

Information technologies and multimedia Informacinės technologijos ir multimedija

ANALYSIS OF MOBILE SERVICES IN THE FINANCIAL SECTOR

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Abstract. Extensive research of mobile financial services has been conducted in digital finance, FinTech, blockchain and cryptocurrencies. These new technologies and products are changing the financial services industry. It is critically important to know how customers will accept these changes. This article aims to discuss the inclusion of Mobile services in the financial sector and how users are likely to adopt mobile financial applications (MFA). Empirical investigation was conducted into what a customer considers to be most important when using MFA and the correlation between level of income of the user and adoption of MFA in Lithuania and in Germany. The findings show that income influences the adoption of MFA in Lithuania, but has no effect in Germany. Also, the key factors of using MFA are: security, comfortability, fast performance and cost. In addition to analysing results, new recommendations are proposed to improve future mobile financial services.

Keywords: mobile services, financial sector, mobile financial application, financial technologies.

Introduction

The development of mobile services (m. services) has changed the everyday life of people. The m. services of the 21st century have become one of the most important features of the IT industry and the economy's flexibility. M. services are user friendly and require only a smartphone with an internet connection. The demand for mobile services will only increase in the future. M. services are integrated into traditional businesses and become an important part of the revenue. Mobile payments, mobile banking applications, blockchain, virtual reality and augmented reality are some of the new technologies in the financial sector. These technologies are changing the way customers use financial services. The object of this article is mobile services in the financial sector. The problem of the paper – rapidly changing technologies in the financial sector. The purpose of the research – to analyse mobile services in the financial sector and propose new recommendations to improve future financial services mobile applications. In order to find the key factors of mobile financial application adaptability the survey has been conducted in Lithuania and in Germany. Hypotheses of the research were stated. H1: the most important factor for customers deciding whether to use a mobile financial ap-

plication is security. H2: customers with higher income more frequently use mobile financial applications, than customers with lower income.

1. Theoretical background

In the following chapter the key terms of mobile financial services, financial technologies and mobile financial application security aspects are described.

1.1. Mobile financial services

In this section differences between traditional banks and mobile financial services are described. Banks are institutions and the suppliers of financial resources, investment solutions, financial advices and other financial services for individuals or companies. Mobile financial services allow individuals and business to be more flexible and get financial services at any time in any place while using the Internet and mobile devices (Gomber, Koch, & Siering, 2017). Gomber et al. (2017) introduced the Digital Finance cube with three component parts: Digital finance institutions, Digital finance technologies and Digital finance business functions (mobile financial services) (Gomber et al., 2017). There are 6 major mobile financial services:

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Payments, Digital money (the currency is based on a decentralized network (European Central Bank, 2012)), Financing, Investments, Financial advice, Insurances (Gomber et al., 2017). The mobile financial service providers use modern, innovative technologies such as blockchain, artificial intelligence, augmented reality, big data analytics, social networks and more in order to satisfy the needs of customers. Financial technologies put pressure on traditional banks and financial service providers to transform their service infrastructures and product portfolios into more customer-oriented ones (Puschmann, Nueesch, & Alt, 2012). These new competitors, differ from the old financial service providers in three ways: they carve out new niches and offer traditional products and services in novel ways, they are built on modular and flexible business models, and enter the market using novel data handling approaches (Liebenau, Elaluf-Calderwood, & Bonina, 2014; Notheisen, Hawlitschek, & Weinhardt, 2017). In the next part of this paper, financial technologies will be analysed.

1.2. Financial technologies

“The term FinTech can be traced back to the 1990s” (Hochstein, 2015; Cai, 2018). “FinTech” is a new expression from the words “financial” and “technology” and describes the connection of modern and, mainly, Internet-related technologies with established business activities of the financial services industry (e.g., money lending, transaction banking)” (Gomber et al., 2017). 402 records related to FinTech in the field of Economics and Finance published by the Web of Science between 2010 and 2018 was analysed by Cai (2018). Research started from 2010 (after Bitcoin became the first digital Currency in 2009) and significantly increased in 2017. These developments seem related to the increasing popularity of Bitcoin and Blockchain technology (Notheisen et al., 2017). The first blockchain was created by a person or group of people know as Satoshi Nakamoto in 2008 (Nakamoto, 2008). The blockchain effectively does not need a centralized agent, which is normally provided by a financial institution. That is why blockchain has the potential to transform financial services (Pollari, 2016; Cai, 2018; Fanning & Centers, 2016). Scribd 2015 describe three stages of the blockchain. In the blockchain 1.0 stage, encrypted digital currency is introduced. The blockchain 2.0 stage involves the addition of intelligent contracts, enabling blockchain to be used in the financial market, and also extend to stocks, bonds, futures, loans, mortgages, property rights, intellectual property and other contracts. Blockchain 3.0 stage is the innovative application stage (Scribd, 2015; Cai, 2018) However, blockchain systems are still an emergent technology exhibiting a variety of problems that still need to be solved, such as scalability issues related to security and network size, limited transaction loads, and high (computational) costs (Beck, Czepluch, Lollike, & Malone, 2016; Glaser, 2017; Malone & O’Dwyer, 2014). Another new technology

which could be used in the financial sector is augmented reality (AR). “AR technology, a more expansive form of VR (virtual reality) is emerging as a cutting-edge technology that integrates images of virtual objects into the real world” (Maad et al., 2010). It could be used in payments, financing, investments, customer authentication and security, data visualization and analysis, virtual meetings etc.

1.3. Mobile financial application security aspects

Notheisen et al. (2017) did a comprehensive literature review of the most relevant and recent IS research in financial technologies. They analysed 427 articles from the IS literature, economics and finance, computer science and informatics, and legal sciences (Notheisen et al., 2017). One of the most discussed topics was privacy and security in IS research (Zyskind, Nathan, & Pentland, 2015; Kosba, Miller, Shi, Wen, & Papamanthou, 2016; Gervais et al., 2016; Eyal, 2015). Research into illegal activities in the FinTech field was conducted such as funding terrorism or white-collar crimes (Irwin & Milad, 2016; Marian, 2013). Other authors analysed the regulatory actions and legal innovations in FinTech applications (Farmer, 2014; Bursleson, 2013). Numerous researchers analysed privacy and security issues of using mobile financial applications from the point of view of the customer (Eisenmann, Linck, & Pousttchi, 2004; Linck, Pousttchi, & Wiedemann, 2006) and it was found that security of the users’ personal data is the most important factor when deciding whether to use mobile financial applications. Several security risks of mobile financial applications could be noticed: data leakage, false user authentication and false user authorization. Authors propose risk reduction measures in Table 1. MFA security aspects should be met to ensure users’ data protection: data confidentiality, integrity, correct authentication and authorization as well as non-repudiation (Merz, 2002). Pousttchi, Selk, and Turowski (2002) conducted an empirical investigation and found that strongest doubts that customers had about security were confidentiality (Pousttchi et al., 2002).

Table 1. Security aspects of mobile financial application

Processes	Risks	Risk reduction measures
Login data entry into the system	Data leakage	Service provider must ensure user data confidentiality. User must enter login data in a safe area
Receive login data	Data leakage	Program administrator must minimize external attack risks and ensure the integrity of data
User authentication	False user authentication	Safest data recognition methods must be used (e.g. mobile signature, Smart ID biometric data)
User authorization	False user authorization	The system must ensure that a person who is making a transaction is allowed to make it. For that reason, digital certificates, digital signatures could be used

2. An empirical investigation of mobile services in the financial sector

2.1. Methods of research

Empirical data was collected through a web-based survey. The online survey was placed on an internet survey portal apklausa.lt in Lithuania and <https://survey.unibw.de/finapp/> in Germany. Vilnius Gediminas Technical University population with 9,6 thousand people in Lithuania and Munich University of Federal Armed forces population with 3 thousand people in Germany were chosen. In order to achieve results with 95% probability and 10% error a representative statistical sample of $n = 95$ in Lithuania and $n = 93$ in Germany was needed. Two rounds of data collection were carried out. The first (Lithuanian survey) took place in the period between 2018.12.11 and 2019.02.28. The second (German survey) took place in the period between 2019.02.15 and 2019.04.01. With these two rounds, a total of 253 valid responses, 149 in Lithuania and 104 in Germany were collected. Random sampling method was used (Waksberg, 1978). All items in the survey were translated into Lithuanian and German languages. The questionnaire was divided into three parts: the first, with demographic data (4 questions); the second, about the financial habits of respondents (4 questions), and the third, about the experiences and opinion of users of mobile financial applications (13 questions), in total 21 questions.

2.2. Demographical data results

First of all, review of the general results is presented. Majority of respondents belong to 18–25 (62% in Germany, 45% in Lithuania) and 26–30 (18% in Germany, 25% in Lithuania) age groups. Most respondents have achieved higher education (85% in Germany, 8% of them in the financial field and 80% in Lithuania, 27% of them in the financial field). Reviewing income results, majority of respondents (51%) in Germany earn from 2001 EUR to 3000 EUR net income per month, meanwhile in Lithuania there is no certain majority, some respondents (19%) earn from 601 EUR to 800 EUR (19%) from 1001 EUR to 1500 EUR and (18%) from 801 EUR to 1000 EUR per month. Most respondents earn income from a salary (85% in Germany, 62% in Lithuania).

2.3. Financial habits data results

In this part of the paper, the results of the survey of the financial habits of users are demonstrated. Majority of respondents (83% in Germany, 72% in Lithuania) state that they have enough income to survive until the end of the month and save money. In Lithuania (54%) respondents indicated that they can save up to 10% of income per month. Meanwhile, in Germany (49%) respondents could save from 11% to 40% per month. Despite these results in savings, respondents are not willingness to plan their budget (57% in Germany, 62% in Lithuania). Reasons could be young age or lack of financial literacy. Budgeting depends on various factors (age groups, income, education). Older respondents with higher income and education in finance are more likely to plan their budget (Zigmantavičiute & Gudaitis, 2014).

2.4. Users experience of mobile financial applications results

Respondents were asked if they use MFA. Results show that 97% of respondents in Lithuania and 81% in Germany are users of MFA. The most popular MFA in Lithuania are: AS Luminor bank (24%), AB Swedbank (20%), Revolut (15%), AB SEB bank (14%), meanwhile in Germany: PayPal (37%), Sparkasse (30%), other mobile financial applications (27%) like: VR Bank, MLP Finanzcepiilot, Klarna, ING DiBa, Union Investment, Volksbank, Santander, Hypo, Sparda, OLB Banking are the most popular. Respondents were asked to evaluate their current mobile financial application. Majority had a positive opinion (69% in Germany, 81% in Lithuania). Despite that, respondents had several suggestions in order to improve MFA (Table 2). Also, participants were asked to choose what is most important to them when using MFA. The choices were: security, comfortability, cost, speed, a lot of functionality, a lot of visual information or beautiful design. The majority of respondents choose security as the most important aspect of mobile financial applications (62% in Lithuania, 70% in Germany). These results confirmed our 1 – st hypothesis. Other aspects were ranked in the following order by German respondents: comfortability, cost, speed, a lot of functions, a lot of visual

Table 2. MFA improvements suggested by the respondents

Suggestions of Lithuanian respondents	Suggestions of German respondents
Integrate different bank accounts into one mobile financial application	Integrate different financial services into one mobile financial application
More individual settings	More finger print, face recognition solutions
Integrate Near Field Communication (NFC) technology	More statistics, visual data about the financial situation
Choose payment recipient by mobile phone number	Simpler interface
Have several simplified payment templates with one touch confirmation	Have a smart budget planner
Have a possibility to send IBAN number by message	Have a transaction authentication number (TAN)
Have a possibility to change card pin code on MFA	Faster access to payments
Increase the level of security	

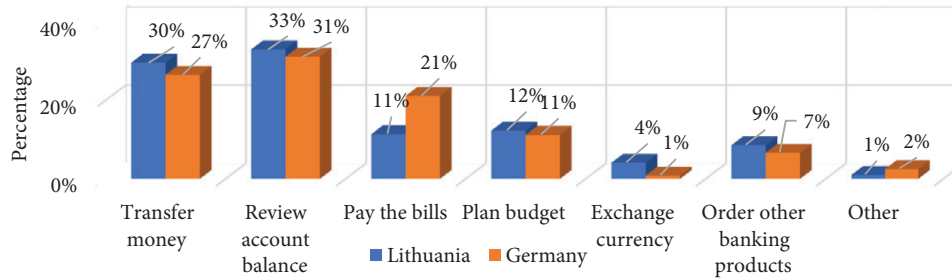


Figure 1. Most frequently used MFA functions

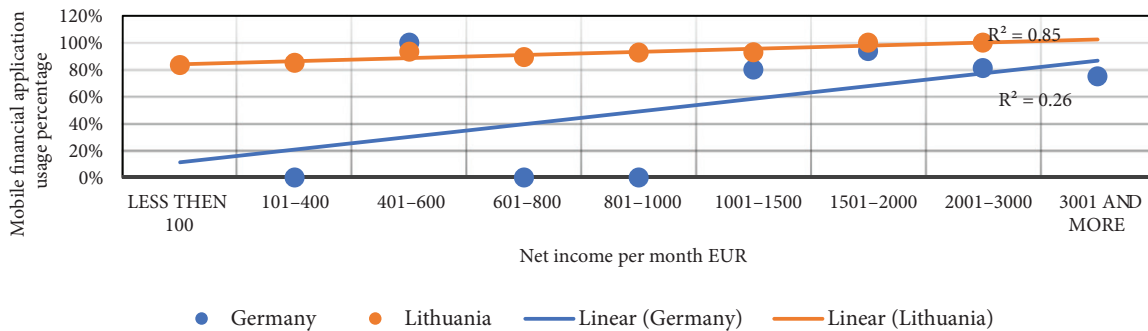


Figure 2. Correlation between income and MFA usage

information, beautiful design. However, Lithuanian respondents indicated that speed is more important than cost, and beautiful design is more important than a lot of visual information.

Tiwari and Buse (2006) found that many bank customers in Germany (15%) are willing to change their bank if it fails to provide mobile services. The willingness to change the bank on account of missing mobile financial services is especially high for customers in the age-group of 31–40 years (33%) and 41–50 years (23%) (Tiwarī & Buse, 2006). MFA creators should take notice of the needs and priorities of users in order to satisfy them.

Most frequently used mobile financial application functions: review account balance (31% in Germany, 33% in Lithuania), transfer money (27% in Germany, 30% in Lithuania) (Figure 1). It is very important to have fast and easy access to these functions in the mobile financial application. For example, use finger print or face recognition solutions to sign and transfer money. Also, a variety of ways to choose payment recipient (e.g. by telephone number, email, IBAN number, etc.) is necessary. Respondents use MFA more frequently in Lithuania than in Germany. Majority of respondents in Lithuania (44%) use MFA once a day, meanwhile in Germany (49%) respondents use MFA once a week. A correlation regression analysis was performed between the mobile financial application usage and the net income per month of respondents (Figure 2). A positive correlation between the level of income and MFA usage was found ($R^2 = 0.85$). People with higher income in Lithuania tend to use MFA more frequently.

Nevertheless, there is no correlation between the level of income and MFA usage in Germany ($R^2 = 0.26$). The 2nd hypothesis was partly confirmed, more research should be done.

Conclusions

Mobile services have become one of the most important innovations in the financial sector. Users need easily accessible, simple, fast and secure financial services. The demand for mobile services will only increase over the years, because these business functions are independent of time and location. In a rapidly changing financial technology environment the way of communication in the financial sector has changed. Nowadays, the financial service providers use modern, innovative technology such as blockchain, artificial intelligence, augmented reality, big data analytics, social networks and more in order to satisfy the needs of customers. Research is focused on mobile financial services and security of users. Empirical investigation was conducted and two hypotheses have been put forward. The H1 hypothesis was confirmed: majority of respondents chose security as the most important aspect of mobile financial application (62% in Lithuania, 70% in Germany). The H2 hypothesis was partially confirmed: A positive correlation between the level of income and MFA usage was found in Lithuania. People with higher income tend to use MFA more frequently. Although there was no correlation between the level of income and MFA usage in Germany. Moreover, respondents are using MFA in Lithuania more

frequently than in Germany. The results show that the most popular MFA in Lithuania are: AS Luminor bank (24%), AB Swedbank (20%), Revolut (15%), AB SEB bank (14%), meanwhile in Germany: PayPal (37%), Sparkasse (30%). Most frequently used mobile financial application functions: review account balance and money transfer in both countries. Also, respondents were asked to evaluate their current mobile financial application. Most of them had a positive opinion. However, key improvements of mobile financial application should be made in order to increase MFA adaptability. Based on research findings, it is suggested to create MFA with integrated accounts of different banks, Near Field Communication, smart budget planner, improved security by using biometric data. Customers will evaluate financial technological solutions that make their daily life easier. Furthermore, future studies should focus on MFA security issues according to the different technologies used in the financial sector.

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MOBILIŲ PASLAUGŲ ANALIZĖ FINANSŲ SEKTORIJE

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Santrauka

Mobiliųjų paslaugų plėtra neišvengiamai keičia kasdienį žmonių gyvenimą, kuriamos naujos visuomenės socialinės struktūros, bendravimo ir bendradarbiavimo būdai. Vykstant ekonominei bei informacinės visuomenės plėtrai mobiliosios paslaugos yra svarbios finansų institucijoms ir jų klientams. Naudotojams jos yra patogios, nes galima greitai ir paprastai atlikti reikiamas kasdienes finansines operacijas, o finansinių paslaugų teikėjams efektyviau vykdyti savo veiklą. Straipsnyje išanalizuotos mobiliosios paslaugos finansų sektoriuje, naudojamos finansinės technologijos, jų saugumo aspektai. Atliktos Lietuvos ir Vokietijos gyventojų apklausos apie naudojimosi mobiliosiomis finansinėmis programėlėmis įpročius, įvertinti jų rezultatai. Nustatyta, kurie aspektai svarbiausi vartotojams naudojantis programėlėmis, išanalizuotas ryšys, siejantis respondentų pajamas ir mobiliosios programėlės naudojimo dažnumą.

Reikšminiai žodžiai: mobiliosios paslaugos, finansų sektorius, mobilioji finansinė programėlė, finansinės technologijos.