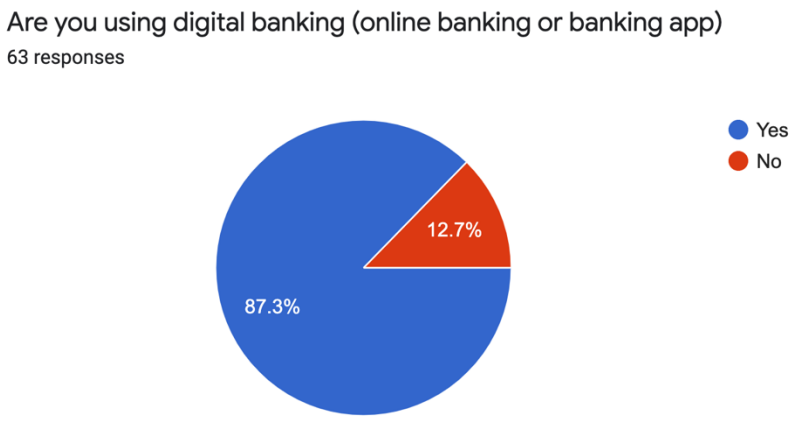
	Yes	No
Online transfers	○	○
Standing orders	○	○
Paying bills	○	○
Checking transaction history	○	○
Applying for banking services (such saving accounts, insurance, loans etc)	○	○
e-wallet (for example, Apple Wallet)	○	○
Cardless ATM withdrawal	○	○
Investment (investing in funds, buying stocks, crypto, etc.)	○	○

4.3. Research Results and Discussion

The results of the survey are graphically presented and discussed.

As already mentioned, the first survey question was used to filter out participants (8) which do not use digital banking, as it would not make sense for them to continue with the survey father.

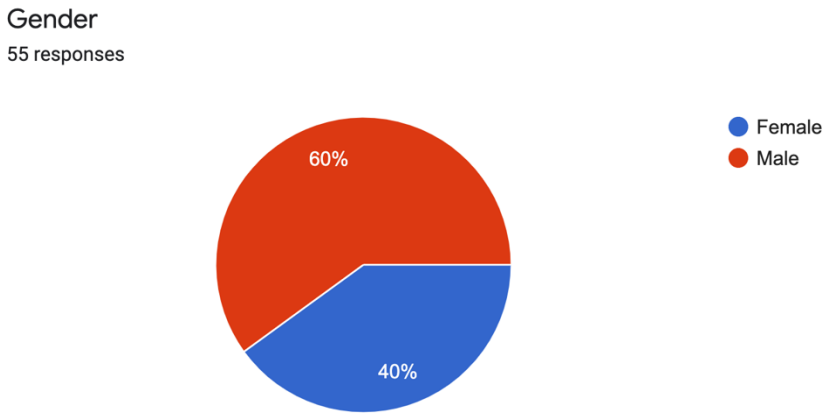
Figure 14: elimination question



4.3.1. Demographic Data

In this subchapter, demographic data of the survey participants is analysed

Figure 15: Distribution of survey participants according to gender



As can be seen in figure 15, Out of the 55 remaining participants of the survey, 60% were male and 40 female.

Figure 16: Distribution of survey participants according to age

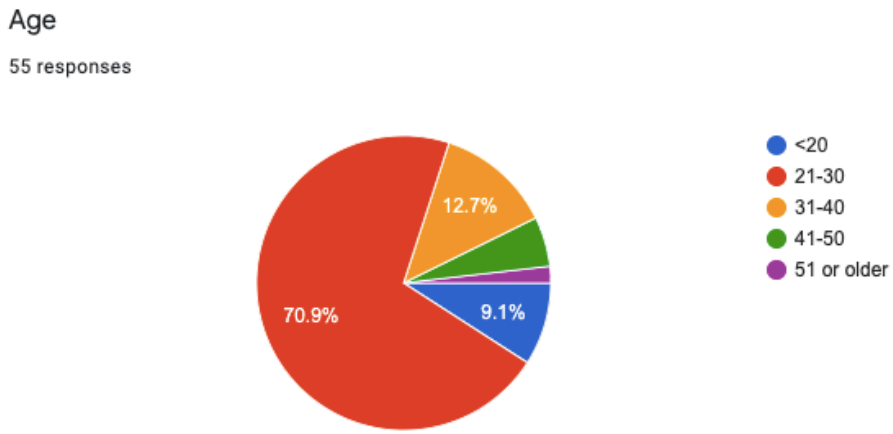
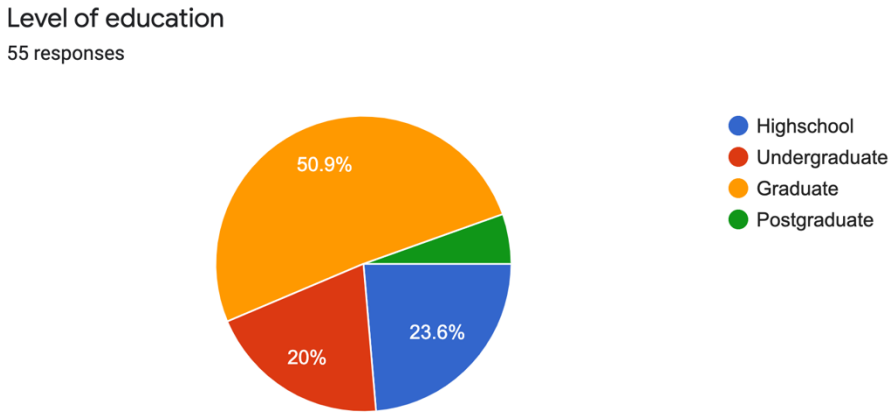


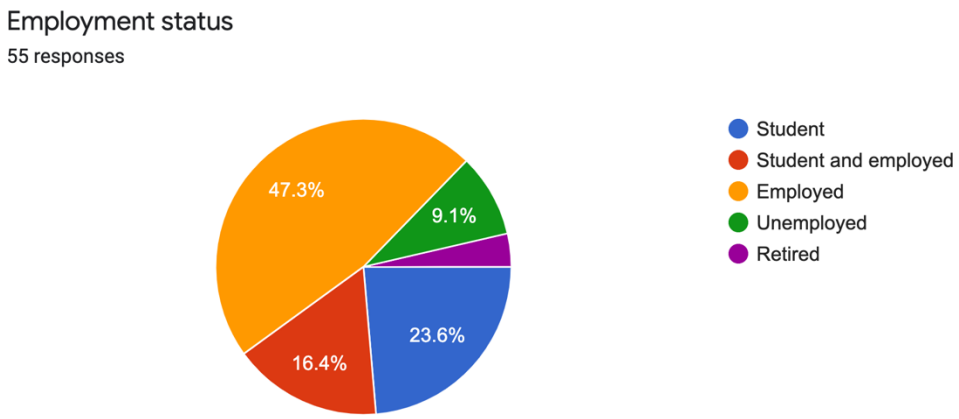
Figure 16 shows that participants of the survey were categorized into 5 age groups: 20 years old or younger, 21-30, 31-40, 41-50, and 51 years or older. It can be seen that 70.9% of survey participants are between 21-30 years old, while the second most represented group with 12,7% was the one with the age range of 31-40.

Figure 17: Distribution of survey participants according to level of education



The next question in the first section was about the level of education of participants in the survey. The results shown in Figure 16 suggest that 50.9% of participants have graduate level of education (master's degree), 23,6% high school level education 20% of the participants have a have an undergraduate level (hold a bachelor's degree), and only 5,5% participants have achieved the level of PhD education.

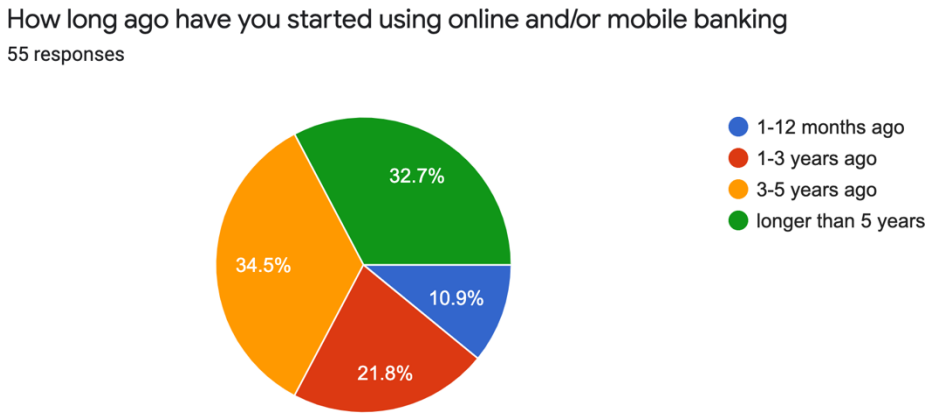
Figure 18: Employment status



47,3% of the participants are employed, 23,6 are students (who do not work), 16,4% are students who are also employed and the rest are unemployed (9,1%) or retired (3,6%).

4.3.2. Digital Banking Preferences

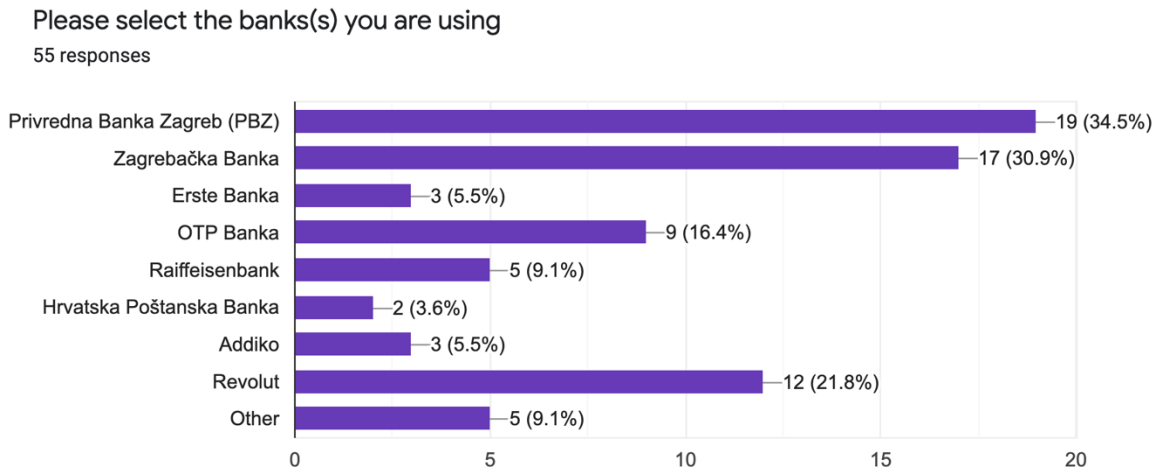
Figure 19: Distribution of respondent according to how long ago they had started using digital banking



As can be seen in figure 19, more than a third 34,5% of the participants have started using digital banking platforms for 3-5 years ago, and almost another third (32,7%) have been using them fir more than 5 years. 32,7% of the survey participants have started using digital banking within the last 3 years (with 10,9% withing the last 12 months). Since that period

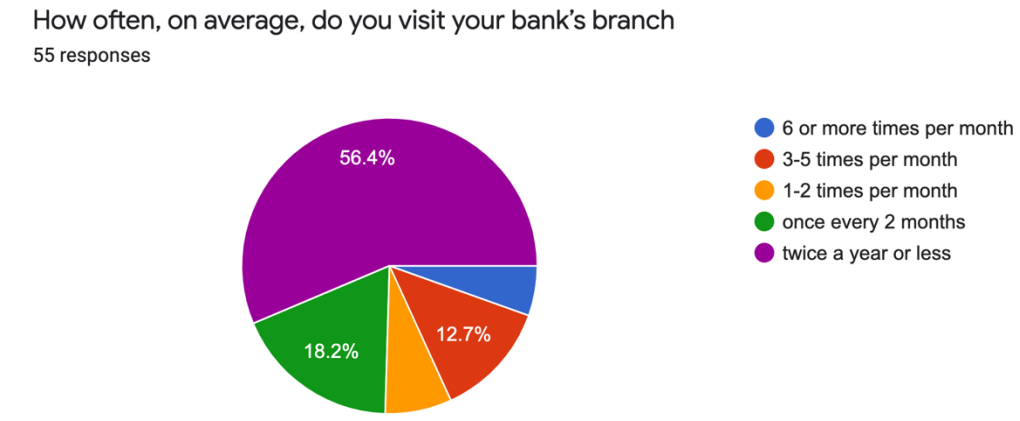
coincides with the outbreak of the Covid-19 pandemic, we can assume that factor may have been the reason why, at least some of those participants adopted digital banking channels.

Figure 20: Banks in Croatia Respondents use



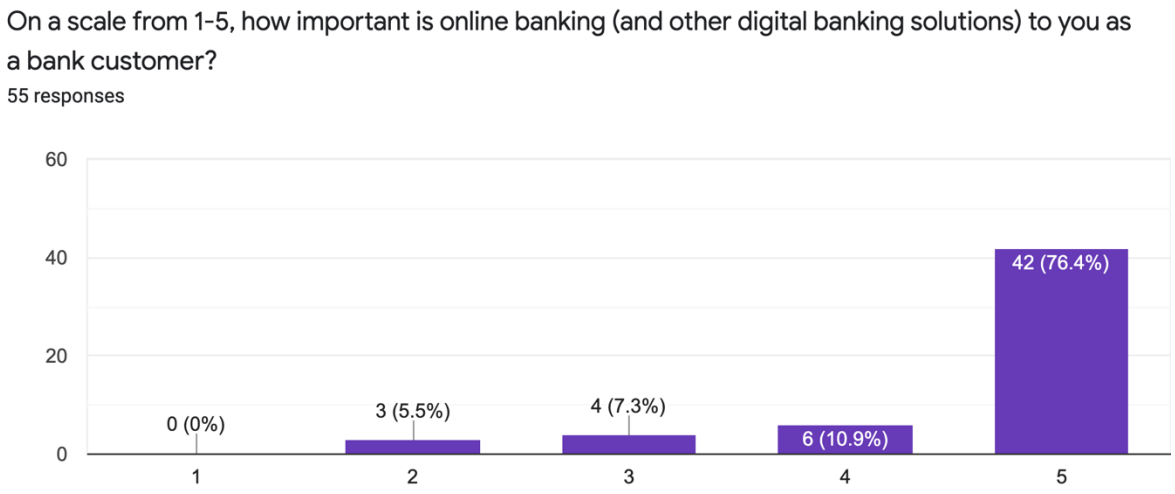
The participants were asked to select the bank (or multiple banks) they were currently using as a provider of banking services. According to the results, the most popular bank was PBZ, with 34,5% of the respondents claiming it. Zagrebačka banka came in as a close second, with 30,9 % respondents selecting it. What is interesting to observe is that 21,8% of the respondents are customers of the digital bank Revolut.

Figure 21: Respondents' frequency of visiting bank branches



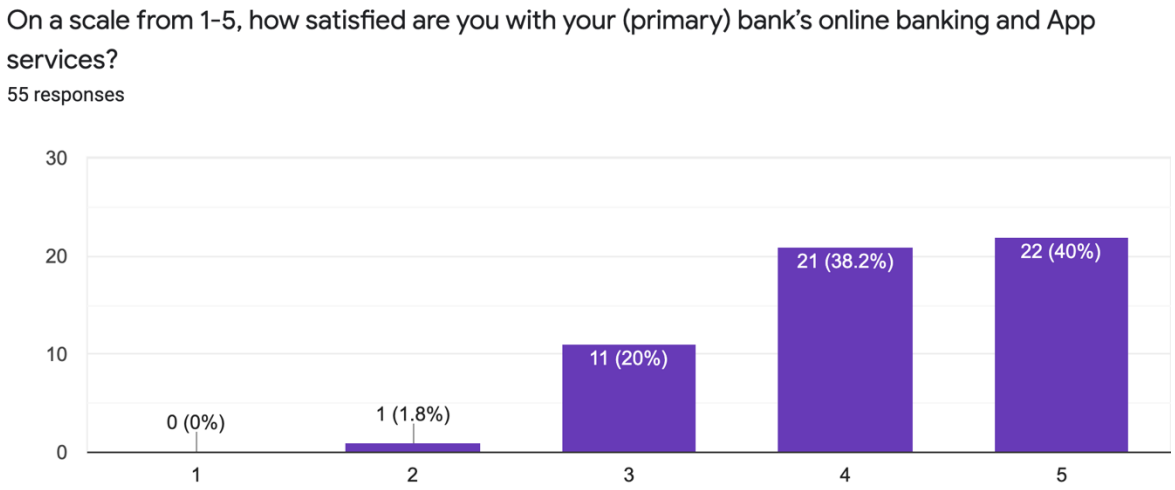
56,4% of the Respondents stated that they visit bank branches no more often than twice a year. This is understandable considering that day-to-day banking activities (like payments, transactions, review of transactions, etc) can be done from home, through digital channels. However, another reason which may skewed the statistic to an extent, might have been the reduced traffic in branches caused by the pandemic.

Figure 22: the relevance of digital banking services according to the respondents



As was expected, the respondents overwhelmingly view digital banking solutions as crucial, with 76,4% giving them an importance level of 5 out of 5.

Figure 23: Respondents' satisfaction with their bank's digital platforms

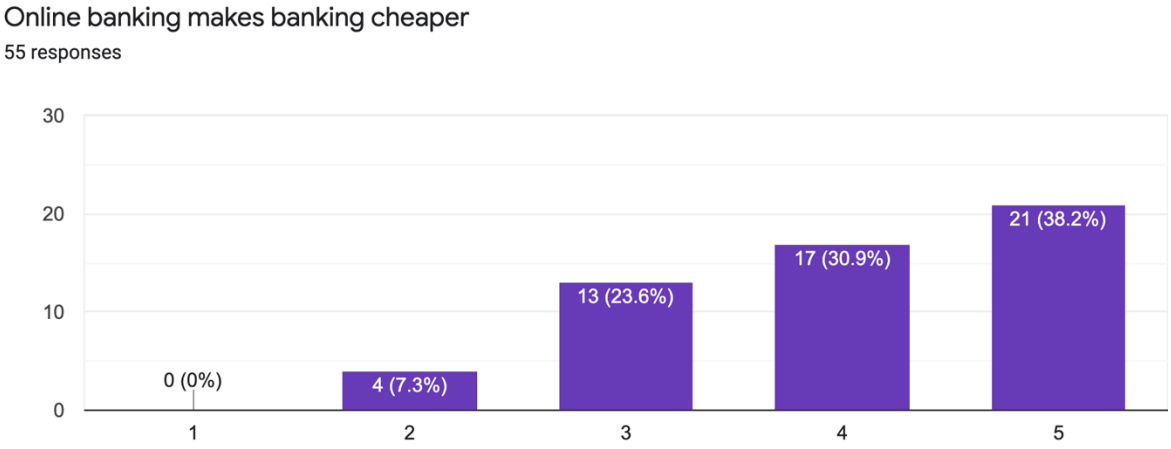


Most Respondents rated their primary bank's digital banking solutions as positive, with 40% of participants giving their bank the maximum grade of 5. 20% have expressed a neutral stance, while only 1,8% have said they are not satisfied with the digital service offer from their bank.

For the following 5 questions, the survey participants were asked to give their opinions on wheatear they agree with the statements:

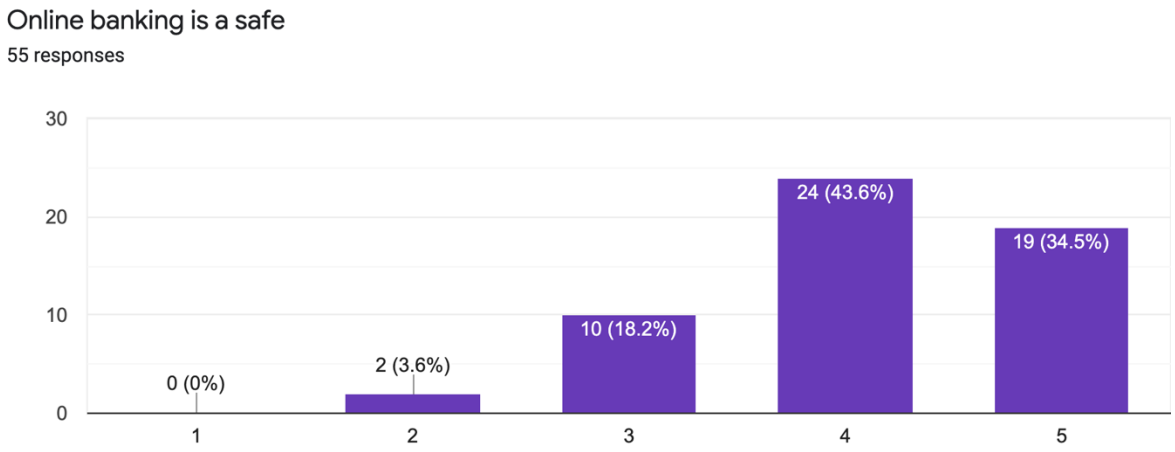
- That online banking reduces the cost of banking services (figure 24);
- online banking is safe for the consumer (figure 25);
- online banking is more time-efficient (figure 26);
- physical bank branches are essential (figure 27)
- they would consider switching banks if another bank would offer better online/mobile (app) banking (figure 28)

Figure 24: perceived cost-efficiency



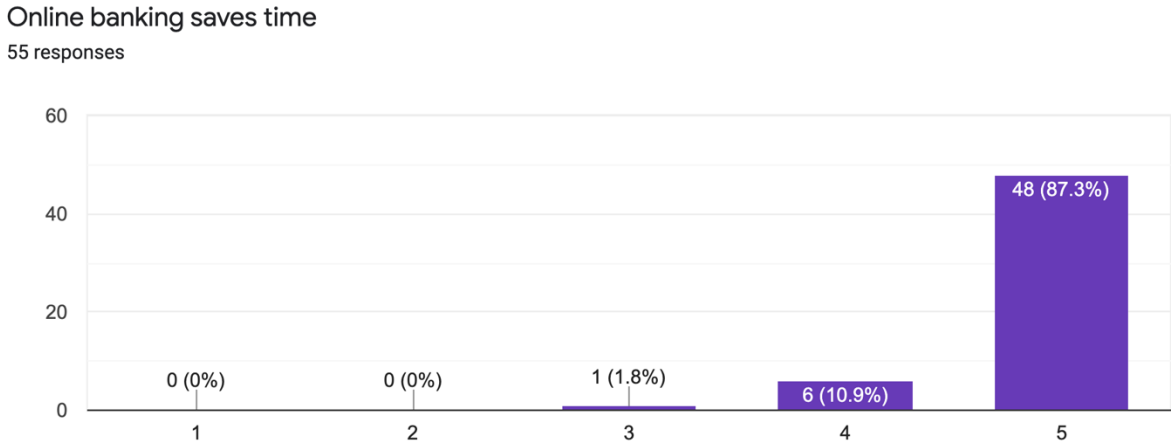
In figure 24 we can observe that most respondents agree with the statement that online banking makes banking more affordable (with 21 participants stating that they agree strongly). 13 of the participants are not sure, while only 2 disagree.

Figure 25: perceived degree of security



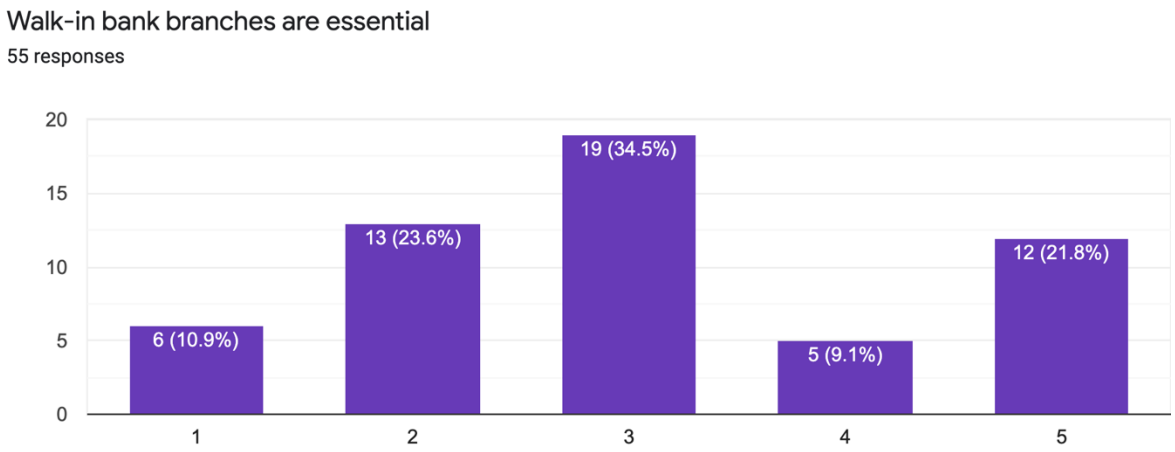
Regarding the statement that online banking is safe (figure 25), we can observe similar results, with 43 of the 55 participants agreeing with the statement (19 of whom agree strongly), 10 remaining neutral and only 2 disagreeing.

Figure 26: perceived time-efficiency



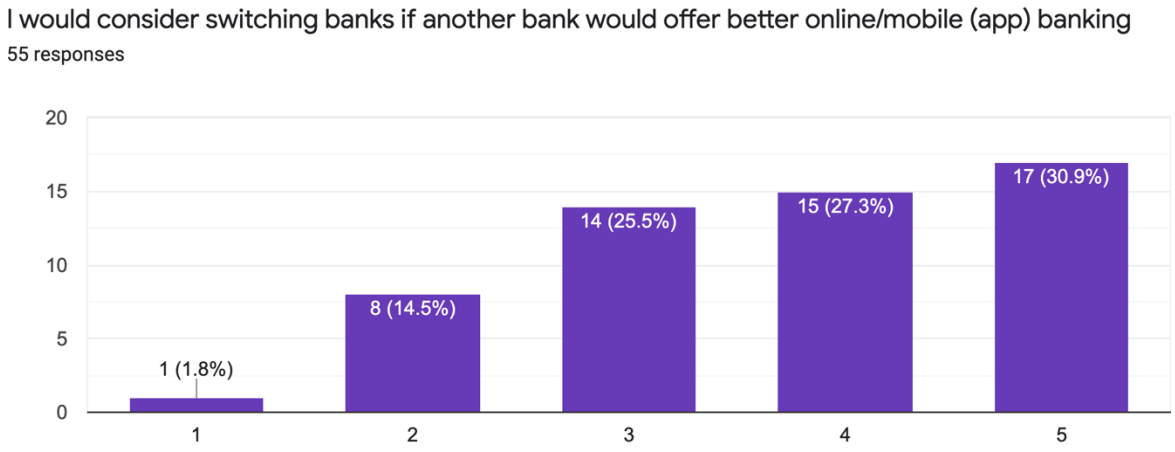
In the statement that online banking saves time (figure 26), an even clearer trend can be observed, where 87,3% of the respondents strongly agree with the statement.

Figure 27: respondents view on the importance of walk-in branches



The results of the fourth statement (figure 27) aren't so clear-cut as the ones before. Most participants (34,5%) were not sure whether they agree with the statement, 21,8% agreed strongly, 9,1% agreed somewhat, 10,9% disagreed strongly and 23,6% disagreed somewhat. As a result, we can't clearly deduce weather the sample does find walk-in branches essential.

Figure 28: Respondents' willingness to switch banks for according to the quality of digital services offered



The results of the fifth and final statement indicate that most of the survey participants would consider switching banks, with 32 participants agreeing with the statement (17 of whom agreed strongly) and 9 disagreeing (with only one disagreeing strongly). 14 participants remained undecided.

4.3.3. Digital Banking-Services familiarity

Figure 29: Participants' use of banking channels

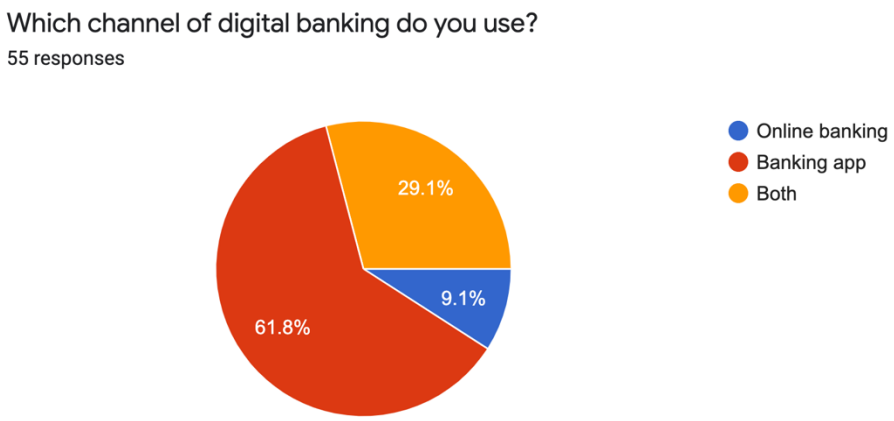
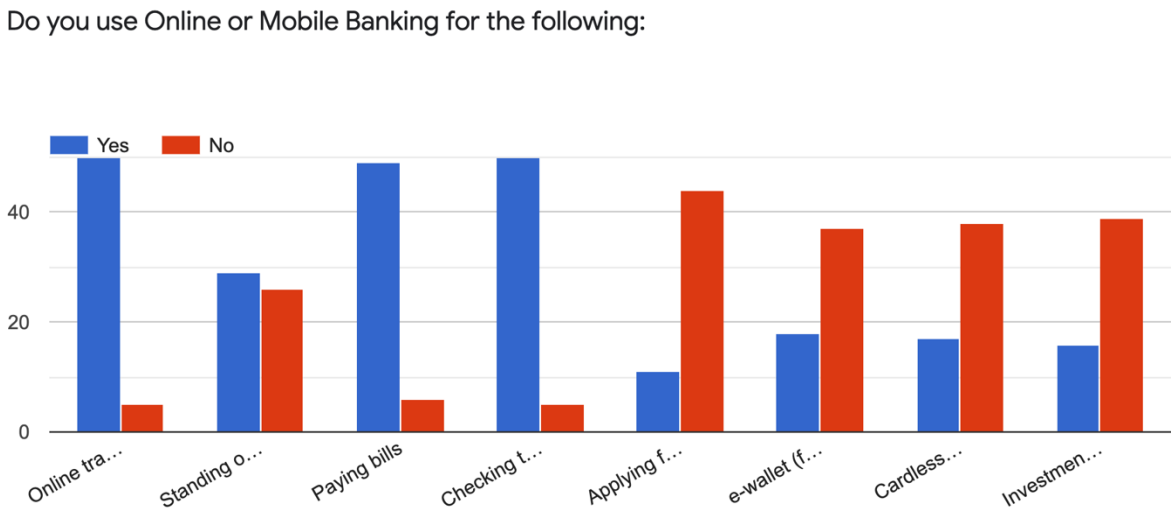


Figure 29 shows the distribution of participants according to the digital banking channels they use, weather only the banking app, only online banking (website based), or both channels. The results show that most of the participants (61,8%) use exclusively banking app to access digital services. 29,1% use a combination of both channels, while only 9,1% rely solely on web-based online banking.

Figure 30: Which digital banking functionalities the participants are using



The participants were lastly asked to select (from a list) which digital banking functionalities they are using. Figure 30 depicts the results of that question. The listed functionalities (from

left to right) are: *online transfers, standing orders, paying bills, checking transaction history, Applying for banking services (such saving accounts, insurance, loans etc), e-wallet (for example, Apple Wallet), Cardless ATM withdrawal* and *Investment (investing in funds, buying stocks, crypto, etc.)*

As can be seen in figure 30, online transactions and checking transaction history are the most widely used functionalities (with 50 participants stating they are using them), followed closely by payment of bills (49). *Applying for banking services* had the lowest number of users withing the sample (11), while *investment* was second last (with16).

5. Conclusion

In conclusion, the changing habits of banking customers, who are increasingly demanding the latest technological innovations from their financial service providers, and the growing fierce competition from FinTech and BigTech companies, are forcing incumbent banks to commit to digitalisation or risk being left behind. Incumbent financial institutions may choose to work with Fintech companies, via partnerships, by buying stakes in their organisation, or they may focus on internal development of digital solutions and transformation. But more often than not they will follow a mixed strategy.

The emergence of the Covid-19 caused pandemic is only accelerating the need and demand for the digitalisation of banking services. As physical bank branches have become difficult to access, especially for the part of the population which is at risk, more and more customers flock to digital banking channels.

Incumbent banks have to find a way to embrace these new trends while still maintaining their established customer base.

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