Application of digital technologies in banking operations in the Republic of Croatia

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APPLICATION OF DIGITAL TECHNOLOGIES IN BANKING OPERATIONS IN THE REPUBLIC OF CROATIA

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Abstract
Digital technologies become an integral part of business activities of a large number of market players in the past fifteen years. Technologies that we used to consider as distant future, such as handheld computers or smart cars, are now considered common and are used on a daily basis. Dynamism, innovation and adaptation are but a few of the features of digital technologies. They constantly change and monitor their users' needs, trying to create a positive user experience, which would eventually provide the most benefits to their owners – by increasing the number of users and reaching the desired financial objectives. Digital technologies penetrated almost all sectors of the economy, from the primary all the way to the quaternary sector. The banking sector is no exception as financial institutions are forced to make use of digital technologies as competitive advantage at the ever more competitive market. Banks, as the most relevant actor at the Croatian financial market, are also no exception; their mobile apps are perhaps the best indicator of how much they are able to keep up with worldwide trends in doing digital business. The conducted survey leads to the conclusion that the respondents are satisfied and have positive opinions about Croatian banks' mobile apps. With regard to the trends concerning the application of digital technologies in Croatian banks, we can say that, when it comes to the context of mobile app digitalization levels, the banks are up-to-date with the trends and innovations implemented at the worldwide banking scene.

Keywords: digital technologies, banks, financial market, mobile apps, online banking

JEL classification: M15, M21

Introduction

Digital technology is based on data written in digital form, i.e. digital record in binary format (0 and 1). When such a digital record is transferred, its quality is not compromised as is the case with transfer of analogue records. The development of said technology was made possible by the enhanced advancement of information and communication technology in the 21st century. Digital technology prototypes used to be seen only in science fiction movies, whereas we cannot imagine our present world without it as it penetrated all sections of the economy of most countries, regardless of their economic prosperity level. Smart devices such as mobile phones, tablets, computers and watches became an integral part of global daily life. Try explaining to the youngest generations how the world worked without the internet, web search engines, digital TV networks and channels and other digitally based technological solutions. The fact that the entire economy of individual countries is based on digital technologies gave rise to the term *digital economy* in modern economics. Digital economy is an umbrella term for labelling new business models, products, services, markets and rapidly growing economic sectors, especially those based on digital technologies as the basic business infrastructure.

Our present lifestyle became faster and more complex, while consumers, whose lifespan extended, became more demanding. Change is one of the core values that lies at the foundation of digital technologies. The surroundings in which an entity is doing business, the market at which it places its products, the way in which it promotes its products as well as the users whose needs should be met – all of these are more volatile than ever. The key activity areas for business operations are customer centricity and brand building (Puri, 2018). Customer centricity entails identifying target customers and their needs, estimating their value to the company, tailoring products and services, and interactive communication with the customers. Brand building entails building customer trust so that they keep returning to the brand and highlighting the uniqueness of a business solution (product or service) relative to the competition.

Srića (2017) highlights creativity and the ability to create and develop innovative organizations as the main sources of competitive advantage and global success.

Connectivity provides added value to digitally dealing with people, companies and intelligent items. Business leaders are expected to design flexible ecosystems which would make the best use of the economy of connectivity (Info trend, 2016). One of the most prominent features of digital technologies is their ability to adapt easily to constant changes in the market environment. The agility of the business leaders, as opposed to a passive approach, and creativity through introducing innovations which enhance and improve consumers' lives, are additional features of digital technologies. Apart from this, mobility enables the consumers to be virtually present at the business entity regardless of their actual physical location. Synergy of various digital processes, hardware, software and other modern technologies is another essential feature of digital technology.

Digital technologies in the function of business support

Digital technologies are one of the key elements of digital business and digital economy that are becoming a source of competitive advantage for enterprises. According to Spremić (2017), they can be divided into primary and secondary.

Spremić classifies the following as *primary digital technologies*:

- Mobile technologies created by technological and infrastructural digital platforms. The development of mobile technologies led to the situation that today mobile devices outnumber people, while constant use of mobile devices introduces drastic changes to all industries and business processes.
- Social networks created by communication and user-oriented digital platforms. They are no longer considered platforms providing only fun and distraction but "serious" communication platforms used in business operations. Social networks are used in synergy with mobile technologies (and all other digital technologies), generating additional benefits as the result of parallel use.
- Cloud computing created by technological and infrastructural platforms. This technology enables efficient and secure use of virtually unlimited digital (hardware, data and software) capacities, primarily for managing, storing and using data, with no capital investment needed, according to the "pay-as-you go" principle (pay for what you use and how much you use it). Cloud computing enables end users quick and simple access and use of mass resources in line with their needs.
- Big data, or advanced data analytics and fast recovery of knowledge from large amounts of diverse data collected in the analytic digital platform. Big data technology is characterised by three key words: data *volume*, data *variety* and *velocity* of recovery, analysis and storage, which enables fast production, storage and distribution of new knowledge generated through advanced analytics of large amounts of diverse data.
- Sensors and Internet of Things (IoT) – connecting a large number of devices equipped with computer chips created by technological and infrastructural digital platforms. The term "Internet of Things" pertains to integrating fast and efficient sensors and computer chips into various devices, making them interactive and "smart".

Secondary digital technologies include: 3D Printers, Robots, Drones, Wearable Technologies, Virtual and Enhanced Reality and Artificial Intelligence.

According to Maričić (2018), 3D print (3D production or 3D press) is the process of creating a physical object by printing it out layer by layer from a digital 3D image or model. 3D print has the potential for creating quite complex products without using complex equipment. By using various materials, such as plastics, aluminium, stainless steel, ceramic or advanced alloys, the 3D printer will be able to produce something that used to take an entire factory.

According to the Croatian Encyclopaedia published by the Miroslav Krleža Institute of Lexicography (2020), robotics is an "interdisciplinary scientific field that deals with designing, constructing and managing robots and their application. It is based on mechanics (mechanical engineering), electrical engineering and computer science, more specifically the discipline of mechatronics, which was born from the interaction of all these disciplines; in recent years, research goes in the direction of bionics." Robotics has a wide variety of applications; today there is virtually no economic sector or activity in which it is not used. Completely autonomous robots receive information from the outside, they are able to work longer and perform more demanding physical labour, they avoid dangerous situations, are able to acquire new knowledge and can adjust to their surroundings. Just like all other machines, autonomous robots will still require regular maintenance by humans (Maričić, 2018). The IT environment recently saw the

emergence of a new aspect of applied robotics, so-called Robotic Process Automation (RPA). This technology accelerates repetitive and labour-intensive processes of software computer robots, minimising the room for error, which leads to automation and optimization of business and eventually reduces costs for the business entity using RPA.

Drones or unmanned aerial vehicles are another technology that is applied in digital business. These are technical systems whose appearance and function resemble those of classic aircraft such as planes and helicopters. What makes them different from one another when completing various aerial tasks is the presence of a pilot on or inside the aircraft platform (Drašner, 2019). Even though they were originally meant to be used for military purposes, in recent years they started to be applied in a variety of areas and are now used, for instance, for controlling crops or animals, irrigation, monitoring fires and floods, saving injured persons, border control, delivery etc.

Wearable Technology, according to the Investopedia definition (Hayes, 2020), is a "category of electronic devices that can be worn as accessories, embedded in clothing, implanted in the user's body, or even tattooed on the skin. The devices are hands-free gadgets with practical uses, powered by microprocessors and enhanced with the ability to send and receive data via the Internet". Wearable Technology was developed for simplifying our daily lives. Tahiri (2017) states that there is a variety of wearable terminal devices, including smart watches, bracelets, glasses, smart shirts, jewellery etc. They appear in many areas of our lives, e.g. healthcare, fitness, education etc.

Virtual Reality technology requires the use of glasses which are not used for seeing the world around you but only the virtually generated world. At that moment, the world you are looking at becomes your virtual reality, in which it is not possible to interact with elements around you in the application, or it is possible to a limited extent - for instance, opening doors, moving objects, enhancing the view etc. Some virtual reality (VR) systems are pretty simple and only require a carboard frame in which you insert your mobile phone and start the VR app; others have more sophisticated additional features that enable you to immerse yourself into a new world by using gloves, headphones or other elements, even enabling movement within the 3D space. Augmented Reality (AR) enables us to use an app to look at the screen of a device, most commonly mobile phone, and see elements that do not exist in real life. These elements augment the reality around us, but only if seen through a screen. The app enables watching without being able to change the elements we are watching, i.e. we are not able to interact with them. Apart from mobile devices, augmented reality glasses are also in use, through which we can see the real world around us as well as additional elements that complement the picture (European Commission, 2020). These technologies can be applied in medicine, sports, design, education, military purposes etc.

Artificial Intelligence (AI) is the area of Computer Science that deals with developing the ability of computers to perform tasks that require some sort of intelligence, i.e. being able to get by in new situations, learn new concepts, make conclusions, understand natural language, recognise scenes etc. (Miroslav Krleža Institute of Lexicography, 2020). It is believed that computers will soon be able to develop, improve and upgrade the software they use on their own, which would optimise performance abilities of the IT system and improve energy efficiency. However, there are downsides to such technology, which primarily means the loss of specific jobs (e.g. programmers, taxi drivers etc.), whose services will be provided by artificial intelligence.

Mobile and online banking

In parallel to the development of new and applicable innovations in information and communication technology (ICT), the banking sector adopted the changes referred to above and adapted its business operations accordingly. This led to electronic operations becoming part of banks' regular operations, which eventually led to the emergence of electronic banking. The emergence of electronic banking is actually a reply by finance institutions to the changes in the market demand conditions, introduced by the entry of computer technologies into the market, together with a wide spectrum of related products. Pursuant to this, modern computer technology enabled banks to reduce costs of financial transaction processing and develop new products and instruments based on this technology. Some of these new products include credit and debit cards, cash machines and home banking. Apart from benefiting the banks, cash machines also benefited the clients as they were now able to access the service 24 hours a day at locations which were not necessarily bank offices, while home banking enabled clients to complete banking transactions from the comfort of their own homes, without having to go to the bank office and lose time queueing. Indirect use of ICT in banks eventually led to the creation of a new financial institution - virtual bank. The first bank of this kind was Security First Network Bank, founded in 1995 and registered in Atlanta, USA. Its purpose and objective were to offer various banking services through the internet (Mishkin and Eakins, 2005).

Electronic banking (e-banking) is the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels (FFIEC, 2003). It can be separated into: online banking, phone banking, mobile banking and cash machine banking.

Online banking enables clients to conduct banking activities with the population and investment services through the internet (Saunders and Cornett, 2006).

Kovačević (2016) defines online banking as "banking service that enables the user to access their user account and conduct financial operations from anywhere on Earth provided they have access to a computer or any other device connected to the internet. It is conducted through a web browser used for accessing the bank's secure website, at which the client gains access to their user account through their security credentials". In order to be granted access, the bank's client must arrange the online banking service with the bank beforehand, which is subject to a fee. Online banking first appeared in the USA at Stanford Federal Credit Union in 1994, soon after which it emerged in Croatia. In 1997, Varaždinska banka was the first to offer its clients the service of checking their account balance and can therefore be considered the pioneer of online banking in Croatia (Brčić, 2018).

According to Panian (2013), mobile business (m-business) can be defined as the use of mobile technologies in the exchange of goods, services, information and knowledge. M-business is the execution of transactions by using mobile equipment via mobile networks that can be wireless and public dial-up networks. This includes a wide spectrum of business activities as part of a company's business operations with end users (*Business-to-Consumer, B2C*) or between companies (*Business-to-business, B2B*). When this form of conducting business is used by banks, we use the term mobile banking. Through the use of tablets, mobile phones or other smart devices, mobile banking users can access a wide variety of banking services such as checking their account balance, making payments or even credit approval. "The most widely used apps are those whose user interface and client authorization mode have been adjusted to the dimensions and technological platform offered by the classical modern smartphone" (Kovačević, 2016). Since the first smartphones, in today's sense of the word, appeared in 2007, when Apple launched its first-generation iPhone, mobile banking gained ground for initial development of

apps for use in the banking sector. The Royal Bank of Scotland developed the first banking app available at Apple's App Store in 2009 (NatWest Group, 2020).
Since online banking and mobile banking are both based on digital technologies, the term "digital banking" is gaining in use as an umbrella term for these two modes of electronic banking (Ahmadi Danyali, 2018). The benefits of digital banking are numerous, both for clients and for banks. Some of these include better organization of free time and more comfort for the bank's clients as they can access their account from anywhere and complete a transaction, e.g. check their account balance, trade their shares in the bank's funds, use money exchange services or other functionalities of digital banking. On the other hand, banks find it more cost effective to maintain the digital banking software than to recruit two shifts of workers in the physical office. From a security aspect, digital banking apps are secured with several authentication and identification levels for account users, which is an additional benefit both for clients and banks. Additional benefits of digital banking include user interfaces that have been designed in a simplistic manner and adapted to clients of all age groups (Merhi et al. 2020).

Methodology and sample description

For the purpose of investigating satisfaction levels of digital technology users in the Croatian banking sector, we created a questionnaire. The survey was conducted in the period between 25 January 2021 and 19 February 2021. Respondents were eligible for taking part in the survey if they used some form of digital banking (online or mobile banking). Before completing the questionnaire, the respondents were informed that the questionnaire was anonymous, that it would be used for writing a postgraduate expert thesis and about the estimated completion time.
The questionnaire was created using the Google Forms tool, available through Google Drive. The questionnaire consisted of 29 closed-ended questions. 22 questions were multiple-choice questions which accepted only one answer. 2 questions accepted one or several answers, while 5 questions required respondents to indicate their level of agreement (Likert scale). The questionnaire was distributed online, through the WhatsApp social network and via e-mail. 253 respondents took part in the survey and all 253 questionnaires were completed correctly and in full (Birovčec, 2021). The total number of respondents to the survey included 143 female and 110 male participants. The respondents were separated into four age groups. The largest number of respondents (95) fall into the 25-35 age group, while the fewest respondents (35) belong to the above-45 age group. The largest number of respondents to the survey hold a university degree (137), followed by professional college degree (79) and secondary school degree (37).

Research results

In the remainder of the text, we focus on the survey conducted for the purpose of investigating satisfaction levels of digital technology users in the Croatian banking sector, whose main results are presented below.
Respondents' preferences with regard to individual types of banking entailed four possible answers. The largest number of respondents prefer mobile banking (197, or 77.9%) and online

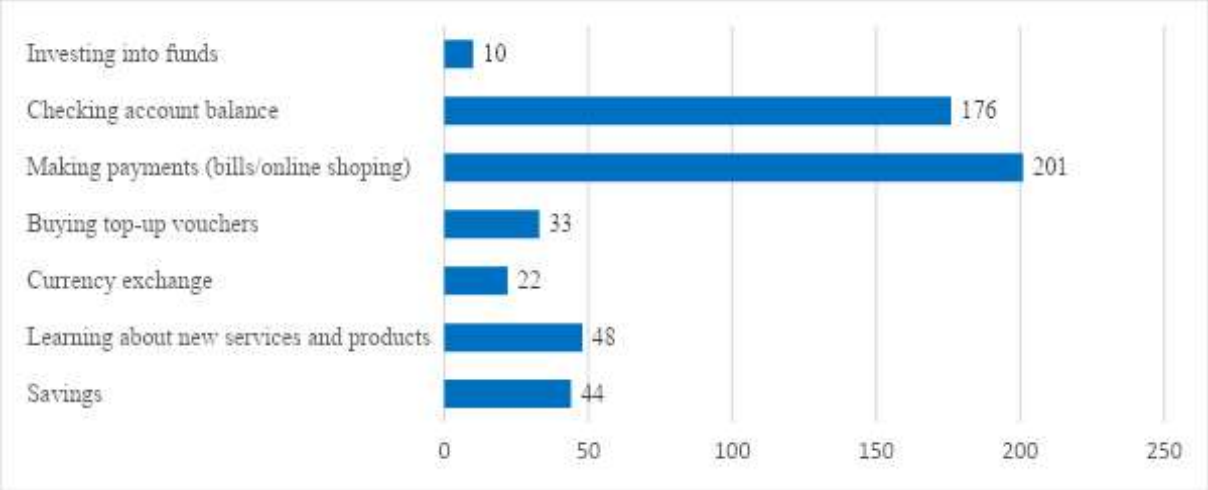
banking (47, or 18.6%), 6 respondents (2.4%) selected personal visit to bank office, while only 3 respondents (1.2%) use digital banking services provided by foreign banks.

When asked about how they access information on digital banking, more than half of the respondents (139, or 51.4%) selected the Internet as the answer, while 49 respondents (19.4%) collect information on digital banking through friends and acquaintances, followed by bank clerks (38, or 15%), social networks (29, or 11.5%), while only 7 respondents (2.8%) receive information from radio and TV.

The frequency of using online banking was graded into three levels. The largest number of respondents (151, or 59.7%) use online banking less than five times a month, 55 respondents (21.7%) use it between five and ten times a month, while 49 respondents (18.6%) use it more than ten times a month. The same question as above was asked regarding the use of mobile banking. The answers show a substantial difference in comparison to the previous question – the most frequent answer was "more than ten times a month" (116, or 45.8%), 70 respondents (27.7%) said they used mobile banking between five and ten times a month, while 67 respondents (26.5%) use it less than five times a month.

The respondents were also asked to indicate online banking services they use, by selecting one or more out of seven possible answers. The survey shows that online banking is used most frequently for paying bills (201 respondents, or 79.4%), checking account balance (176 respondents, or 69.6%) and keeping up-to-date with new services and products (48 respondents, or 19%).

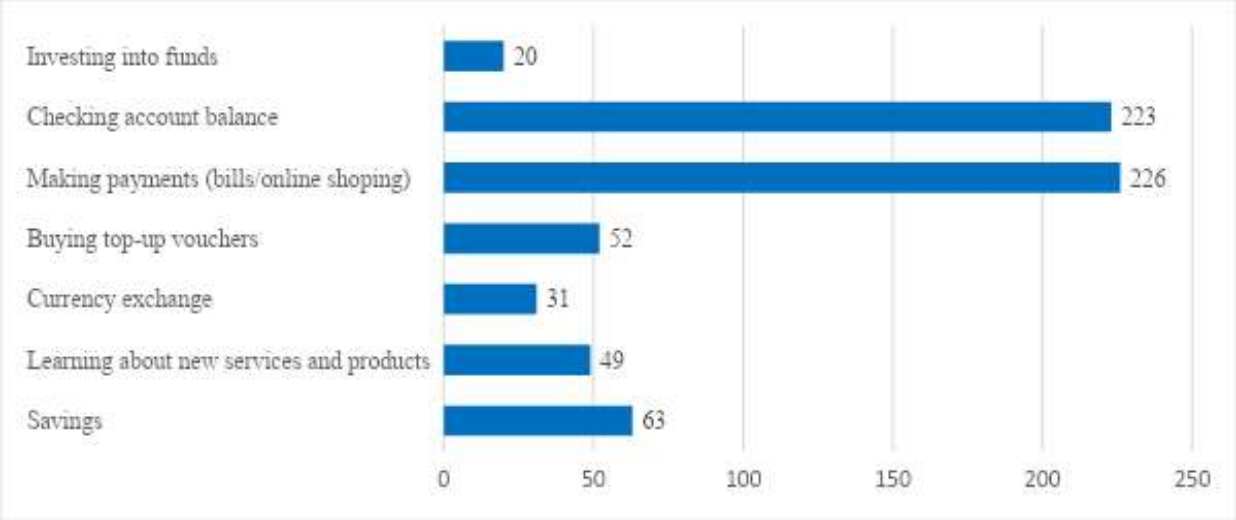
Graph 1. Most frequently used functionalities of online banking



Source: Authors' treatment of survey results

When asked about the mobile banking services they used most frequently, the respondents' answers were similar as in the previous question – the majority of respondents use mobile banking primarily for making payments (226, or 89.3%) and checking account balance (223, or 88.1%); however, other answers appeared more frequently than was the case in the previous question, such as buying top-up vouchers (52 respondents, or 20.6%) or money saving (63, or 24.9%).

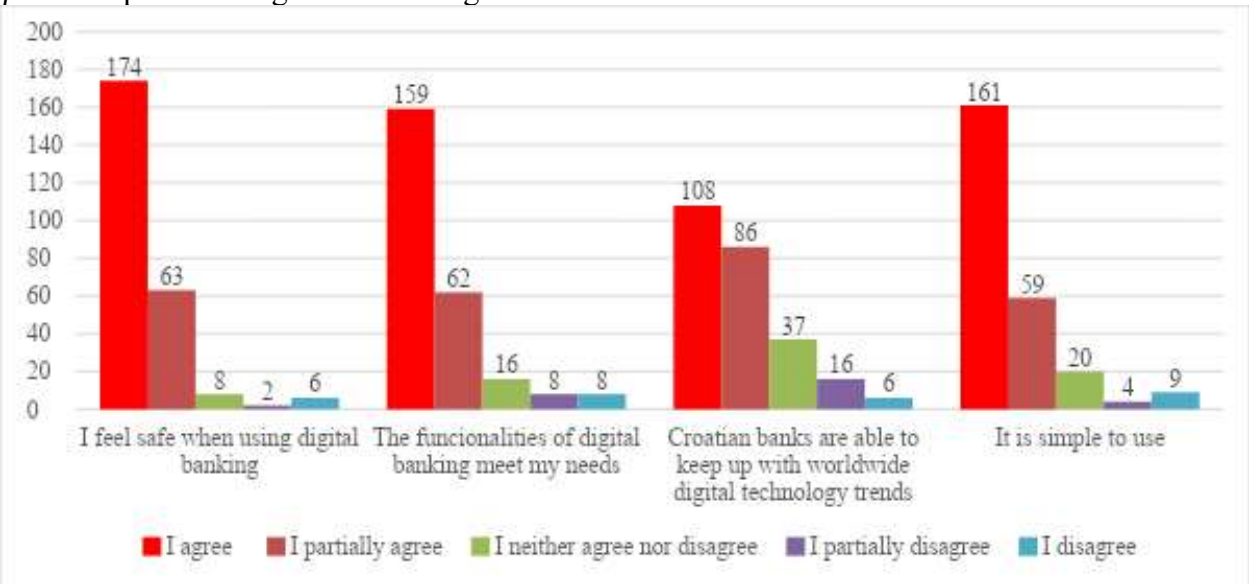
Graph 2. Most frequently used functionalities of mobile banking



Source: Authors' treatment of survey results

For agreeing, or disagreeing, with individual statements regarding digital banking, the respondents were asked to select a specific level of agreement. The question was designed as a multiple-choice grid. The great majority of respondents totally or partially agreed with all four statements (over 80% of respondents expressed full or partial agreement). For instance, 174 respondents (68.8%) totally agreed with the statement that they felt safe when using digital banking, 161 respondents (63.6%) totally agree that it is easy to use, 159 respondents (62.8%) agree that digital banking functionalities completely meet their personal needs, whereas almost half of the respondents (108, or 42.7%) believe that Croatian banks follow worldwide digital technology trends.

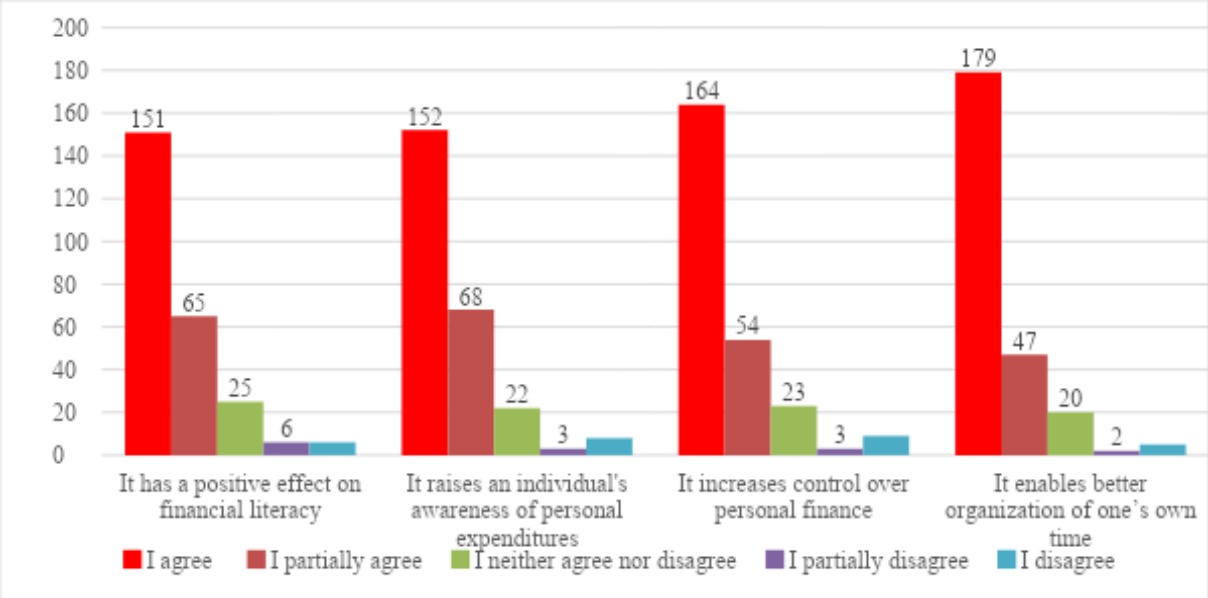
Graph 3. Respondents' agreement with given statements



Source: Authors' treatment of survey results

The respondents were also asked to express their agreement/disagreement with individual statements regarding the benefits of digital banking. Over 60% of respondents expressed full agreement with every statement, while over 18% expressed partial agreement.

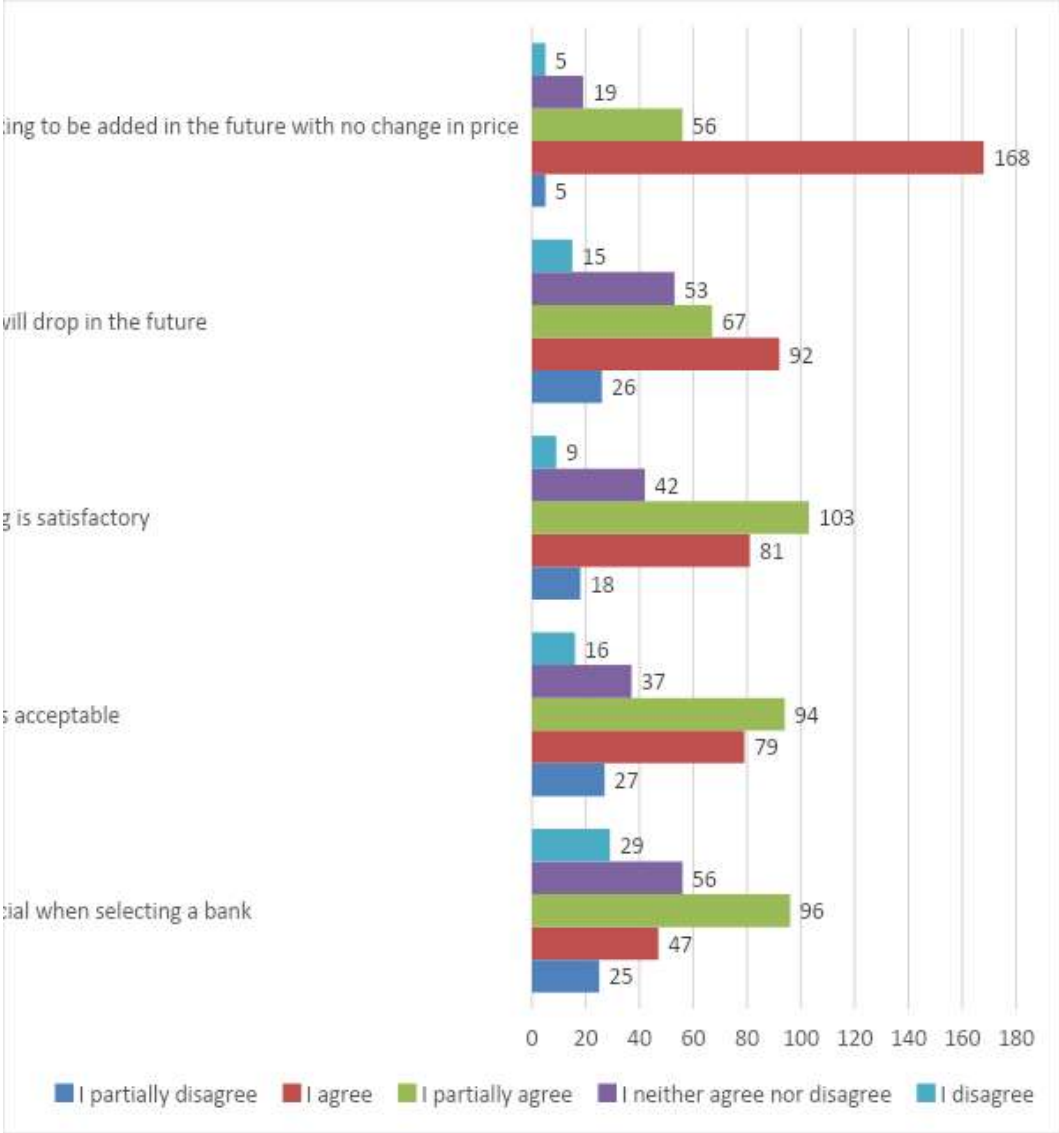
Graph 4. Respondents' opinion on the benefits of digital banking



Source: Authors' treatment of survey results

The respondents were also to express their opinion regarding the price of digital banking services. The majority of respondents (168, or 66%) expressed total agreement with the statements that they expected new functionalities of digital banking to be added in the future with no change in price and that the fees for using digital banking would drop in the future (92, or 36%). With regard to the other statements, the majority of respondents also expressed agreement, albeit partial agreement.

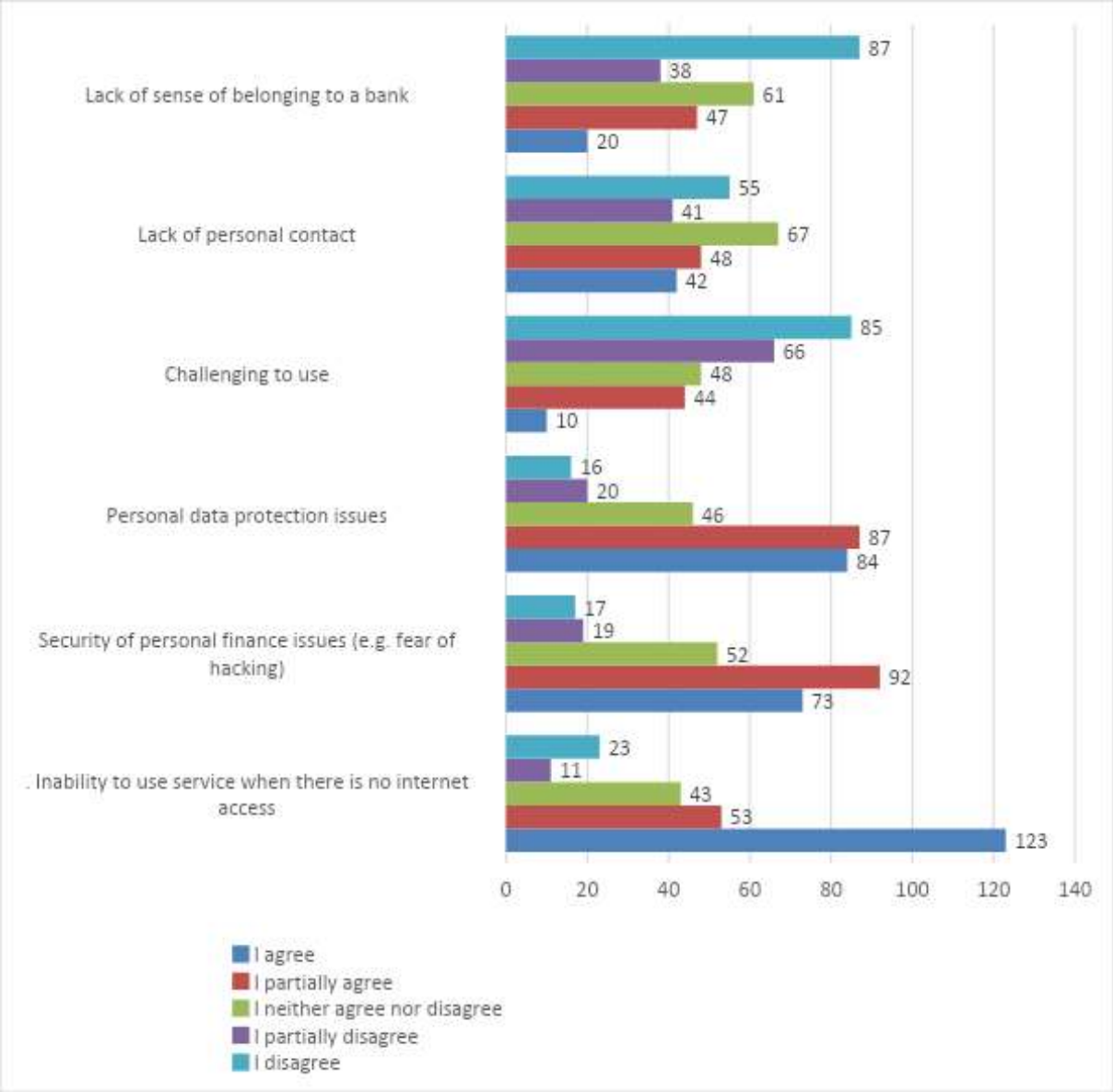
Graph 5. Respondent's opinion on the prices of digital banking services



Source: Authors' treatment of survey results

The next question asked for the respondents' opinion regarding the shortcomings of digital banking. The majority of respondents agreed with the statement that the greatest shortcoming of digital banking was the inability to use it when there is no internet access (123 respondents, or 49%). The highest level of disagreement regarding the shortcomings of digital banking was recorded for statements concerning the lack of sense of belonging to a specific bank (87, or 34%), being challenging to use (85, or 34%) and lack of personal contact (55, or 21%).

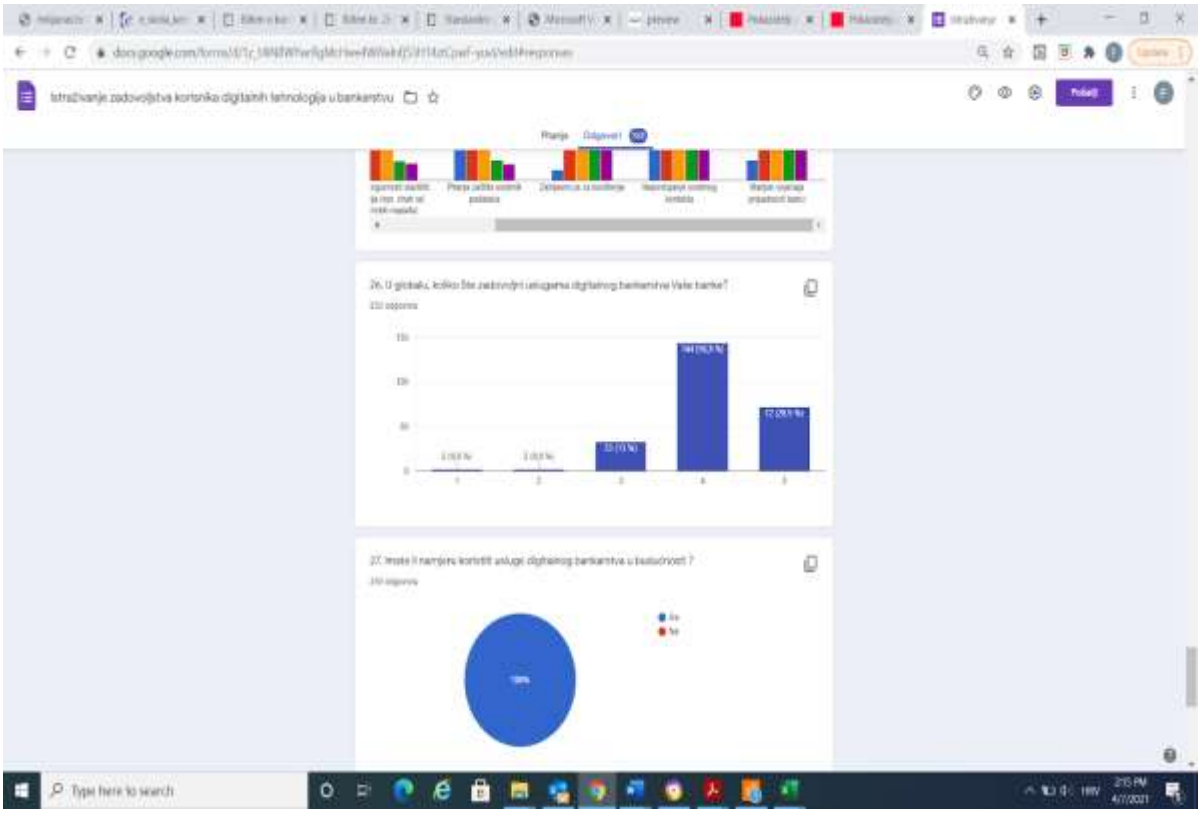
Graph 6. Respondents' opinion on the given shortcomings of digital banking



Source: Authors' treatment of survey results

The respondents were asked to rate their level of satisfaction with digital banking services provided by their personal bank on a scale of 1 to 5. The survey showed that only 4 respondents (1.6%) rated their satisfaction as 1 (insufficient) and 2 (sufficient), 33 respondents (13%) rated it with 3 (good), the majority (144 respondents, or 56.9%) marked it with 4 (very good), while 72 respondents (28.5%) gave it the top mark 5 (excellent).

Graph 7. Respondents' satisfaction with digital banking services



Source: Authors' treatment of survey results

In sum, the conducted survey has shown, among other things, that the respondents prefer mobile banking to all other forms of banking, that the internet is their most common source of information regarding digital banking, that they mostly use online banking services less than five times a month, primarily for making payments and checking their account balance, while mobile banking services are used more than ten times a month, also for paying bills and checking account balance. In addition, the majority of respondents said that they felt completely safe when using digital banking, that digital banking functionalities completely met their personal needs, that Croatian banks followed worldwide digital technology trends and that digital banking was easy to use. Furthermore, a large majority of respondents completely believe that digital banking has a positive effect on financial literacy, raises an individual's awareness of personal expenditure, increases control over personal finance and enables better organization of one's own time. With regard to prices of digital banking services, the majority of respondents expect new functionalities of digital banking to be added in the future with no change in price and that the fees for using these services would drop in the future. The majority of respondents partially agree with the statement that the price-to-quality ratio is satisfactory, that the fees for using these services are acceptable and that the price of the service is crucial when selecting a bank. The inability to use digital banking when there is no internet access was reported as its greatest shortcoming. Finally, the majority of respondents are satisfied with digital banking services.

Conclusion, Recommendations and Research Limitations

The changes in social behaviour are getting quicker and arise in shorter time intervals, while user demand for new solutions that would meet their needs is becoming more challenging and complex. Changes became an inevitable part of today's disruptive world. In this constantly changing environment, enterprises that want to survive at the market must be flexible, i.e. they have to be able to adjust as much as possible, the banking market as an integral part of the global economy being no exception. Changes to the banking sector both at the global and local levels and lax monetary policies of leading central banks in the world led to deposit interest rates constantly falling. Namely, the above trends can lead to a drop in credit interest rates, drop in bank's revenue from interest, poorer financial performance, discontent of clients with deposits and lack of the clients' loyalty. To reply to potential negative implications of such behaviour and the surrounding trends, banks are turning more to the use of digital technologies in business in order to attract new clients and meet their needs in an innovative and flexible way.

The leading roles at the Croatian financial market are played by credit institutions, primarily banks, which are mostly owned by foreign entities. In line with global digitalization trends, the number of digital banking users in Croatia constantly increased in the previous years. Interestingly enough, in 2019 the number of mobile banking users in Croatia exceeded the number of online banking users, which, up to 2019, always used to be the larger of the two. In the context of mobile app functionalities, Croatian banks observe worldwide digital innovations and are keeping up with their international competitors. The currently used banking mobile apps in Croatia have been analysed on the basis of their most commonly used functionalities.

Furthermore, in order to test specific hypotheses regarding the level of use and development of various forms of digital banking in Croatia, we conducted a survey examining satisfaction levels of users of digital technologies in banking. The obtained results, among other things, lead to the conclusion that users prefer digital banking to going to a physical bank office and also prefer mobile to online banking; clients use digital banking more than five times a month on average, primarily for checking their account balance and making payments; the users require digital banking services to be reliable; the majority of users do not use digital banking services provided by foreign banks and believe that digital technology of Croatian banks (digital banking forms, protection, biometric authentication etc.) is able to keep up with digital technologies used by banks worldwide. Respondents also believe that the price-to-quality ratio of digital banking is satisfactory, while what they see as the biggest shortcomings are the inability to use digital banking when there is no internet access and perceived security of their own finance (fear of hacking). Finally, the largest number of users of digital banking assess their personal satisfaction with digital banking services provided by their bank as very good or excellent.

In line with the above, the conducted survey leads to the conclusion that the respondents are satisfied and have positive opinions about Croatian banks' mobile apps. With regard to the trends concerning the application of digital technologies in Croatian banks, we can say that, when it comes to the context of mobile app digitalization levels, the banks are up-to-date with the trends and innovations implemented at the worldwide banking scene. In addition to the above, in 2019 digital channels – online and mobile banking – become Croatian banks' primary channels of sales and distribution, both in the sense of value and the number of transactions. Since we were unable to include all trends related to the application of digital technologies in banks in this paper, we cannot offer a conclusion on how Croatian banks apply digital technologies in business operations outside the above context.

The conducted research has limitations that need to be considered when assessing validity, reliability and generalising results. Since a part of the research involved the questionnaire method, we run into a bias issue since we rely on the respondents' subjective views and opinions.

Recommendations for future research are implementing surveys in other EU countries and do a comparative analysis of Croatian banks and their use of digital technologies relative to banks in other countries. Croatian banks benefit from the use of digital technologies in their business operations. For how long banks will be able to use the benefits of digital technologies to raise profitability will depend on time and their ability to adjust to new demands and challenges at the financial marker.

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