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DETERMINANTS OF THE SAFETY OF THE ELECTRONIC DAILY TRANSFER IN THE CONTEXT OF GLOBAL TRENDS ON THE INTERNET DEVELOPMENT OF THE MOBILE BANKING

DETERMINANTY BEZPIECZEŃSTWA ELEKTRONICZNEGO TRANSFERU DANYCH W KONTEKŚCIE GLOBALNYCH TRENDÓW ROZWOJU INTERNETOWEJ BANKOWOŚCI MOBILNEJ

ПОКАЗАТЕЛИ БЕЗОПАСНОСТИ ЭЛЕКТРОННОГО ОБМЕНА ДАННЫМИ В КОНТЕКСТЕ ГЛОБАЛЬНЫХ ТРЕНДОВ РАЗВИТИЯ МОБИЛЬНОГО ИНТЕРНЕТ-БАНКИНГА

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Prokopowicz D., Gwoździewicz S., Grzegorek J., Matosek M. (2018) Determinants of the Safety of the Electronic Daily Transfer in the Context of Global Trends on the Internet Development of the Mobile Banking.

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Abstract

Technological progress and the ongoing globalization processes determine new challenges for the protection, electronic transmission and processing of data, including classified information. According to the guidelines of the European Union Directives in the perspective of the development of the Internet and digital society, the ICT infrastructure of individual entities should be modernized and adapted in order to guarantee the right to protect electronically-available information. The development of techniques for processing and providing information via the Internet is determined by many facilities for beneficiaries, clients and people using information services of public sector institutions. In addition, there is a possibility of a significant reduction of transaction costs of financial operations and electronic data transfer. On the other hand, the development of information technologies functioning on the Internet also involves the risk of loss or theft of information by unqualified entities. The process of providing information via the Internet generates many threats related to crime of identity theft, interception of classified data by hackers and impersonation of monetary funds in electronic banking systems. In response to these threats, individual entities, including institutions of the financial sector, develop security systems for remote sharing of information and transactions carried out via the Internet. Currently, the process of improving techniques ensuring a certain level of Internet data transfer security is being continued. Procedures for safe processing, storage and sharing of information in online banking systems are improved. Gradually, national legal regulations are being supplemented, taking into account new emerging technological innovations and technologies of electronic data transfer on the Internet.

Keywords: *electronic banking, cybersecurity, cybercrime, data protection, digital data processing, security of digitization, Big Data, systems risk management IT systems*

Streszczenie

Postęp technologiczny oraz dokonujące się procesy globalizacyjne determinują nowe wyzwania dla ochrony, elektronicznego przesyłania i przetwarzania danych, w tym informacji niejawnych. Zgodnie z wytycznymi Dyrektyw Unii Europejskiej w perspektywie kontynuacji rozwoju Internetu i społeczeństwa cyfrowego infrastruktura teleinformatyczna poszczególnych podmiotów powinna zostać zmodernizowana i dostosowana, aby zagwarantować prawo do ochrony udostępnianych elektronicznie informacji. Rozwój technik przetwarzania i udostępniania informacji poprzez Internet zdeterminowany jest wieloma udogodnieniami dla beneficjentów, klientów i osób korzystających z usług informacyjnych instytucji sektora publicznego. Poza tym dla podmiotów udostępniających elektronicznie informacje poprzez Internet pojawia się możliwość znaczącej redukcji kosztów transakcyjnych przeprowadzanych operacji finansowych oraz elektronicznego transferu danych. Z drugiej strony z rozwojem technologii informacyjnych funkcjonujących w Internecie wiąże się także ryzyko utraty bądź kradzieży informacji przez podmioty nieuprawnione. Proces udostępniania informacji poprzez Internet generuje wiele zagrożeń związanych z przestępstwami kradzieży tożsamości, przechwytywania przez hakerów danych niejawnych oraz dokonywania malwersacji środków pieniężnych w systemach elektronicznej bankowości. W odpowiedzi na te zagrożenia poszczególne podmioty w tym instytucje sek-

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tora finansowego rozbudowują systemy bezpieczeństwa zdalnego udostępniania informacji oraz dokonywanych transakcji realizowanych za pośrednictwem Internetu. Obecnie dokonuje się kontynuacja procesu doskonalenia technik zapewniających określony poziom bezpieczeństwa internetowego transferu danych. Doskonalone są procedury bezpiecznego przetwarzania, składowania i udostępniania informacji w systemach internetowej bankowości elektronicznej. Stopniowo także uzupełniane są krajowe regulacje prawne uwzględniające nowe, pojawiające się innowacje technologiczne oraz technologie elektronicznego transferu danych w Internecie.

Słowa kluczowe: bankowość elektroniczna, cyberbezpieczeństwo, cyberprzestępstwa, ochrona danych, cyfrowe przetwarzanie danych, Big Data, zarządzanie ryzykiem systemów informatycznych

Аннотация

Технологический прогресс и продолжающиеся процессы глобализации определяют новые задачи в области защиты, электронной передачи и обработки данных, включая секретные данные. В соответствии с рекомендациями Директивы Европейского союза, ввиду продолжения развития Интернета и цифрового общества, инфраструктура ИКТ отдельных предприятий должна быть модернизирована и адаптирована так, чтобы гарантировать право на защиту в электронном виде предоставленной информации. Развитие методов для обработки и обеспечения информации через Интернет определено многими средствами для бенефициариев, клиентов и людей, использующих информационные услуги учреждений государственного сектора. Кроме того, для предприятий, предоставляющих электронную информацию через Интернет, есть возможность значительного сокращения операционных издержек финансовых операций и электронной передачи данных. С другой стороны, развитие информационных технологий, функционирующих в Интернете, включает риск потери или кражи информации неавторизованными субъектами. Процесс предоставления информации через Интернет чреват возникновением угроз, связанных с хищением идентификационных данных, перехватом классифицированных данных хакерами и незаконным присвоением валютных фондов в электронных банковских системах. В ответ на эти угрозы отдельные предприятия, включая учреждения финансового сектора, развивают системы безопасности для удаленного обмена информацией и сделок, выполняемых через Интернет. В данный момент продолжается процесс по улучшению методов, гарантирующих определенный уровень интернет-безопасности передачи данных. Улучшены процедуры безопасной обработки, хранения и обмена информацией в онлайн-банковских системах. Постепенно дополняются национальные правовые нормы с учетом новых технологических инноваций и технологий электронной передачи данных в Интернете.

Ключевые слова: электронный банкинг, кибербезопасность, киберпреступность, защита данных, безопасность оцифровки, Big Data, управление системным риском ИТ-системы

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Statement of the problem in general outlook and its connection with important scientific and practical tasks.

Nowadays commercial institutions as well as public financial sector perform certain functions in modern economies of the economic systems of highly developed and developing countries (Rakowski J., Prokopowicz D., 2017, pp. 372-373). One of the areas of public services offered is meeting the information needs of citizens after more than 25 years of development of the Polish economy in market conditions and adjustment processes to the institutional standards of the European Union (Wociór D. ed., 2016). Decision-making processes in the institutions of commercial and public financial sectors, such as financial management, indirectly affect the pace of socio-economic development of the country (Muchacki M., 2014).

In all areas of the effective functioning of businesses and public institutions the important issue is the acquisition, processing, gathering, sharing and archiving to other entities of various kinds of information, including classified and unclassified information and personal data of citizens. The key issue of circulation and sharing information is a security of archiving and transferring data in IT systems of enterprises, financial sector institutions, public sector and Internet (Górka M., ed., 2014). These processes also determine the development of pro-innovative corporate culture in business entities and public institutions operating in developing economies (Gałek G., Prokopowicz D., 2017, pp. 118-119).

Entities of commercial sectors, including economic entities of both non-financial and financial sectors of the economy in order to function efficiently are obliged by market determinants of competition to constantly adapt to the changing realities of the socio-economic environment and technological progress in the field of modern IT solutions for secure archiving, processing and sharing information (Sarnowski J., Dmowski A., Prokopowicz D., 2008, pp. 75-76).

The Polish economy in the last quarter of the century has undergone a thorough, multidimensional system transformation. During this period significant changes took place in the Polish economy, including enterprises, financial institutions and public sector entities. On the other hand, the integration processes of economic structures of individual countries are being successively implemented, especially in the European Union. The basis of these processes was the liberalization of cross-border capital flows supported by the harmonization of legal regulations. However, the development of modern technologies generates improvements, innovations and conveniences of electronic data transfer and information sharing and simplifies distribution channels for products and services, which contributes to the improvement of economic growth (Dutko M., Karciarz M., 2011). However, there is an increase in the standardization of applied procedures, devel-

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oped sales techniques and business operations in business entities. This indirectly influences the improvement of techniques for collecting, processing data, sharing and exchanging information between economic entities. The processes of standardization and homogenisation of market structures as well as the lower - dissemination of IT standards are the basis for the transnational phenomenon of market integration, globalization of economic processes and techniques of electronic processing and sharing of information in the global network (Lakomy M., 2015). In recent years, the importance of electronic data processing in Business Intelligence has been growing in business entities (Grzegorek J., Prokopowicz D., 2017, pp. 224-225). More and more enterprises are deciding to integrate archiving and analysis systems of data collected on Big Data platforms, data transfer via the Internet, financial operations via

electronic mobile banking and obtaining data related to potential clients from social networking websites developed over the Internet, Internet improvement information transfer techniques for creating new marketing strategies and organizing advertising campaigns on the Internet (Sarnowski J., Prokopowicz D., 2015, pp. 145-146). Effective combination and integration of the aforementioned fields of electronic collection, processing, archiving and sharing of information is becoming one of the key areas for the development of innovativeness of currently operating business entities (Prokopowicz D., 2016, pp. 72-73). A special role in this area, apart from financial institutions, is attributed to fast-growing enterprises operating within the SME sector and corporations operating according to the concept of social enterprises (Gardzinski, T., 2016).

Analysis of latest research where the solution of the problem was initiated.

The issues of electronic data transfer safety described in this paper in the context of global trends in the development of online mobile banking in recent years is undertaken in various and numerous scientific publications by scientists from different countries operating in various environments. Therefore, the issue is examined and obtained a global character. The growing interest of scientists in this problem can be explained by its relevance and high level of probability. The increased interest in this issue in environments of scientists shows the growing importance of mobile web banking in the context of the current development of banking systems and financial settlement. In addition, the importance of improving IT risk management procedures in banking is growing due to the issue of electronic data transfer security.

The verification of the opinions, considerations, conclusions and research theses contained in the cited publications first formulated the main research aspects and the image of electronic data transfer security in the context of contemporary trends in ICT development implemented into the online mobile banking systems. Formulated main research aspects and the picture of the analyzed topic served as a basis for determining the objectives and research methods used in this study. Objectives and methods of the research are presented in the next section of this article. The basis for these main components of the research process, which was carried out in this study, was to define a synthetic image of the electronic data transfer security in the context of modern trends in ICT development implemented in online mobile banking systems

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after collecting analytical data and verifying the conclusions contained in the cited publications. A synthetic image of the global trends in the security of electronic data transfer in online mobile banking systems can be described as follows: Technological progress and ongoing globalization processes determine new challenges for the protection, electronic transmission and processing of data, including classified information. The development of techniques for processing and sharing information via the Internet is determined by many facilities for beneficiaries, clients and people using information services of public sector institutions. In addition, for entities providing electronic information via the Internet, there is the possibility of a significant reduction of transaction costs of financial operations and electronic data transfer. However, on the other hand, the development of information technologies functioning on the Internet also involves the risk of loss or theft of information by unauthorized entities. The cited publications indicate that the process of providing information via the Internet generates many threats related to identity theft, interception of classified data by hackers, and the embezzlement of funds in electronic banking systems. In response to these threats, individual entities, including institutions of the financial sector, develop security systems for remote sharing of information and transactions carried out via the Internet. All of the above-mentioned determinants of the online mobile banking development are getting more and more global and become another factor in the contemporary economic and informational globalization. The authors of this study have reviewed the literature on the above-mentioned issues before researching, collecting and developing research results on various aspects of the determinants of electronic data transfer

security in the context of global trends in the development of online mobile banking. Determining and specifying the research problem, which was characterized and analyzed in this article, was preceded by a review of the publication literature and available source materials in which key issues of the determinants of the online mobile banking development of had already been considered. The literature review shows that the various issues of determinants of the online mobile banking development described in different publications were examined only on selected issues, while no attempt was made to synthetically capture this issue, i.e. one that would integrate various key aspects of determinants in an integrated manner. The development of online mobile banking, the considerations taken would have an interdisciplinary attribute and the conclusions of the research would also be a derivative of a fully synthetic approach. This type of research approach has been used in this study. One of the key methodological premises taken up in this study on the determinants of the development of online mobile banking was the application of a synthetic research approach to achieve an interdisciplinary combination of various aspects of the described and researched issues of determinants of the online mobile banking development. The conclusions that were formulated in the summary are a derivative of the synthetic research approach used.

On the basis of the content of the studied source materials and expert publications it has been shown that in recent years the issue of determinants of the mobile web banking development is one of the most promising areas of both the banking and the scientific study of the subject. The analysis of the source literature publication shows that it was a significant progress in electronic data transmission systems in the

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last decades, which was determined mainly by the development of information and communication technologies. From the data contained in literature publications addressing the determinants of the development of online mobile banking, it appears that customers of products and services offered by enterprises, public and financial institutions are increasingly contacting these entities remotely via the Internet. The article describes the problem of determinants of the online mobile banking development using synthetic approach to research and considerations undertaken by authors in earlier publications by D. Prokopowicz (Prokopowicz D., 2016; Prokopowicz D., 2017a; Prokopowicz D., 2017b; Prokopowicz D., 2017c; Prokopowicz D., 2017d), S. Gwoździwicz (Gwoździwicz S., Prokopowicz D., 2016a; Gwoździwicz S., Prokopowicz D., 2016b; Gwoździwicz S., Prokopowicz D., 2016c;), M. Matosek (Matosek M., Prokopowicz D., 2017), J. Grzegorek (Grzegorek J., Prokopowicz D., 2017) and other authors of the cited publications. The analysis of the content of the source literature publication addressing the determinants of the online mobile banking development shows that in the US, research into the security of electronic banking development is conducted by experts operating in the Cisco and Trend Micro technology companies (Cisco 2017; TrendLabs 2016). In Poland, research on the analysis of determinants of the online banking development was conducted by the following scientists: M. Białas and Z. Mazur (Białas M., Mazur Z., 2013), S. Antkiewicz (Antkiewicz S., 2008), B. Domańska-Szaruga (Domańska-Szaruga B., Prokopowicz, D., 2016), M. Dutko, M. Karciarz 2011 (Dutko M., Karciarz M., 2011); M. Górka (Górka M., ed. 2014), M. Polasik (Polasik M., 2008), B. Świecka (Świecka B., 2008). On the other hand, the

global aspects of the development of financial systems were described in the publications by the following scientists: S. Bukowski (Bukowski S., ed., 2010), B. Domańska-Szaruga (Domańska-Szaruga B., 2013), T. Kaczmarek (Kaczmarek T., 2009), J. Świdarska (Świdarska J., 2013). Based on the study of literature sources listed in the Bibliography, it has been shown that the researchers of the described problem confirm the high level of significance of the studied determinants of the online mobile banking development, also indicating the timeliness and development of the issues described. In addition, the authors of the source literature dealing with the determinants of the development of online mobile banking agree that the process of improving techniques ensuring a certain level of Internet data transfer security is being continued. It was observed based on the analysis of the source data, that the procedures for safe processing, storage and sharing of information in online electronic banking systems were improved. The verification of the mentioned literature suggests that the researchers of the described problem state that the national legal regulations are also gradually being supplemented, taking into account new and emerging technological innovations and technologies of electronic data transfer on the Internet. In the context of the described issues, it is generally recognized that the above-mentioned determinants of the online mobile banking development are gradually becoming global in their nature, referring to globally operating financial institutions, transnational finance and accounting systems and increasingly globalized new online media. It is uncontested statement, according to which it is assumed that technological progress and globalization processes occurring determine new challenges for the protection of

electronic transmission and processing of data, including classified information. In the context of the issue described in this paper, it is also important that websites with the development of information technologies functioning on the Internet also involve the risk of loss or theft of information by unauthorized entities. The studied contents of scientific literature publications, source materials analysis and normative regulations show that financial sector institutions within the framework of improving

ICT risk management systems of mobile banking systems, computing cloud computing technology and business analytics based on Big Data databases expand remote security systems information and transactions carried out via the Internet. Conclusions and suggestions resulting from previous research described in the content of the studied literature were used to formulate the key research thesis and the objectives of the research undertaken.

Aims of paper. Methods.

Before writing this article, a review of the literature dealing with globalization issues of key determinants of the electronic data transfer security in the context of contemporary trends in the development of information and communication technology implemented in the online mobile banking systems has been reviewed. The literature review was also preceded by specifying the key issues of the research problems, which were analyzed, the objectives of the study and formulation of the key questions and research theses. The subject of this work initially defined conceptually and axiomatically was also clarified after the aforementioned review of the publications of other researchers describing the issues of globalization of the determinants of the online mobile banking development. Thus, this article analyzes the problem of globalization of the determinants of the online mobile banking development in a synthetic approach. The analysis of source materials shows that the issues discussed in the subject of determinants of electronic data transfer security in the context of global trends in the online mobile banking development have been described and considered in the current scientific literature only in selected few aspects. On the other hand,

no attempts have been made to conduct research that would consist in developing a synthetic approach to this problem. A full synthetic approach would include various key aspects of globalization of the determinants of the online mobile banking development in an integrated manner, the considerations would have an interdisciplinary attribute and the conclusions from the research would also have the feature of a synthetic approach. This type of research approach has been used in this study. One of the key methodological premises of the online mobile banking development in the present study was the use of a fully objective description of all premises, conditions, components of the analyzed topic and factors affecting particular aspects of globalization of electronic data transfer security in the context of modern trends in ICT development implemented into online mobile banking systems. Analyzing the problems of determinants of the online mobile banking development, the authors of this study have verified the theses and conclusions formulated by the authors of the cited publications. Verified theses and conclusions that repeatedly represented a diverse view, heterogeneous assessment of key aspects of the topic in terms of their level of significance and identified correlations were

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used to formulate key questions and research theses for this study. The conclusions were formulated and included in the summary part based on the verification. In the process of drawing conclusions from these studies guided by the principle of scientific objectivity, impartiality and synthesis of the research approach.

Based on the studied source materials and expert publications, it was noticed that until recently, poor literature describing the problems of determinants of the online mobile banking development in the last few years has been significantly expanded with new titles. On the publishing market, within the mentioned subject matter, there were mainly original monographs and interpretations of specific normative studies and comments on legal regulations. On the other hand, there are far fewer titles that could help in the everyday work of an economic and financial analyst employed, for example, in globally operating investment funds, and help for students of economic faculties as an enrichment of academic literature. The largest gap on issues of research, however, concerns the whole attempt to interpret in terms of synthetic issues relating to the determinants of the mobile banking development. Prokopowicz in the study *The Question of the Security of Facilitating, Collecting And Processing Information In Data Bases of Social Networking* indicates that the issue of the security of electronic data transfer also applies to globally functioning online social networks. The incompletely represented literature describing the issue of globally developing determinants of the development of online mobile banking functioning in the field of electronic banking development is an example of the phenomenon in which intensive development precedes its subsequent interpretation. The problem of determinants of the online mobile banking

development, which obtained the rank of priority in recent years, has become the main premise for the creation of this study. The assessment of the effectiveness of banking risk management was carried out on a macro and a micro scale. The macro-scale is an analysis of credit risk improvement in the context of the entire financial system in Poland. The area also includes the organization and effectiveness of institutions supporting the development of the banking system in Poland. Micro-scale research focuses on the analysis of individual loan procedures. The research undertaken in the work focused primarily on the determination of connections or separateness in the following areas: determinants of electronic data transfer security, ICT instruments for data processing in the cloud, multi-criteria data analysis platforms in Big Data databases, global trends in the development of online mobile banking and perspectives, directions of the development in future financial systems.

During the research, various research methods were used, which were listed below. The work involved various test methods, including:

- a) descriptive and comparative method,
- b) inductive reasoning,
- c) deductive reasoning,
- d) descriptive and vector method,
- e) method of media observation.

The choice of methods was determined by the type of research materials in which various aspects of the subject of the determinants of the security of electronic data transfer in the context of global trends in the development of online mobile banking were described. The purpose of presenting the key issues of the subject, explaining particularly important relationships, connections, correlations between the components of the problems occurring globally growing the determinants of the mobile

web banking development mainly used descriptive method. The comparative method was used primarily in comparison of selected aspects of the studied determinants of the online mobile banking development. Inductive reasoning was used to select unambiguous facts and aspects of the determinants of the online mobile banking development meeting the requirement of indisputability in their experimental verification. The deductive reasoning was commonly applied by the rationalist formulation, selection and ordering of axioms that did not have to be certain. However, they had to meet the condition of presenting complex problems in the form of models and schemes. The axioms formulated by this method were built and developed in the process of logical binding of facts. The descriptive and vector method was used in this article by highlighting the relevant factors of the determinants of the online mo-

bile banking development with an indication of the appropriate direction of impact for them. The literature review was also carried out using the method of observation media, based on the monitoring of selected issues examined the problems reported by journalists specializing in specific areas of economic issues.

Therefore, following the principle of scientific objectivity, impartiality and synthetics of the research approach based on the verification of the content of the cited publications for the purposes of this study, the following main research thesis was formulated: All the above-mentioned determinants of the development of online mobile banking gradually take on a more global character and become an another factor in contemporary economic and information globalization. The final part of this study contains a reference to the issue of verifying the research thesis.

Exposition of main material of research with complete substantiation of obtained scientific results. Discussion.

Economic and civilization conditions of technological progress in the field of data transfer and sharing on the Internet.

The increase in technological innovations of electronic information sharing in the enterprise sector, financial institutions and public sector entities has a significant impact on the development of data transfer through ICT systems connected to the Internet. Unfortunately, in terms of broadly defined innovations in the field of ICT, enterprises and public sector entities operating in Poland are among the least active in the European Union (Żołnierski A., 2012). A particularly important issue that should be taken into account when shaping economic policy in Poland for the next years is the activation of business entities, financial

institutions and public sector entities to improve the standards of information sharing so that the technological level and security of data transfer on the Internet is up to the standards of developed countries of Western Europe (Gałach A., Hoc S., Jędruszczak A., Kowalik P. et al., 2015). A significant convenience in the process of improving the techniques of electronic access to information by public sector entities and improving the operation of security instruments is the possibility of implementing these processes in investment projects co-financed with the use of financial resources and subsidies of the European Union. It is now widely accepted that key aspects that are exchanged when defining systemic goals that should be activated and developed in the Polish economy, are also technological innovation, development

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Prokopowicz D., Gwoździewicz S., Grzegorek J., Matosek M. (2018) Determinants of the Safety of the Electronic Daily Transfer in the Context of Global Trends on the Internet Development of the Mobile Banking.

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electronic economy, digitization of public sector institutions and improvement of data transfer security on the Internet in the next, already started financial perspective for 2015-2020 (Gwoździewicz S., 2014). A positive result of these processes should be in the following years a significant activation of economic growth, including the improvement of the situation on the labor market as a result of generating new jobs for specialists in the security of IT systems, Internet and other IT areas (Dutko M., Karciaz M., 2011). In the longer term, the process of public finances should also be derived from these processes after 2020. The basis for the above strategic objectives for the development of the electronic economy and information society in Poland is experience in financing technological investment projects implemented under the previous financing perspective with the participation of EU funds in 2007 - 2013. Based on these experience, it was noted that the effective use of available EU funds from the previous financial perspective were determined by innovativeness and entrepreneurship already operating effectively in the market conditions of economic entities in Poland (Matosek M., 2009, 23-24).

In terms of the economic process of globalization, there have been significant globally operating changes in modern economies, including financial sector institutions and public sector entities (Muchacki M., 2014). Individual entities of the aforementioned sectors improve their functioning also in the scope of collecting, processing and sharing data with other entities, including citizens and enterprises. The processes of improving the security of data transfer on the Internet are successively implemented. These processes are undertaken to activate the development of the electronic economy and information society and to

adapt procedures and techniques for ensuring security to the standards of developed Western European countries, including the existing European Union regulations (Wiśniewska M., 2013).

These processes also can be applied to the institutions and economic entities operating internationally, whose dynamic development is determined by the issue of effective implementation of technological innovations in individual corporations, enterprises, financial and public sector institutions. The basis of these processes is the liberalization of capital flows supported by the harmonization of legal provisions. On the other hand, the development of modern technologies is correlated with the issue of activating technological progress in the field of electronic data processing, storage and sharing information on the Internet. This development simplifies the distribution channels of enterprise products and services as well as information services for public sector entities and contributes to the growth of innovation, standardization of applied procedures, developed product distribution techniques and implemented information services. The processes of merging and unifying market structures and the bottom-up process of technological innovation, dissemination of IT standards are the basis of the information globalization phenomenon, including data transfer via the Internet (Bukowski S., ed., 2010).

The essence of online mobile banking and the Internet bank.

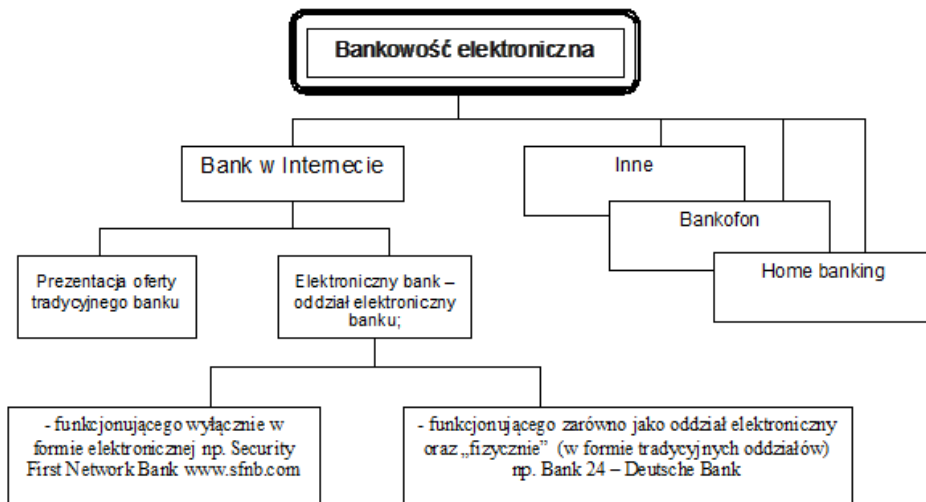
Electronic banking is an area that is currently considered one of the most important factors that determine the development of modern financial systems. Not only the customers of these systems, who are no longer limited by physical access to bank divisions and hours of bank branches, benefit from this development, but also banks, that have expanded their scope of activity

on a national and international scale by starting with the offer to a potentially wider group recipients (Dmowski A., Prokopowicz D., 2010, pp. 347-348). The above-mentioned image of the positive conditions for the implementation of new IT solutions and the benefits that the Internet gives to operating systems of commercial banks has become the main factor in the intensive development of online electronic banking in Poland. This development, which increased growth was recorded primarily in the last few years, is associated significantly with the specifics of the development of the entire national financial system (Domańska-Szaruga B., 2013, p. 267) and the changes that have taken place in the minds of customers. A particularly important factor determining the current processes of implementing new IT solutions to banking systems is the development of ICT in the so-called cloud, including the storage

of large data sets in the so-called big data platforms.

The term “bankowość elektroniczna”, which is a Polish version of the English expression; electronic banking is usually defined as a remote access to a wide range of banking services via the Internet using a computer or other mobile devices providing access to a global network (Guzek E., Słazak E., 2012, p. 57). In recent years, these other devices are mainly mobile ones, including smartphones, tablets, laptops and notebooks. The technical miniaturization of these devices continues, therefore, in the near future, smart watches that will function as a miniature smartphone can be counted among such devices. Due to the increasing use of mobile devices for online banking, this type of banking services is more and more often called mobile banking.

Figure 1. The scope of meaning of the concept of banking.



Source: Own study.

The growing online mobile banking is a system of remote access to banking services from mobile devices, which most commonly use smartphones. Due to the widespread 3G and 4G generation of mobile phone technology, enabling customers to carry out various operations remotely, virtually from anywhere, as a part of electronic banking services. A bank customer can make payments remotely, can verify financial operations carried out on his account, can make transfers and submit loan applications and other banking products. Dissemination of an electronic signature may completely eliminate the client's contact with the physical branch of the bank (Antkiewicz S., 2008, p. 37).

The development of online electronic banking systems, i.e. access to specific banking services through the network, the widespread use of the Internet among individual users and the improvement of electronic data transfer security technologies has generated a new type of banking known as a virtual bank, a bank on the Internet (Gwoździewicz S., Prokopowicz D., 2017a, pp. 123-124).

The main technological and economic determinants of progress in the field of data transfer and storage on the Internet

The advantages of the above-mentioned positive aspects of globalization processes and technological progress demonstrated in recent years suggest their continuation in the near future (Kaczmarek T., 2009). In terms of the main determinants conducive to improving techniques for electronic data transfer and sharing of information to interested recipients via the Internet is mentioned (Szpor G. Wiewiórowski W., 2012):

- improvement of techniques and emerging innovations in the distribution of products, financial services of financial sector and information services of public sector institutions,

- reduction of procedural barriers, technological facilities for clients of business entities and beneficiaries of public sector institutions, including in the scope of conducted business activity, concluding financial transactions with the participation of electronic banking, electronic settlement of business operations with offices,

- target measures included in the socio-economic policy of the country, eg: through governmental programs to support the development of national and local economy in order to increase the level of digitization of the activities of public sector institutions,

- activated by pro-development socio-economic policy, technical progress in the field of computer science and electronic data transfer techniques, it generates an improvement in standards of cooperation and information exchange between enterprises and public sector institutions and financial sector institutions.

A derivative of these processes should also be the activation of entrepreneurship and technological innovation, which should have a positive impact on the development of business activity. In the long-term perspective, this should translate into accelerating the pace of economic development, increasing GDP and improving the situation on the labor market.

Therefore, significant developing correlations and feedback in the field of technological innovation in the sector of business entities and cooperation of these entities with public sector institutions were pointed out in this sub-chapter. Since the early 1990s, economic growth in Poland has been determined mainly by the development of entrepreneurship, the commercialization of economic processes, the implementation of modern technological solutions and the adjustment of procedural standards to the normative regulations of

the European Union. The participation of creativity and innovativeness of business entities operating in Poland, as well as local and national entities operating in the public sector, including local government ones, is significant in this respect. These positive trends were not seriously disturbed even by the recent global financial crisis. On the other hand, the level of technological innovation in Poland is significantly lower in the context of the standards of highly developed countries (Borcuch A., 2012). In particular, there is a need for a further systemic socio-economic policy to inspire in order to create technological innovations emerging in enterprises and their implementation in public sector institutions. This will result in an improvement in the financial management of these entities, and thus this process can be an important factor in improving the finances of public institutions, including local government units, some of the already indebted ones. In addition, correlations and feedbacks that improve the cooperation of business entities and institutions in the financial and public sectors should also develop in the midst of this process (Goździewicz S., Prokopowicz D., 2017b, pp. 98-99).

Determinants of the development of online electronic banking in Poland

A bank that offers credit products in the form of a remote service in the operational risk management process takes into account the risk of IT systems resulting from the architecture and specificity of IT technologies used and personal operational risk, i.e. the risk of loss or copy of confidential information by unauthorized persons (Kosiński J., 2015). According to a study by BizRate.com dealing, among other things, with the monitoring of preferences of e-commerce customers, out of 13000 people surveyed, 2% were the vic-

tims of the theft of data related to the transaction, which was paid with a credit card via the Internet. The significance of the mentioned paradox increases in direct proportion to the growth of the difference in the assessment of the said value of 2% from the bank side and from the side of potential clients (Gąsiorowski J., Podsiedlik P., 2015). Both clients and bank employees who make statements in polls and surveys agree that online e-banking still has a future. The key determinants of the development of this form of financial operations are primarily for the potential client (Grzywacz J., 2016):

- a) more efficient management of funds deposited in the bank, which consists of:
 - the ability to keep track of all operations carried out on the accounts and accelerating the regulation of current payments,
 - the possibility of placing an order to deposit current funds on a time deposit account or to purchase treasury bills,
 - current and up-to-date information about the funds held and liabilities towards the bank or other institutions;
- b) Further positive aspects are (Świecka B., 2008):
 - using the bank's services 24 hours a day from any place via ICT mobile devices such as smartphones or tablets, regardless of bank opening hours,
 - submitting an application for launching a new financial service and sometimes accepting its conclusion remotely by the electronic signature,
 - making transfers between various accounts and performing financial operations on investment accounts with the use of banking products and securities operating on various financial markets.

It must be added the same argumentation that is often given by bank employees to the above-mentioned advantages of online

electronic banking systems for the customer. This is above all (Borcuch A., 2012):

- reducing queues at the bank and the labor intensity of data entry from documents to the bank computer system,

- automatically carrying out of most of banking operations with a relatively low value (in terms of value), which in turn will allow employees to be requalified and directed to activities that require more contact with the client in order to provide new services, eg. direct support or indirect with the client's finances (Gwoździewicz S., Prokopowicz D., 2017, pp. 89-100),

- the possibility of a significant reduction in customer service costs and increase of the bank's operation profitability. This is due to a significant increase in the number of customers and operations carried out on the accounts while maintaining or slightly increasing the employment of bank employees. In general, there is no need to increase the number of customer service stations, and thus incur additional expenses for new banking rooms and their equipment (Białas M., Mazur Z., 2013).

Determinants of the online electronic banking development and the issue of security of data transfer in the Internet

Therefore, the growing online electronic banking is a system of electronic communication with the bank, allowing clients from practically any point of the world to carry out operations on their own account, have constant insight into the data on the company's account, manage finance in a more quick and effective way, reduce the time of operations, as well as apply for new transactions or launch additional financial services. On the other hand, not only positive aspects are associated with the dissemination of electronic online banking. The increase of online bank accounts number and transactions made through them also

promotes the development of cybercrime, which is also confirmed by data from commercial banks operating in Poland (Dolecki S., Brutalna cyberzwistowość ..., 2016).

The dissemination of an electronic signature may completely eliminate the client's contact with the physical branch of the bank (Antkiewicz S., 2008). The development of online electronic banking systems, i.e. access to specific banking services through the network, the widespread use of the Internet among individual users and the improvement of electronic data transfer security technologies have generated a new type of banking known as a virtual bank, a bank on the Internet (Polasik M., 2008).

The development of online banking also has its barriers, which are associated with new risk categories of using information technology in banking. The most important barrier to the rapid development of financial services through the network results from the imperfections of the cybernetic medium, primarily due to the lack of a full guarantee regarding the security of information sent and remotely performed financial operations (Solarz M., 2006). The mentioned imperfection of the Internet is not a factor that banks have no influence on. The use of a specific set of tools increasing the level of security in the bank's IT systems contributes to raising the level of security of electronic banking systems and thus enhances the attractiveness of the bank's offer provided via the Internet. Increasing the security of IT systems is associated with a partial reduction of operational risk and additional costs incurred by the bank. However, the improvement of ICT systems will not fully eliminate operational risk because a significant part of it in the form of operational personnel risk is generated by human factors, i.e. employees of financial institutions who often unknow-

ingly may erroneously carry out certain activities that are necessary for the implementation of electronic transaction (Prokopowicz D., 2017, pp. 93-94).

Threats and security of electronic data transfer in online banking in Poland

The issues of classified data protection, including personal data sent electronically and collected in IT systems of various institutions can also be applied to electronic banking. Banking is a field that mostly developed at online platforms and it is considered to be one of the most important factors that determine the development of modern financial systems. The basic convenience for banks' clients, conditioning its dynamic development, is the ability to carry out financial operations at any time and virtually anywhere in the world through a global network. The benefits of this development come not only from the clients of these systems, who are no longer limited by physical access to bank branches and bank branches' working hours, but also by banks that have extended their activities on a national and international scale by offering a potentially broader audience. The above-mentioned image of the positive conditions for the implementation of new IT solutions and the benefits that the Internet gives to operating systems of commercial banks has become the main factor in the intensive development of online electronic banking in Poland. This development, which increased growth was recorded primarily in the last few years, is associated significantly with the specifics of the development of the entire national financial system and the changes that have taken place in the minds of customers. A particularly important factor determining the current processes of implementing new IT solutions to banking systems is the development of ICT in the so-called cloud,

including the storage of large data sets in the so-called big data platforms.

The term electronic banking is usually defined as a remote access to a wide range of banking services via the Internet using a computer or other mobile devices providing access to the global network (Guzek E., Ślęzak E., 2012). In recent years, these other devices, mainly mobile devices, include smartphones, tablets, laptops and notebooks. The technical miniaturization of these devices continues, therefore, in the near future, smart watches that will function as a miniature smartphone can be counted among such devices.

The security of online mobile banking and the processing of data in the cloud on Big Data platforms

Therefore, the scale of dynamism in the development of online mobile banking is mainly determined by the above-mentioned positive aspects of conducting financial transactions carried out electronically, including via the Internet. In recent years, Poland has been continuing the process of developing online mobile banking and growing interest of bank customers using this form of settlements and payments. Therefore, it should be stated that online mobile banking is a particularly important determinant conditioning current processes of implementing new IT solutions to banking systems and the evolution of transaction platforms for financial operations. The most dynamically developing fields of ICT technology, which determine the successive stages of progress in the field of online electronic banking, include the dissemination of standards for conducting financial operations carried out in the so-called cloud as well as using the large data sets located in the big data platforms (Prokopowicz D., 2017, pp. 117-118).

The concept of so-called "cloud" means cloud computing. It is a service that allows

you to store, archive and use the collected data, which is accessed through the Internet by computers found in another location. Normally, this technology is the ability to use via the Internet with high computing power and memory disks and therefore reducing spending on their own computer equipment (eg. Operational memory). Using the cloud technology can be also characterized by other positive aspects that can be described as increasing convenience for the user. Well, you can access the data stored in the cloud from any Internet-connected device, and therefore not only from a computer, but also from a tablet, smartphone or other device connected online with the Internet.

Therefore, the amount of stored data in the cloud on external servers has also been dynamically growing in recent years, it is usually available for free with certain disk capacities, i.e. parts of what is increasingly commonly referred to as big data. Institutions and companies whose effective functioning is currently based on the above-mentioned cloud and big data technologies estimate that by 2020 the amount of component data in this way on external servers will increase many times, which will mean an increase in the storage capacity of data storage devices, including large disks, which connected in the cloud with servers enabling communication via the Internet will create a kind of external data warehouses, which are currently referred to as big data (Gwoździewicz S., Prokopowicz D., 2016b, pp. 231-232).

Conducting financial operations carried out in the "cloud" as well as using the large data sets located in the so-called big data platforms are, however, only some areas of cyberspace, whose dynamic development determines the need for analogous progress in the improvement of security instruments for transferring and storing classified data.

In recent years, the scale of cash fraud has been growing in Poland on the basis of personal data stolen in the IT systems, i.e. "identity theft". Based on data from the 26th edition of the InfoDOK Report prepared by the Polish Bank Association, it was shown that in the second quarter of this year PLN 81.8 million was attempted to extort. According to the report more than 1.5 thousand were detected. cases of using stolen identity in the phishing of funds (InfoDOK, Report on documents ... 2016). An effective solution significantly limiting this criminal practice was a creation of a system to reserve documents by people who lost them under the "Restricted Documents" program and to disseminate this possibility in social media information campaigns carried out in various fields (InfoDOK: Almost 900,000 zlotys a day were tried to extort ... 2016).

For the above reasons, ensuring a high level of security of transactions made in cybercrime is more and more often recognized as an integral part of security issues in the context of the development of the information society. Cybersecurity of mobile banking is more and more often recognized as the determinant of the effective development of the national economy. Therefore, central state institutions should also take into account the improvement of mobile banking security systems, including information on financial operations and personal data of citizens. The main idea of improving these security systems should be to ensure that individual citizens and entities created by these persons should have the highest possible level of guarantee of new technologies safety, eg. when using electronic banking services, making online purchases or sharing information with friends around the world. In this way, the trust of electronic banking customers will increase, also in the field of personal data

protection in cyberspace, which will contribute to faster development of e-services, which are primarily interested in international accounting institutions and banks (Domańska-Szaruga B., Prokopowicz D., 2016, pp. 125-126).

Statistics indicate that in 2015 there were only 21 physical intrusions to banks with losses estimated at PLN 600,000. These data indicate that the scale of this problem is nearly half lower than the average statistics of physical burglaries to banks against the background of Europe. 125 attacks were carried out on ATMs installed in Poland, of which PLN 5 million were stolen in total. A serious problem for the banking system was false transfers, which estimated the losses for the banks for a total amount of PLN 16 million. Surveys carried out periodically show that 85% of various types of institutions in Poland were attacked by cybercriminals. Among the companies operating in Poland, one-third of these entities admitted that they were the victims of hacker attacks. The banks' losses related to extorting loans based on forged signatures, forged or stolen documents were also relatively high in recent years.

Banking statistics show that the most serious problem that derives from the activity of cybercriminals was the rapidly growing trend of fraudulent transfers because as many as 331 percent of the number of fraudulent Internet transfers increased in 2015 compared to the previous year. In recent years, a growing trend of personalized attacks on the bank's richest clients has been observed, through the use of social engineering techniques of "h-commerce" manipulation. In this criminal activity, hackers remotely infect their victims' computers via the Internet by introducing "Trojan horses", spyware and hacking passwords typed from a computer keyboard. In addition, hackers are increasingly sending

out false information about pseudo overpayments in e-mails received as if from the Tax Offices. Entrepreneurs increasingly receive hack-prepared emails that inform about alleged orders of transfers from bailiffs or contain false invoices for allegedly purchased goods (D. Prokopowicz, 2017, pp. 319-320).

Therefore, in order to increase the effectiveness of crime detection, it is necessary to deepen cooperation of banks and develop systems for efficient and rapid exchange of information about emerging threats at the bank-client level and among other participants in the business. It means a growing role of banking CERTs, data analysts operating on big data platforms, experts on ongoing monitoring in order to identify sources of hacker attacks in advance.

It follows from the above considerations that it is unlikely at the current technological level to ensure a 100% level of security of operations in the field of electronic banking, e-services and the guarantee of a complete lack of access to personal data by unauthorized third parties, so-called hackers. Institutional bodies of the states, which are responsible for the creation, improvement and updating of legal norms adequate to the progress of technology, do not always fulfill their role accordingly. The recent financial crisis of 2008 has demonstrated this, when the majority of sources of crisis factors are perceived in the current imperfections of banking procedures. Bank executives are trying to counter this criticism by suggesting rapid technological progress in the field of risk valuation instruments and banking products made available in a different way than so far, that the improvement of internal banking procedures and security instruments has not been able to keep up with such dynamic

progress (Prokopowicz D., 2017, pp. 176-177).

Economists studying this problem scientifically do not fully share such an approach to the problem. Technological progress is a process that is so objective, interdisciplinary and unpredictable in its positive and negative effects that attempting to target it purposefully through interventionist actions of the state would be an extremely difficult undertaking, even though sometimes it would seem justified. Supporters of the free market approach to simplifying regulations and procedures argue that this would limit the possibility of further stages of technological progress and would reduce the possibilities of competition between entities offering electronic banking, e-services, etc.

The development of institutional integration of cybersecurity systems in Poland

Now the prevalent opinion is that if statistics recorded by the Police and crime banks indicate that in recent years in Poland, the number of both ineffective and effective attempts to break into electronic banking systems and also steal personal data is increasing, which means that the financial system is not too comfortable with this problem and there is a need for state intervention in this matter. It is questionable whether this intervention should be combined with the extension of the scope of media surveillance and electronic data transfer by the state, which is currently the controversial issue. In this study, we do not consider this issue, recognizing it as too far from the analyzed issues.

However, if in this "arms race" between IT specialists employed in institutions offering e-services and IT specialists - hackers in some areas of electronic banking and the latter will start to win, this suggests deep-

ening weaknesses, technological imperfections in the financial systems of banks and other entities providing an Internet platform of electronic banking. Therefore, the state should be involved more actively in the process of regulating this sphere of financial operations and electronic data transfer. However, in order to determine what the scope of this state intervention should be, it is necessary to verify the sources of the increase in the number of effective third party burglaries into electronic data transfer systems and to determine whether the technical imperfections of information systems or rather unpaved security procedures or ignored intentionally, or unknowingly by customers, the principles of safe use of devices for electronic storage and data transfer, including personal data. It is necessary to cooperate with the Police, Ministry of Digitization, Internal Security Agency, Central Investigation Bureau, central and supervisory institutions of the financial sector, ie. the National Bank of Poland and the Polish Financial Supervision Authority, commercial banks and other system institutions participating in the process of electronic data transfer to fully investigate this issue (Matosek M., Prokopowicz D., 2017, pp. 225-226). The role of institutions coordinating and disseminating the high rank of personal data security in electronic banking systems, ie. institutions such as the Polish Bank Association and the Center for Banking and Information Law, is also important. The need to strengthen the cooperation of these institutions to improve the risk identification system, to develop effective solutions in order to improve the security of electronic data storage and transfer systems, including personal data was also emphasized at the "5th Bank Security Forum", which took place in Warsaw on May 10 (Bank Security Forum 2016).

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During the periodically organized conference of the "5th Bank Security Forum", as well as during the debates of the Banking Technology Forum, the Electronic Banking Council, the Antifraud Forum, security experts exchange practical experience to develop constructive, common directions of activities and consultations with representatives of other institutions participating in security systems for classified information. As a result of these debates and coordinating the work of various groups of banking specialists, scientists and central institutions of the financial system, another system institution was established whose main goal will be to improve both identification of risks and development of effective security instruments in cyberspace. Therefore, it was held an official opening of the newly established institution called the National Security Center on July 4 of the current year in the Warsaw headquarters of the Research and Academic Computer Network (NASK). One of the key platforms of this institution is the Bank Cyber Security Center, whose main objective will be to detect cyber threats, analyze them and develop new system solutions adjusted to the current fast changing realities of cyberspace, increasing the security of electronic data transfer and storing classified information, including personal data of citizens. The effectiveness of the new solutions for improving the security issue will be determined by the effectiveness of counteracting the effects of hacker attacks on the IT system of banks and other public institutions (Opening of the Bank Cyber Security Center 2016).

It should be emphasized that the vice-president of the Polish Bank Association, Dr. Mieczysław Groszek, during the conference "V Bank Security Forum" underlined the successful debut of the Bank Cyber Security Center during the implementation of

the governmental "500 Plus Program". In addition, an important conclusion of the Forum was the statement that another important step in the cooperation between banks and the government will be the joint implementation of the National Cybersecurity Strategy (Banking Security Forum 2016). Time will show whether the establishment of the National Security Center as a new institution will realistically change the "balance of power" in this "arms race" between IT professionals - system administrators and computer hackers. Now we can assume that if mentioned new institutions improve the issue of experience exchange and integration of activities between various state authorities, this should contribute to improving security in the area of protection of classified information, including personal data of citizens. On the other hand, organizational and institutional changes will not ensure a high level of security of classified data transfer on the Internet. It can be assumed with a high level of probability that in the coming years cybercriminals will change their hacking techniques adapting them to the changing ICT technologies and online tools. Apart from improving technical and IT instruments of cyber security of attacked institutions and enterprises, it will be necessary to continuously and permanently update legal norms regarding the security of data transfer on the Internet, so that legal regulations enable the improvement of cyber security procedures and tools (Gwoździewicz S., Prokopowicz D., 2016a, p. 393-394).

It is only as a result of this full cooperation that it is possible to develop effective system solutions and the development of legal regulations appropriate for the given situation by the state. However, full cooperation of these institutions is necessary to make it possible, ie. one that would also allow

banks and other e-service providers to provide relevant institutions with full information on both effective and ineffective attempts of hacking attacks on electronic banking information systems, including re-

ported thefts. personal data of bank customers, telecoms, social networks, online stores, etc., all those entities that participate in the process of collecting and using their clients' personal data for their needs.

Conclusions.

Over the last decades, there has been a significant progress in electronic data transmission systems, which was determined mainly by the development of information and telecommunications technologies. Product customers and services offered by enterprises, public and financial institutions are increasingly contacting these entities remotely via the Internet. This is a key but not the only factor determining the currently occurring digital revolution in information societies. In addition, determinants of this process of digitization of societies include also the development processes of ICT devices enabling mobile access to the global Internet network, and the successively expanded offer of financial institutions (Świdarska J., 2013) in the field of online electronic banking. These processes are one of the main factors of the ongoing economic globalization (Bukowski S., ed., 2010).

Accordingly, the progressing economic globalization and, consequently, the growing links between the Polish economy and the world, improve national legal regulations regarding the maintenance of a high level of security of information systems and the protection of classified data, among others as a process of adapting Polish legislation to European Union regulations (Kosiński J., 2015). On the other hand, these adjustment processes do not ensure full adequacy of the adjustment of legal regulations to the constantly evolving elec-

tronic banking offer of financial institutions as well as ICT used in the Internet. Currently, it is assumed that the existing legal norms provide only the most elementary level of protection of classified data during the implementation of specific commercial orders and financial transactions and therefore may be insufficient in the face of constantly progressing ICT technology used by Internet service providers and especially companies that usually offer no-cost use from social networks. The security of classified data transfer as well as transactional and financial information sent via electronic information systems of online electronic banking is also a particularly important issue (Liderman K., 2008).

In the context of the ongoing digitization process of companies, offices and financial institutions, it is assumed that, according to the needs of most Internet users, protection of classified data is an area of human existence that should be provided by entities operating on the Internet. In accordance with the provisions of the Constitution to protect the transfer of classified data, including personal data is one of the elementary rights of every citizen and therefore also an Internet user. Continuing technological progress, constantly modified technical parameters of electronic banking systems and changing internet service offerings may cause non-adaptation of legal norms to rapidly changing realities of the digital age (Gałach A., Jędruszczak A., Nowakowski B., 2013).

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