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Trends and Risks of Electronic Banking in Slovakia during the COVID-19 pandemic

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Abstract

Research background: Currently, commercial banks prefer using electronic banking as much as possible. One of the reasons is cost savings, but also more effective communication with customers and a greater collection of data about them. Electronic banking has several forms like fintech technology, biometrics, instant payments, chat bots, electronic signature or multibanking, and there are many risks associated with them. **Purpose of the article:** The aim of the paper was to present a part of the results of our survey with 180 respondents focused on new trends and risks of electronic banking. We focused on the use of electronic banking during the COVID-19 pandemic in Slovakia, while we researched statistically significant differences of its use in terms of gender, age, education and permanent residence.

Methods: We used Chi-square goodness of fit test and Chi-square test of Independence.

Findings & Value added: The results of our survey have shown that the majority of the respondents use electronic banking, and that the respondents used the electronic banking during the COVID-19 pandemic in the same way as before. Men are more familiar with the risks of electronic banking, while a large group of respondents have never heard of some of the mentioned risks like phishing, vishing, scam or pharming. Therefore, we recommend continuous education of the population about the risks and safety of electronic banking.

Keywords: *electronic banking; risk; COVID-19 pandemic*

JEL Classification: *G21; G40; I00*

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1 Introduction

Electronic banking is a modern form of payment, which involves controlling bank accounts using electronic means. Communication between the bank and the client takes place through modern telecommunications equipment. Banks have always ensured the highest protection of clients' deposited money, which they also strive for in electronic banking. The most frequently used security measures in banking operations are PIN - a four to eight-digit number, GRID card - codes, Electronic personal code - a generated code, and biometric data that work using biological signs. The advantage of electronic banking is that we can carry out various banking operations from any place in the world without visiting the bank in person (20).

The outbreak of the COVID-19 disease has undoubtedly greatly increased the opportunities for online shopping (5), thereby increasing the demand for internet banking. The long-lasting pandemic has significantly accelerated customer expectations regarding digitization of banking. With the increasing popularity of internet banking during the COVID-19 pandemic, researchers are thus motivated to investigate the factors influencing the intention to use internet banking, e.g. in Indonesia (8).

Banks can be chosen based on several factors, such as location, security and electronic banking functions. Customer characteristics such as gender and age can also influence this decision. As the digitization of banking has accelerated due to the COVID-19 pandemic, the factors that affect this decision may change as well (19).

The role of social media in the transition of internet banking during the COVID-19 pandemic was also clarified in the research (13). Covid-19 has disrupted personal banking operations and increased the physical threat to both retail bankers and customers. As a result, the world has moved towards online banking to continue with routine transactions related to paying bills, buying groceries, and shopping for brands.

In recent years, in general, all bank services in branches have become more expensive. Branches are a significant cost item for banks, which is why banks are trying to optimize them. Experts say that bank fees will continue to rise. Due to the pandemic, fees for non-cash and cash transactions have increased. Banks are trying to push their clients to use digital applications in order to reduce the number of branches in Slovakia (16, 17).

The year-on-year increase is 109%, which increases internet banking logins by 31%. The overall use of mobile or online applications has increased by 30%. Currently, in banks, contracts and signatures are purely electronic, and banks plan to constantly improve their online applications (10).

Innovative banking technology should address the needs of the modern client, provide relevant markets, bring benefits to the customer and be easily accessible and user-friendly (21, 24).

However, growing threat of cyber-attacks and computer crime is associated with the increase in the use of internet services and also internet banking during the COVID-19 pandemic. Therefore, banks must also focus on cyber security solutions.

According to the study (1) aimed at analyzing the coronavirus crisis (COVID-19) from the point of view of cybercrime, the most common were hacker attacks (37%), followed by spam emails (13%), malicious domains (9%), mobile applications (8%), phishing (7%), malware (7%), browsing apps (6%), DDoS (6%), web apps (6%) and MSMM (6%). The study recommends that governments and organizations should work on staying resilient and innovative in their cyber security decisions to weather

the current and future consequences of a pandemic or similar crisis that may be prolonged.

Fraudsters aimed to steal sensitive data such as passwords, usernames, banking information and other personal information. Some hackers used the stolen data to withdraw money from people's accounts. At the height of the COVID-19 crisis, bank loan fraud spread rapidly, as many of the scams focused on robbing people of their money and personal information through online shopping. As a result of the pandemic, the number of fraud cases was 42% higher than in the previous year 2019, as cyber fraudsters took advantage of the fact that many physical stores had to close down. Some bank clients said they received text messages instructing them to connect to the Internet and change the delivery date of the package. At the same time, others filled in their bank details, which subsequently led to their accounts being hacked (1).

Many other studies (16, 11) focus on researching various cyber threats associated with the COVID-19 pandemic and exploring potential preventive measures. The results also point to the importance of education and user training to increase cyber security awareness.

2 Methodology

The data used for the analysis are derived from own survey, which was realized in January and March 2021 during the COVID-19 pandemic. We used MS OFFICE-FORMS applications to compile the questionnaire. 180 respondents took part in the research.

To assess the representativeness of the sample, we used the Chi-square goodness of fit test.

$$\chi^2 = \sum_{i=1}^r \frac{(E_i - T_i)^2}{T_i} \quad (1)$$

For calculations of theoretical frequencies, we used data from The Statistical Office of the Slovak Republic (SOSR). Used gender, education and age categories applied to the economically active population in the year 2020. For permanent residence, we used data concerning total population.

To detect statistically significant differences between individual groups, we used the Chi-square test of Independence:

$$\chi^2 = \sum_{i=1}^m \sum_{j=1}^r \frac{(E_{ij} - T_{ij})^2}{T_{ij}} \quad (2)$$

To determine the degree of dependence, we used the Pearson coefficient (C) and Crammer coefficient (V), which are in the interval <0; 1):

$$C = \sqrt{\frac{\chi^2}{\chi^2+n}} \quad (3)$$

$$V = \sqrt{\frac{\chi^2}{n*(\min((m,r))-1)}} \quad (4)$$

and it applies that:

- values close to 0 indicate weak dependence
- values close to 1 indicate very strong dependence
- the maximum value depends on the size of the table

When evaluating the number of banks and payment institutions, we used data on financial market entities from the National Bank of Slovakia (NBS) (26).

3 Results

According to the authorization aspect, we have several institutions in Slovakia. There are 25 banks and branches of foreign banks in Slovakia; 12 payment institutions and branches of foreign payment institutions; 39 payment services agents; and 58 e-money services distributors (26).

3.1 Testing the representativeness of the sample set

The data used for the analysis are derived from own survey, which was realized in January and March 2021 during the COVID-19 pandemic. 180 respondents took part in the research, of which 87 were women and 93 were men. The age range of the participating respondents in our research was:

- age of 15-34 years: 146 respondents,
- age of 35-54 years: 13 respondents,
- age of 55 – more years: 21 respondents,

In terms of permanent residence, the structure comprised of 97 respondents from cities and 83 respondents from rural areas. In terms of education, there were 124 respondents with elementary and secondary education, and 56 respondents with university education and higher. Originally, there were more groups, but they were merged, as we were not able to achieve representativeness by these several groups. The results of the performed tests are shown in Table 1. It follows that the representativeness was confirmed for the parameters of gender, education and permanent residence.

Table 1. Results of the representativeness tests of the sample

Gender	Male	93	52%	Chi-square goodness-of-fit test:	0.63594131
	Female	87	48%	Chi table value:	3.84145882

	Sum	180	100%	Result:	representative
Age	15-34	146	81%	Chi-square goodness-of-fit test: Chi table value:	244.852385
	35-54	13	7%		5.99146455
	55+	21	12%		
	Sum	180	100%	Result:	unrepresentative
Education	Primary - secondary	124	69%	Chi-square goodness-of-fit test: Chi table value:	1.25557409
	Higher	56	31%		3.84145882
		Sum	180	100%	Result:
Permanent residence	City	97	54%	Chi-square goodness-of-fit test: Chi table value:	0.03376263
	Village	83	46%		3.84145882
		Sum	180	100%	Result:

Source: authors (2022)

3.2 Development trends of electronic banking

The first group of questions in our survey dealt with using and trends of electronic banking. To the question “Do you use electronic banking?” the majority of the respondents answered “yes” regardless of gender. Only 13 respondents answered “no” (Figure 1).

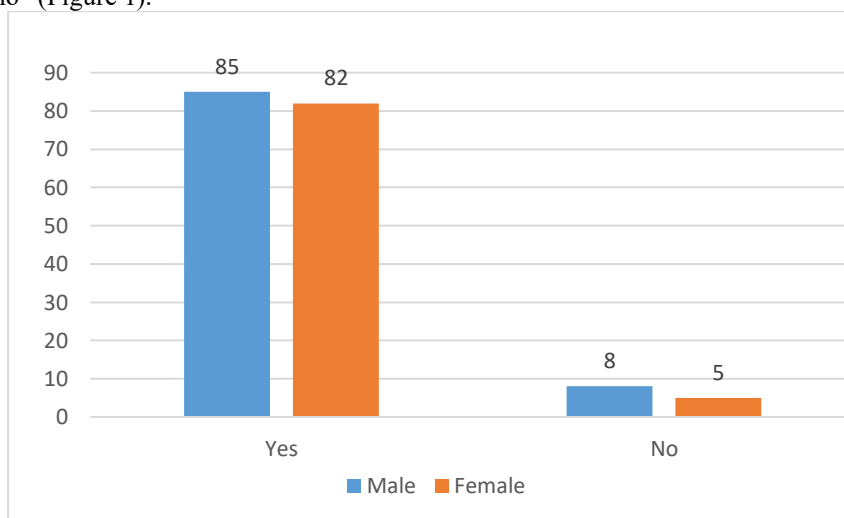


Figure 1. Answers to Question 1: Do you use electronic banking?

Source: authors (2022)

To the second question “How often do you use electronic banking?”, there were different answers, while the respondents could choose from 5 answers:

1. once a week
2. 2-3 times per month
3. 2-3 times per week
4. never
5. every day

Most women answered “2-3 times per month”, while most men answered “2-3 times per week”. Important groups of answers were “once a week” or “every day” (Figure 2).

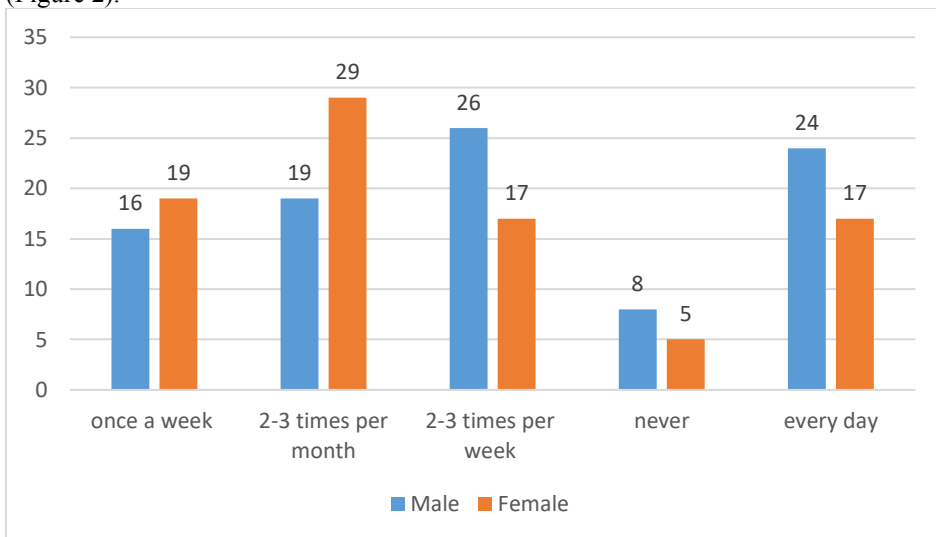


Figure 2. Answers to Question 2: How often do you use electronic banking?

Source: authors (2022)

The third question was related to new trends in electronic banking. In our survey, we listed the following new trends of electronic banking:

Fintech technology – this is aimed at protecting financial transactions, payments and money transfers. The system's task is to help residents and detect criminals in time. Fintech uses scientific methods to preserve, collect, identify, document and obtain digital resources to facilitate actions that have been found criminal. (7)

The entire overview of research questions regarding Fintech is processed in the study (22), where all innovations in payment systems are included, while smart contracts supported by Blockchain technology are important, too.

Biometrics – this is a system for observing human patterns, which is currently also used in banking. With the help of these patterns, we can identify a person. This task was being performed by fingerprints for a long time, but today we know a much broader form of biometrics, which was created by technological development and can recognize a walking style, face, iris, and retina.(2)

Instant payments – a crisis like the coronavirus accelerates development and this pandemic has forced many clients to use online services. The bank's goal is to be able to fully serve groups of clients, both online and at branches. The idea of instant payment is to credit the money immediately, within a few seconds, to the account during a payment, regardless of the bank – whether it is different or the same bank. (9)

Chatbots – these are software conversational agents, or dialogue voices, which provide users with access to information and services through interactions in their everyday languages via voice or text. In electronic banking, they work as an online service where you ask the chatbot necessary questions. The service is still being improved. (18)

Electronic signature – this serves as a tool for identification and authentication via the Internet. The signature is based on certification services, and is most often used to sign electronic mail or documents in electronic form, according to the website of the Police of the Czech Republic. (28)

Multibanking – this is a tool that allows controlling all bank accounts in different banks from one place. A user can keep his current account balances in his internet banking together. (27)

For this question, respondents had the opportunity to choose several answers at once. Respondents were most familiar with biometrics, followed by electronic signature and chatbot. As many as 44 respondents stated that they did not know any of the listed.

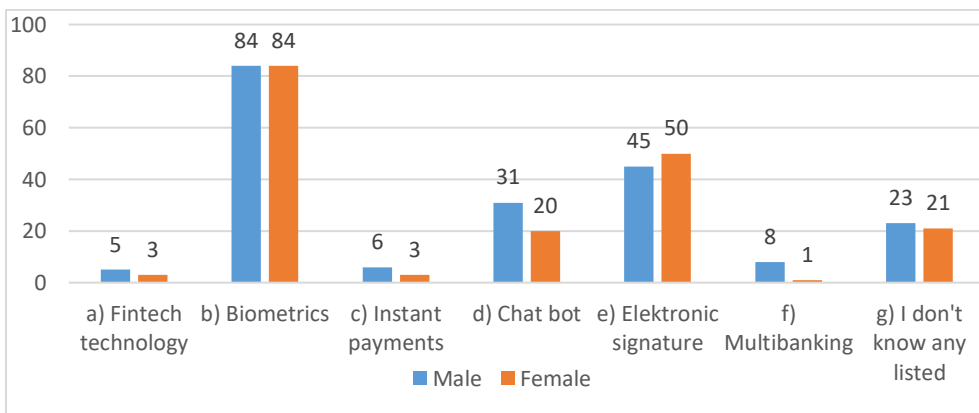


Figure 3. Answers to Question 3: Do you know any of the above mentioned forms of electronic banking?

Source: authors (2022)

Table 2 shows the results of testing whether the differences between men and women are statistically significant in the 3 given questions. In all 3 questions, we accepted the null hypothesis (H0) that is: “there are no statistically significant differences between men and women in the answers”. This is also confirmed by the low values of the Pearson and Crammer coefficients.

Table 2. Testing the statistical differences between men and women in the first group of questions.

Test	Question 1	Question 2	Question 3
Chi-square test of Independence	0.55	6.47	8.65
Chi table value	3.84	9.49	12.59
Result	H0	H0	H0
Pearson's contingency coefficient	0.055	0.187	0.148
Crammer's contingency coefficient	0.055	0.190	0.150

Source: authors (2022)

Fintech technologies are becoming increasingly important in the banking sector, as they enable alternative effective means of interacting with clients and gathering hard information, i.e. codifiable data, to make better credit decisions. However, the

advent of technology contrasts with the traditional relationship between banks and firms, which is based on human interactions and soft information. For example, the study (6) examines whether Fintech favours or limits the volume of debt financing issued to SMEs. The findings reveal that the use of internet banking reduces SME debt, suggesting that credit decisions based on hard information reduce the likelihood that SMEs use bank debt. A key implication of the findings is that banks and entrepreneurs should strengthen their personal relationships.

The purpose of another study (12) is to investigate how consumers in emerging markets interact and collaborate with banking chatbots when conducting banking transactions.

3.3 Risks of electronic banking

The study (1) focuses on current cyber challenges in the context of the COVID-19 pandemic. This pandemic has witnessed the largest use of the Internet and attacks. Many people around the world use the Internet to keep in touch, do business, learn, and get medical care, among other things. This pandemic has put the stress level of each of us to the test. The pandemic showed that people could perform their duties, participate in any activities, and study at home. However, cybercriminals have seized the opportunity to profit from the widespread use of the Internet by the public. We should all learn our lesson from the COVID-19 pandemic so that everyone can be prepared for the future better, as well as to ensure that cyber security does not cause any more problems for the world. Cyber security issues must be on the agenda of executive committee meetings of organizations. While preventative measures are key, cyber-attack detection, response and recovery skills are also required.

In the second group of questions, we focused on safety and risks of electronic banking. To the question “Do you consider electronic banking safe?”, most respondents answered “yes”. However, 46 answered that they were not completely decided (Figure 4).

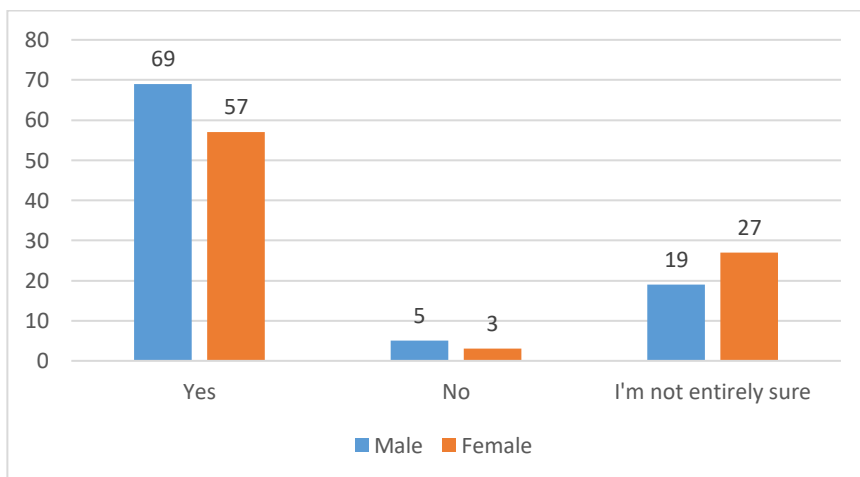


Figure 4. Answers to Question 4: Do you consider electronic banking safe?

Source: authors (2022)

The second question in this part was: “Have you ever been a victim of electronic banking fraud?”. 12 respondents have experienced being such victim, but despite this, 6 of them consider electronic banking to be safe (result of internal answers matching with the previous question).

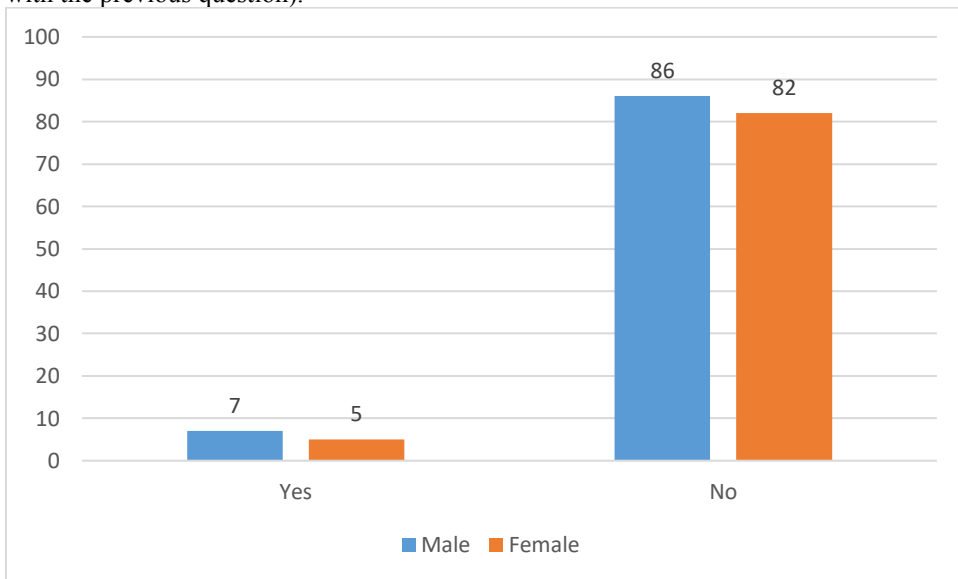


Figure 5. Answers to Question 5: Have you ever been a victim of electronic banking fraud?

Source: authors (2022)

In the third question regarding safety, we asked the respondents which of the listed risks they knew:

Phishing – this represents mass unsolicited emails with deceptive content sent via SMS, email, and other services. The intention is to make the victim log into his internet banking or social network account via a sent URL. After logging in, the attacker gets access to data such as passwords, user ID, or email, through which financial funds can be stolen. Phishing has increased significantly during the COVID-19 pandemic. (3)

The study (4) explains how to prepare for the onslaught of phishing emails, and it states that there is a worrying increase in attacks from phishing emails by almost 700% compared to the last year.

Vishing – this is a fraud that uses phone calls. Its aim is to obtain sensitive data from the victim, such as internet banking password or payment card numbers. The process begins with a suspicious text message, by which the perpetrator encourages the client of the bank to call the relevant number. The perpetrator impersonates a bank employee and asks for an authorization code to obtain financial funds from the client's bank account. (29)

Scam – these are fraudulent phone calls, SMS and emails from an untrustworthy person who demands the client's bank details or paying of various payments and fees immediately. This method contains suspicious characters such as strange name, sender address, and grammatical and stylistic mistakes. This method is very similar to the phishing method. (25)

Pharming – this is similar to phishing, but the perpetrators attack the user's computer or device. Even after entering the bank's website in the right way, a fake page loads, from which the attacker obtains the necessary data to steal financial resources from the account. (25)

To this question, the respondents could again choose several answers. They were most familiar with scams and phishing. Figure 6 shows that there is a difference regarding gender. As many as 38 women answered that they have not heard about any of the listed forms until now. This was also confirmed by the results of the statistical testing of differences in responses by gender. Responses were given to the question about the risks of electronic banking, and we confirmed the H1 hypothesis (Table 3).

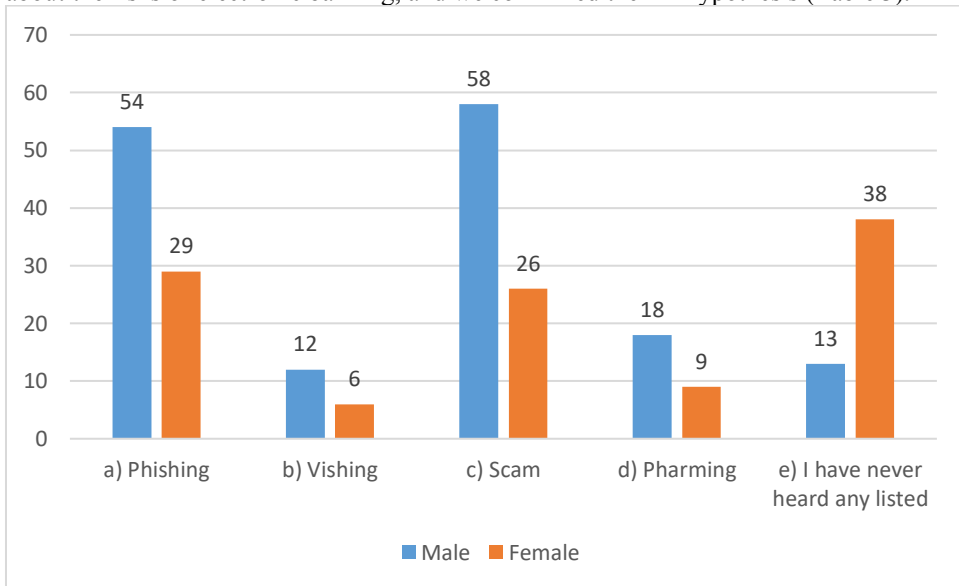


Figure 6. Answers to Question 6: Do you know any of the listed risks?

Source: authors (2022)

Table 3. Testing the statistical differences between men and women in the second group of questions.

Test	Question 4	Question 5	Question 6
Chi-square test of Independence	2.84	0.23	29.52
Chi table value	5.99	3.84	9.49
Result	H0	H0	H1
Pearson's contingency coefficient	0.125	0.036	0.318
Crammer's contingency coefficient	0.126	0.036	0.335

Source: authors (2022)

To other risks of the electronic banking, we can add:

Fraudulent deviation from payment – after gaining access to internet banking, the fraudster receives a fake application on his mobile phone, the task of which is to change the parameters of bank orders. After the client enters the transfer order, the bank sends a message to confirm the payment. The infiltration intercepts the first SMS

and in the meantime, the perpetrators change the transfer to their own order with their IBAN. The client then sees only the second fake SMS. If the client does not check the completed data and IBAN before confirmation, money from his bank account will be sent to another account. (25)

According to the research (15) on credit card fraud detection using artificial intelligence, credit card transaction fraud is common today due to the advancement in technology and increase in online transactions, which lead to fraud causing huge financial losses.

Online transaction processing - OLPT – these are the programmes with the ability to support Internet-oriented transactions. It is used for orders, financial transactions, CRM and MOO sales. The system represents a huge number of users with short transactions. Its main task is to maintain the concurrency of transactions. Currently, it is used by the vast majority of applications. It can be used by many users simultaneously. The main goals of the application embrace availability, speed and concurrency. (23)

3.4 Questions related to the COVID-19 pandemic

According to the results of a study in Hungary (19), personal visits to banks decreased after the outbreak of the COVID-19 pandemic. In addition, the number of electronic bankers has increased. There have been no correlations found between gender and location of the bank, when clients chose the bank. On the other hand, older people chose different banks than their younger colleagues. The security of the internet banking features was not associated with the bank choice, while the security of the mobile banking app was. Regarding bank ratings, men and women did not rate banks differently, and younger people tended to be more critical in their ratings. Safety, an accessible location, and good customer service can also lead to more positive reviews. The findings can be used by banks in Hungary to improve their services to attract customers and increase their satisfaction.

In the next part of our paper, we deal with the issue of using electronic banking during the COVID-19 pandemic. We evaluated respondents' answers according to gender, permanent residence, age and education.

Figure 7 shows that most men (61 answers) and women (58 answers) answered that they used electronic banking to the same extent during the COVID-19 pandemic as before the pandemic.

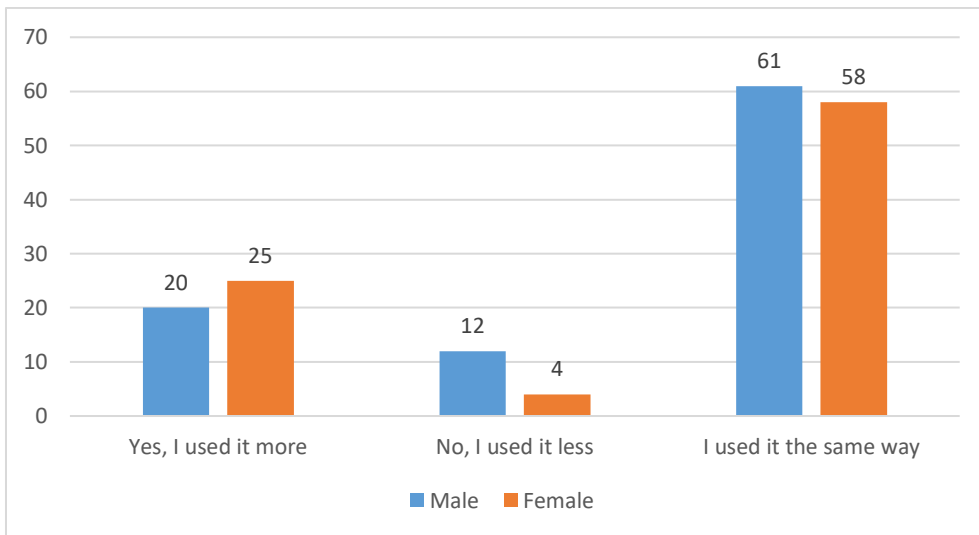


Figure 7. Answers to Question 7: Did you start using electronic banking to a greater extent during the COVID-19 pandemic? (according to gender)

Source: authors (2022)

According to the distribution of respondents based on permanent residence, most respondents from the city (65 answers) and from the village (54 answers) stated that they used electronic banking to the same extent during the pandemic as before the pandemic. The fewest respondents (11 respondents with permanent residence in the city and 5 respondents with permanent residence in the village) stated that they used it less. (Figure 8).

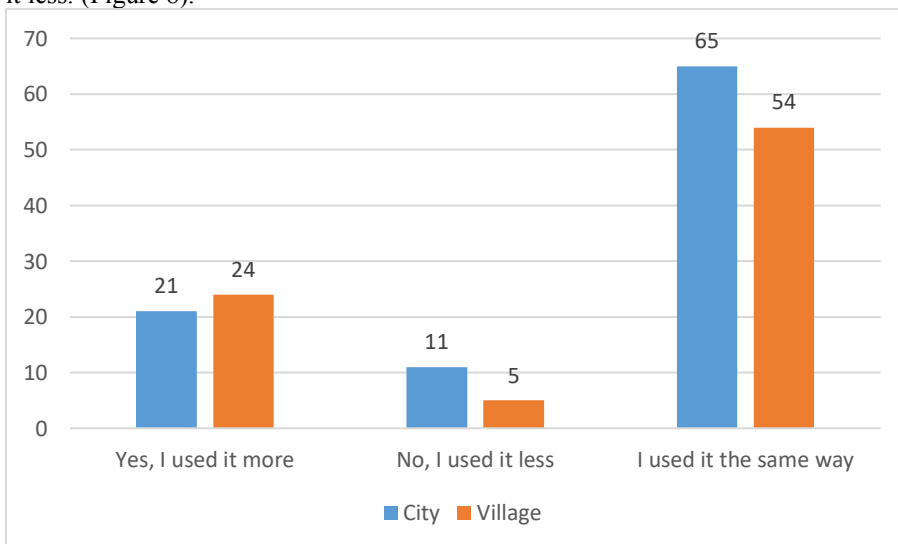


Figure 8. Answers to Question 8: Did you start using electronic banking to a greater extent during the COVID-19 pandemic? (according to permanent residence)

Source: authors (2022)

In terms of the differentiation of respondents by age (Figure 9), most respondents (104 answers) in the age of 15-34 answered that they used electronic banking to the same extent during the COVID-19 pandemic as before the pandemic. 36 respondents in the same age range answered that they started using electronic banking to an increased extent during the COVID-19 pandemic. Only 16 respondents used the electronic banking less during the COVID-19 pandemic.

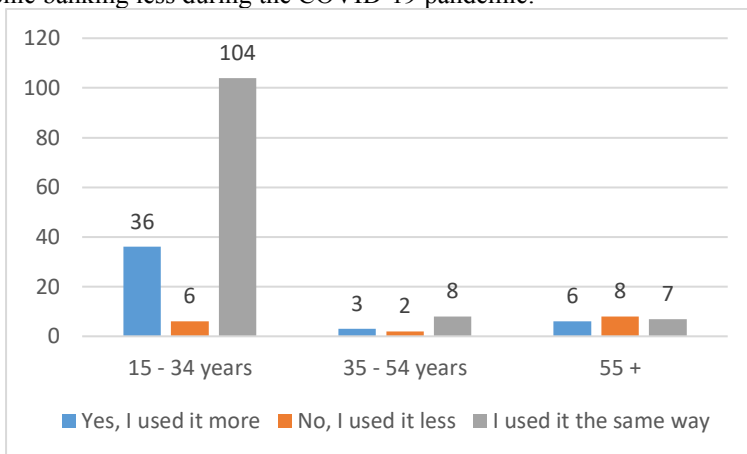


Figure 9. Answers to Question 9: Did you start using electronic banking to a greater extent during the COVID-19 pandemic? (according to age)

Source: authors (2022)

81 respondents with primary and secondary education and 38 respondents with higher education stated that they used electronic banking to the same extent as before the pandemic. The fewest respondents (2 answers of respondents with university education and 14 answers of respondents with primary and secondary education) stated that they used electronic banking less. Moreover, 45 respondents stated that they used it more (Figure 10).

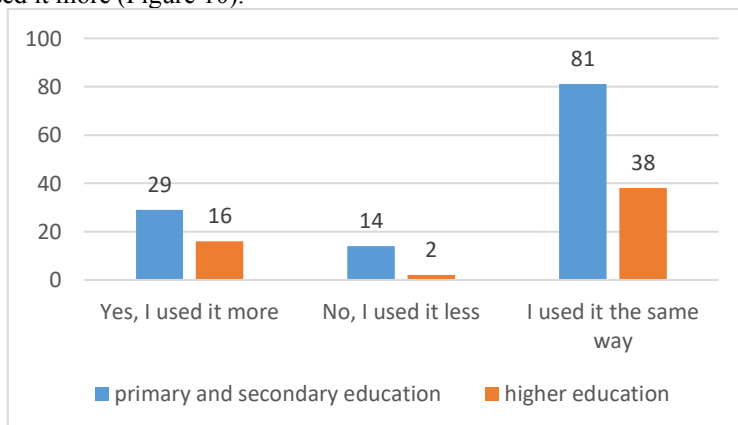


Figure 10. Answers to Question 10: Did you start using electronic banking to a greater extent during the COVID-19 pandemic? (according to education)

Source: authors (2022)

The results of the testing the 4 given questions show that a statistically significant result was obtained only when dividing the respondents by the age category, which can also be considered logical. Older people used electronic banking more during the COVID-19 pandemic, probably out of fear of personal contact in public. However, we remind that precisely from the point of view of the age category, our sample was not representative (Table 1).

Table 4. Testing the statistical differences by the COVID-19 questions.

Test	Gender	Permanent residence	Age	Education
Chi-square test of Independence	4.44	2.39	28.69	3.04
Chi table value	5.99	5.99	9.49	5.99
Result	H0	H0	H1	H0
Pearson's contingency coefficient	0.155	0.115	0.37	0.129
Crammer's contingency coefficient	0.157	0.115	0.28	0.130

Source: authors (2022)

4 Conclusions

In this paper we present a part of the results of our survey focused on new trends and risks of electronic banking in Slovakia. The survey was carried out in March 2021 during the COVID-19 pandemic. Representativeness of the sample was confirmed for the parameters: gender, education and permanent residence. In terms of age, the representativeness was rejected due to the fact that up to 81% of the 180 respondents were in the age of 15-34. The first group of questions was related to the use and new trends in electronic banking, while we investigated statistically significant differences between men and women, too. The results showed that the majority of respondents use electronic banking, while the most common answer for men was “2-3 times per week”, and “2-3 times per month” for women. Biometrics and electronic signature were the most familiar terms, while the least known were multibanking, instant payments, and fintech technologies.

The second group of questions was related to safety and risks of electronic banking. Most of the respondents consider electronic banking to be safe, while 12 of them have already become victims of fraud in electronic banking. The most famous risk terms were scam and phishing. It is precisely in this question that a statistically significant difference between men and women was confirmed, while we can claim that men know the risks of electronic banking better than women.

The last asked question was “Did you start using electronic banking to a greater extent during the COVID-19 pandemic?” Most of the answers were that the respondents used the electronic banking the same way. Therefore, we can say that the COVID-19 pandemic did not have an impact on the use of electronic banking for most of the respondents. Statistically significant differences in answers were not confirmed in terms of gender, permanent residence, and education. It was confirmed only in the case of age, since older people used electronic banking more during the COVID-19 pandemic than before. However, our sample is not representative in terms of age.

In conclusion, we can say that there is a need for continuous education of the population, especially in the area of risks of electronic banking. We call also for

caution when using electronic banking, since 12 out of 180 respondents have fallen victims to fraud in electronic banking.

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