

The impact of digitalization on the financial sector

CSERNE PANKA PÓTA
University of Debrecen Károly Ihrig Doctoral School,
potaplazma@gmail.com

PATRÍCIA BECSKY-NAGY
University of Debrecen Faculty of Economics and Business,
becsky.nagy.patricia@econ.unideb.hu

Present-day consumer society increasingly satisfies its needs through digital channels, and financial products and services are no exceptions. The 4th industrial revolution is not only about the penetration of technology, but also the paradigm shift of business processes. The traditional members of the financial sector must adapt to the digitalized world to keep their positions in the market. The penetration of BigTech and FinTech companies influenced the expectations of consumers: customer experience became the main criteria of their decisions. In order to simplify and accelerate processes, banks use the methods of digitalization, and automatize the system to increase client satisfaction. In this article, we will introduce the three bank types based primarily on the usage of innovative technology, the extension and depth of the cooperation with FinTech companies, and the status of a bank's internal digital transformation. Also, we will introduce the current status of the banking sector evidenced by our SWOT-analysis and mention some of the existing payment solutions.

Keywords: digitalization; financial services; FinTech; GAFA

JEL Classification: G21; G23

1. Introduction

The accelerated digitalization and the penetration of FinTech and BigTech companies force banks to change tack. Also, a regulatory environment full of challenges and potentials has evolved. The topic of our research is a current issue because digitalization and continuous innovation have turned the financial sector upside down and enhanced the competition among its members. The entering in of in-

novators to the financial market increased the number of competitors. In order to survive, the incumbent market participants in the financial sector must adapt to the changed circumstances.

The purpose of our research is to introduce the conditions having an impact on the financial sector, particularly focusing on the penetration of digitalization, new market participants, the requirements of industry regulators and revolutionary new innovative solutions and phenomena. Finally, we will demonstrate how financial institutions react to these challenges. This article is based on secondary research, the elaboration of literature sources and the introduction of the results of international and domestic surveys.

2. Factors having an impact on the financial sector and the reaction of financial institutions

Digitalization can be seen as a phenomenon for saving resources or making working processes faster. One thing is certain: by the 21st century, digitalization has fully covered most fields of economy and society. The accelerated digitalization and the penetration of FinTech and BigTech companies force banks to change tack. Also, a regulatory environment full of challenges and potentials has evolved. For some, the root of aversion to digitalization comes from the fear mostly of cyber-attacks or the fear of robots assuming power over humans. On the other hand, most banks and businesses have a positive view of digitalization and the advantages ensured by FinTech (Financial Technology). Still, there can be huge differences among countries and regions.

In fast-developing Asian countries, Fintech services spread very quickly. In North America, the outstanding investment appetite drives the development of the FinTech market, while in Europe, FinTech firms develop either through cooperation with banks or by making use of small niche markets (MNB, 2017).

With the advancement of digitalization and with a more open regulatory approach towards FinTechs, the landscape of financial services has changed significantly. The innovative new market participants and their technologies influence the entire financial services supply chain (Becsky-Nagy et.al, 2022). In recent years, the demand for online banking services has also increased significantly (Lakatos et.al, 2022). Today's consumer society increasingly satisfies its needs through digital channels, and financial products and services are no exceptions (MNB, 2018a). It is important to know that adaptation to digital financial solutions is not so easy for everyone. It is becoming increasingly difficult to adapt to and to catch up with digitalization for those working in financial fields. Information and communication technology develop at a stunning pace, so we must broaden our knowledge in the fields of everyday financial and accounting tasks.

We are experiencing an international intensification of digitalization, in which the members and clients of the financial sector face different generational challenges. Concerning the service providers of the financial sector, only those can survive who continuously modernize their technology in order to meet their clients' requirements. Digitally illiterate businesses risk becoming obsolete.

2.1. The FinTech phenomenon

In the financial sector, FinTech and BigTech businesses are the new market participants in a sense that they provide more and more financial services with the help of their digital knowledge. FinTech is the new generation of digital finances and on the other hand can refer to the provider of the digital financial services, using innovative, new technology that can be a new software, IT system or a new business model.

New market participants are trying to come up with offers that clients have never seen or experienced before, because these new offers have not ever been provided by the incumbent members of the financial sector actors to-date. There are three main reasons why financial service businesses have not done so before: either because they did not have enough source to introduce technological innovations in their processes, or the regulatory environment made it harder to transform, or simply they just did not see the potential in digital natives.

FinTech created a new industry in which financial services have become more effective by developing technologies and software. Moreover, often FinTech companies create cheaper or completely new services. FinTech does not merely represent a kind of trend, but it can also be considered to be a reform process which is taking place in finances. In this context, these businesses are the drivers of digital transformation for banks, these include new software, processes, products, or even business models. Because of their huge, but outdated systems, it is hard for the incumbent members of the banking sector to keep up with the new market participants. Often, FinTech firms focus on market segments, thus fewer rules restrict their activities, or the regulatory system just simply cannot control the new type of services. A growing percentage of banking employees are IT specialists which also reflects the increasing importance of digitalization and information technology (Turzó, 2016).

According to the consultation document of the National Bank of Hungary, there are – basically – three potential paths of development with respect to the spread of FinTech firms:

- One possibility is that incumbent market participants incorporate the innovation (e.g. in the form of a partnership agreement, acquisition or internal innovation) either at the local or the global level. As a result, innovative firms become part of the traditional financial intermediary system.

- A FinTech company may also decide to specialize and focus on a single element of the value chain and therefore it serves a specific customer base.
- In the third scenario, the FinTech firms or the global technology giants (BigTech) cover the whole value chain and crowd out traditional banking actors. This latter possibility represents the greatest challenge for not only the incumbent market participants, but also for regulatory and supervisory authorities (MNB, 2017).

The fast penetration of new solutions created not only new opportunities but new challenges, as well. New technology must meet the requirements of users concerning trust, security, competitiveness, and the protection of privacy. The lack of unambiguous rules can restrict the willingness to use innovations. Nobody would like to invest in a development if it can turn out that it does not comply with all legal requirements. FinTech is international by nature, so because of its ability to conduct its activities across national borders and within and outside of economic regions, e.g. the European Union, legislators must apply common norms and principles with respect to domestic features, in order to ensure equal rights and security for everyone. At the same time, we must stay open-minded and receptive about newness in order to enjoy the advantages provided by modern solutions and to stay among frontrunners.

Regulation evolves alongside technology. Technology is often used for regulatory compliance, monitoring and implementation (aka. regtech and suptech). In some cases, regulatory and supervisory requirements are being built right into technological systems (Arner et al., 2020). One huge problem arises from the lack of suitably qualified professionals at supervisory bodies, which makes it harder to control the continuously changing and developing FinTech innovations.

Due to their decades of operational experience, banks have great expertise in regulation and compliance. In most cases, FinTech and BigTech companies gain access to the regulated financial system at the back office or infrastructure layers by offering their financial services in close direct or indirect collaboration with banks (Feyen et al., 2021).

2.2. Regulations

The regulatory dilemma linked to FinTech solutions is about finding the balance between a laissez-faire approach and a fully prohibitive regulatory stance. With a too lenient approach, FinTech firms would gain an unfair competitive advantage in comparison with incumbent market participants leaving several risks concerning investors and consumers. Excessive restrictions would curb innovations, so innovators and clients would probably turn away from the domestic market. The

aim of supervisory bodies is to create a framework in which risks are minimized but innovations are supported to spread. Applying regulatory instruments like Innovation Hub and Regulatory Sandbox could be a solution to this problem (MNB, 2017).

Innovation Hub (Financial Innovational Platform) is a platform ensured by regulatory authority where FinTech innovators receive guidelines from the regulators. The experts of the regulatory authority answer the questions of the delegate of FinTech innovations, help them to interpret legal requirements and assess the need for law changes, which they forward to the decision makers. The currently established MNB (Bank of Hungary) Innovation Hub helps to identify real legal obstacles and to foster the viability of innovative ideas. With the help of Regulatory Sandbox, innovators can test the viability of their financial product or business model in a “test environment” controlled by regulators, enjoying temporary exemption from certain regulatory obligations. These tests are carried out with real customer involvement. A common feature of Sandboxes is that the testing of innovations in real market conditions is allowed only for a limited amount of time – usually for 6-12 months –, with a limited number of clients. During that time, regulators dispense with some pre-defined regulatory requirements. The main criteria of getting into the test is that the innovation must be a significant novelty for the customers or clients, and the applier of that must meet the requirements of market entering. If the viability of the service is proved during the test, the real market entering may take place (Fáykiss et al., 2018).

PSD2 is a revised directive about payment services within the EU. It is a technological and regulatory framework thanks to which not only banks can provide financial services, but it also supports the introduction of new digital services. However, the new participants of the market tend to cooperate with the already existing members.

The Revised Payment Services Directive abolished one of the main tasks of banks: the exclusive dealing with banking secrecy. Indeed, third party providers – with the consent of their clients – have the right to access clients’ bank accounts when providing financial services (Müller – Kerényi, 2021). PSD2 intends to transform the European payments market into a more efficient one and encourages innovation while making payments more secure. The GDPR aims to harmonize data privacy laws across Europe, to protect EU citizens’ data privacy while reshaping the way organizations approach data privacy. These changes will pose new challenges for financial institutions in terms of technology, operational and strategy perspectives (EBA, 2018).

Banks work with a huge data set, using a transparent and user-friendly interface that can help consumers to see their financial matters in a different approach, so they can make more soundly based decisions. In terms of the PSD2 (the Revised Payment Services Directive of the EU) and the GDPR (General Data Pro-

tection Regulation of the EU), users decide to whom they choose to give financial data. Banks managing data must ensure that data transmission is carried out safely through APIs (Application Programming Interface). This model is called open banking. One advantage of this model is that product offer comparison is easier, and it makes the offers of financial service providers more transparent.

Open banking regulations require banks to post accurate and unbiased information both online and in their bank branches, on the basis of what clients can assess the quality of their services. Banks must raise the awareness of their clients about the unforeseeable exceeding of bank overdraft limits and must grant a grace period to their clients to correct the problem and to be able to avoid charges. PSD2 ensures the legal background of open banking, so non-banking financial service providers entering the market can provide new services to the consumers by using banking data, which clearly boosts competition (Frankenfield, 2019).

The Revised Payments Services Directive includes many cyber security rules. Worth mentioning among the additional rules is the technical regulation about strong customer authentication and secure communication, which was created by the European Banking Authority (EBA). The essence of the so-called strong customer authentication is that the identification of clients is based on the reality of at least two validation data when using electric payment services, which must be in different categories (MNB, 2018b). The 3-element authentication based on elements categorized as knowledge (e.g., PIN code), biological parameter (e.g., fingerprint) and possession (e.g., mobile) require the presence of two elements, thus making electric payments more secure.

2.3 The status of the banking system

The EBA conducted a survey about the impact of the spread of FinTech technologies and business models to the operation of banks. The European banks participating in the survey assessed the impact of FinTech to the business efficiency and business models of the incumbents and the revenue-generating ability of financial services (Németh, 2019). It names three groups of banks based primarily on the usage of innovative technology, the extension and depth of the cooperation with FinTech companies, and the status of the bank's internal digital transformation:

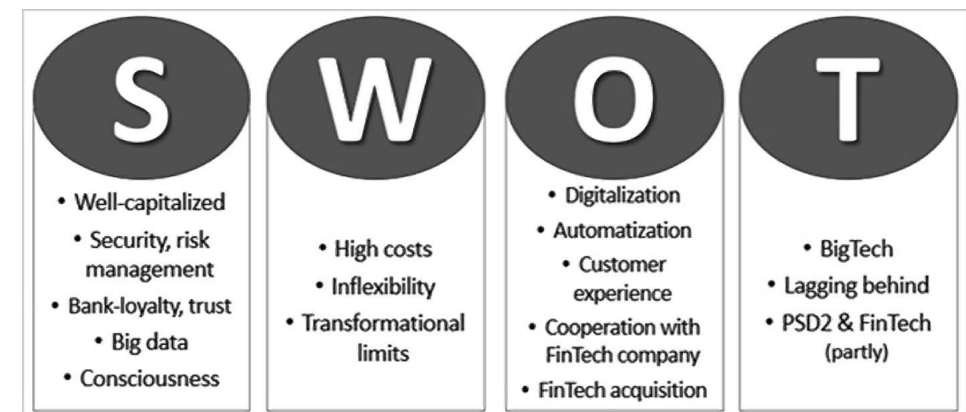
- *Proactive/front-runners*: institutions with ambitious innovation strategies, highly targeted transformation projects and growing investments in FinTech. Although some institutions may have set aggressive strategies, which usually have unclear impact and risk assessments, in an effort to achieve the first mover advantage, others have set clear, well thought out and comprehensive strategies and targets with a strong research orientation and the necessary focus on governance, organizational aspects, operations and risk management.

- *Reactive*: in this group, there are two sub-groups, with (a) some institutions perceived as followers of the technological developments and taking a 'wait and see' approach, with carefully defined strategies and a steady pace of internal changes and (b) other institutions that appear to react to peer pressure and take a 'go with the flow' approach combined with the concern of being left behind. Such an approach could lead to irrational decisions and inadvertently bring new/amplified and unknown risks to the business.
- *Passive*: in this group, we usually see institutions left behind in terms of technological developments because of other significant priorities (e.g. high non-performing assets levels). Nevertheless, they are slowly trying to catch up, as customers have started asking for a change in their banking products/services. However, in this group, we also see some conservative or more traditional institutions, which are usually reluctant to change (EBA, 2018).

We think that we could list here the old banks too, in case of which the process and the investments would cost a lot of money.

Based on the available information, we have compiled the SWOT-analysis of the banking system in the light of digitalization and the FinTech phenomenon.

Fig. 1: The SWOT-analysis of the banking system



Source: Author's development

Banks are well-capitalized institutions, which have extensive security systems to meet the requirements of laws and clients. In the last few years, risk management has become a key role of central banks. Thanks to its decades of operational experience, the banking system has won the trust most of its clients and a kind of bank-loyalty has appeared. The banking system has a comprehensive database

about customer behavior; thus, it is easier for them to mark out the direction of future developments (MNB, 2018a). According to the survey based on this database, most people have a bank account in the same bank as their parents, and do not like moving from bank to bank.

A big weakness is the high banking costs – especially in the case of European banks. Banks with a long history are less flexible because it would be quite expensive to transform their infrastructures. They often face transformational barriers, because many institutions need a full IT conversion.

In order to survive, the banking system must seize the advantages of digitalization and automatize its processes to be able to focus on more important fields. Financial institutions probably have the source to differentiate their products with a high level of customer experience. The fast adaption of financial institutions to the innovations can ensure a long-term competitive advantage. One possibility of renewal is the cooperation with FinTech firms applying their innovative ideas, digital solutions and IT expertise. Another option can be the acquisition of FinTechs.

We believe that currently, the BigTech firms pose the biggest threats to the banking system because of their highly developed IT systems and the brand loyalty of their clients. It would be a big mistake for the banking system to lag behind the modern environment and requirements because it would lead to the loss of clientele, income, and finally to failure and closure. PSD2 also contains several regulations that can endanger the future of banks and may alter the competition among the members of the financial sector (e.g. open banking). FinTech firms appearing on the market can distract the life of incumbent participants too with their innovative mentality, cheaper solutions and more user-friendly interfaces.

2. 4. The 4th Industrial Revolution

According to the 4th Industrial Revolution or digital industry conception the industrial production is combined with the internet technology and the knowledge-based capital. Huge amounts were invested into digitalization in many industrial fields and the digital innovation has become widespread (Hausmann, 2017).

Distributed ledgers, cloud services, big data, and artificial intelligence (AI) are some of the innovative technologies which are being tested for many types of financial operations, to make them more efficient and less costly (FSB, 2019).

The 4th industrial revolution is not only about the penetration of technology, but also the paradigm shift of business processes. Highlighting some innovations and phenomena which were brought into the financial world by industry 4.0, and which can be crucial concerning financial culture:

- *Blockchain* technology resembles a decentralized (P2P) transaction database with cryptographic methods. In banking fields, blockchain can be applied in e.g. digital client identification, stock commerce or in transaction management. This technology is not completely mature, but it is sure that it offers more efficient and cheaper opportunities compared to other systems. Thanks to its decentralization, it saves time for its users and it lowers the chance of conflicts because the involvement of a third party (banks, lawyers) is unnecessary. Blockchain and the smart contracts applying them help to prevent and filter out misuses and make sensitive data storage more secure.
- *Artificial intelligence* has already appeared in the financial services – clients will probably communicate with robots in the future. Robo-advisors are digital platforms controlled by an algorithm and they can provide financial services with a limited level of human supervision.
- So-called *Business Intelligence* (BI) instruments make relevant information (that can be converted into knowledge) out of data. Business intelligence means the conscious and organized collection, systematization of own in-house data and public source. And then, on that basis, summarizing relevant business information and passing it to corporate decision makers or other interested parties. In the last years, the technological background of business intelligence has become clear. Banks have the most sensitive and most valuable information about client behavior, so they can make better decisions and provide personalized services. In this way, clients can use more convenient services and make more conscious financial decisions.
- *GAF*A is an acronym that stands for the initials of the four big American technological giants: Google-Apple-Facebook-Amazon. These digital leaders have started to break into the financial fields as well. There is a similar acronym in China for BigTech companies: BAT (Baidu, Alibaba, Tencent). These giant firms deal mainly with online services, software and computers (Pál, 2018; T-Systems, 2016).

BigTech companies have enormous clientele, capital and user data analyzer artificial intelligence, which help them to come up with breakthrough innovations even in the field of financial solutions. It can cause systemic risk that such companies can access to sensitive financial user data without those rules that incumbent financial service providers must follow (Becsky-Nagy et al., 2022).

The payment solutions – WeChat Pay and Alipay – of Chinese technological companies (Tencent, Ant Financial), created access to financial products for millions. On the other hand, 90% of the mobile payment market is now in the hands of two companies. While the American BigTech companies in other regions were

noticed by authorities and paid huge fines, the Chinese BigTech firms tried to avoid that. Probably as a result, Chinese BigTech firms tried to avoid that.

2.5 Banking services and new payment solutions

In our view, it is hard to make a difference between the financial products of banks because they are homogeneous. For clients, reliability and customer experience – like fast and easy administration – are the primary considerations when choosing financial service providers. We believe that concerning financial products and services, clients are looking for a user-friendly interface, data protection and the transparency of product conditions.

Increasingly, clients prefer avoiding having to run bank errands by using a mobile application, instead. With this method, not just cash, but also payment card usage, would be minimized, or it could even cease to exist in the future. A cashless society is considered a good thing, but QR-code and NFC based payment solutions are not completely safe. QR-codes are two dimensional barcodes which store digital data. With their help, we can code webpage, Twitter links or other information. Each bank must provide customers the opportunity to pay bills through net- and mobile banking. The scanning of QR codes is probably the simplest way of the entry of the bill's data into the banking system without making a mistake. To scan the code, one only needs a mobile and a QR code scanning application. Some companies use QR codes to offer discounts for their customers. On the contrary, NFC (Near Field Communication) is a short-range (max. 1 meters) wireless technology, which sends data with the help of a magnet – like those used in shops to prevent shoplifting. Although these solutions provide a convenient option for customers and a cheap marketing tool for businesses, both alternatives entail some risk. A QR code can hide any kind of data, thus there was a case when the scanned code directed the person to a fake website. So, there is a danger that we give our card number or invoicing address on an unreliable page when ordering a product or initiating a payment, easing the work of phishers. NFC ensures the communication between two devices, but it does not exclude the possibility for a third device to take or modify data. Of course, companies applying these technologies and governmental organizations are continuously working on the elimination of these risks.

In order to simplify and accelerate processes, banks use the methods of digitalization, and automatize to increase client's satisfaction. Worth mentioning for instance the online comparable offers or the opportunity of VideoBank account opening. In this way, choosing a banking product would be the result of a more comprehensive, exhaustive but at the same time easier decision-making process. Also, online administration, credit offers and lending are already available for cli-

ents. These solutions will soon appear in our everyday lives because we could run our banking/financial errands from home avoiding standing in queues independently of opening hours. We only need a PC/laptop or a mobile and internet connection. Time is money, so it does matter how much time we spend running our financial errands. Banks are trying to simplify the transparency and understanding of information by applying user friendly interfaces. It is easy to find one's way on their webpages and they also provide calculators for comparing banking products. Apart from traditional banking (like money transfer, loan taking or investments), banks provide the opportunity of paying bills, topping-up mobile balance, or even buying motorway toll stickers. Some applications provide even more, of course, with the backgrounds of banks or other financial service providers.

Digital trends are rapidly accelerating and there is a huge demand for alternative payments models. The global pandemic has only enhanced interest in and investments into the payment sector driving activity in the challenger banking and B2B sector (KPMG, 2021). One must not forget that technological improvement and digitalization brings new types of risks. Cybersecurity is one of the most important aspects of FinTech in the modern world to combat new dangers (Peters, 2021).

3. Summary

To sum up, we believe that we are experiencing an international rise in digitalization, in which the participants and clients of the financial sector face different generational challenges. The penetration of BigTechs and FinTech startups brought along an obvious shock to the business life of the sector. These changes influenced the expectations of consumers: customer experience became the main criteria of their decisions. The traditional members of the financial sector must adopt to the digitalized world, the innovative solutions and the technological changes in order to keep their positions in the market and to stay in the ring.

The 4th industrial revolution has already reached payment solutions and other financial fields. Financial digitalization improves client satisfactions and the quality of services, and moreover, it decreases the frequency of cash usage and helps to make cash management more transparent (Póta et. al., 2021).

In our view, incumbent market participants must make the efforts to meet the super modern challenges and keep their clients by providing high level of customer experience (its source can be an accelerated banking administration), while preserving traditional banking values. We believe that they have already made the first steps by introducing the Revised Payment Services Directive, modernising their systems, digitalizing and automatizing their services, managing cyber risks and by creating payment platforms.

The number of digital solutions in banking fields will probably rise, thus the financial sector faces the challenges of digital switch more intensively, which could also enforce a shift towards a more cost-effective way of banking operation.

Nevertheless, it is important to emphasize that automatization has limits because human factor is irreplaceable in some fields like creativity, thinking or decision-making.

Acknowledgements

- This paper is supported by EFOP-3.6.3-VEKOP-16-2017-00007 – “Young researchers for talent” – supporting careers in research activities in higher education program.
- “Supported by the ÚNKP-19-1-I New National Excellence Program of the Ministry for Innovation and Technology.”
- This article is supported by “DETEP” (Talent Management Program).

References:

- Arner D. – Aurer R. – Frost J. (2020) *Stablecoins: risks, potential and regulation*. BIS Working Papers No 905. ISSN 1682-7678 (online) <https://www.bis.org/publ/work905.pdf> [30 Jun 2021]
- Becsky-Nagy P., Póta Cs. P., Fazekas B. (2022). Fintech cégek rendszerkockázati elemzése (*The impact of FinTech to systemic risks*). in Fenyves V. (edited) (2022) Magyar Nemzeti Bank – Debreceni Egyetem kutatási konferencia Fenntartható gazdaság Versenyképesség és digitalizáció pp 160. (ISBN: 978-963-490-401-4), pp 25-45
- European Banking Authority (2018). *EBA Report on the impact of FinTech on incumbent credit institutions' business models*. eba.europa.eu Available: <https://eba.europa.eu/sites/default/documents/files/documents/10180/2270909/1f27bb57-387e-4978-82f6-ec725b51941/Report%20on%20the%20impact%20of%20Fintech%20on%20incumbent%20credit%20institutions%27%20business%20models.pdf?retry=1> [3 Aug 2020]
- Fáykiss P. – Papp D. – Sajtos P. – Törös Á. (2018). *A FinTech-innovációk ösztönzésének szabályozói eszközei: Innovation Hub és Regulatory Sandbox a nemzetközi gyakorlatban*. Hírelintézet Szemle, vol. 17. no. 2., pp. 43-67.
- Feyen E. – Frost J. – Gambocarta L. – Natarajan H. – Saal M. (2021): *Fintech and the digital transformation of financial services: implications for market structure and public policy*. BIS Papers No 117. ISSN 1682-7651 (online) <https://www.bis.org/publ/bppdf/bispap117.pdf> [30 Jun 2021]
- Financial Stability Board (2019): *Decentralised financial technologies – Report on financial stability, regulatory and governance implications* <https://www.fsb.org/wp-content/uploads/P060619.pdf> [13 Aug 2021]
- Hausmann R. (2017). *A digitalizáció gyökeresen átalakítja az államigazgatást is*. Napi.hu, Available: <https://www.napi.hu/prcikk/a-digitalizacio-gyokeresen-at-alakitja-az-allamigazgatast-is.631289.html> [21 Aug 2019]
- Jake Frankenfield (2019). *Open Banking*. investopedia.com, Available: <https://www.investopedia.com/terms/o/open-banking.asp> [20 Jul 2020]
- KPMG (2021): *Pulse of Fintech H2'20*. <https://assets.kpmg/content/dam/kpmg/xx/pdf/2021/02/pulse-of-fintech-h2-2020.pdf> [01 Mar 2021]
- Lakatos V., Balogh P., Czine P. (2022). *Examination of consumer preferences for innovative online banking services*. in Fenyves V. (szerk.) (2022) Magyar Nemzeti Bank – Debreceni Egyetem kutatási konferencia Fenntartható gazdaság Versenyképesség és digitalizáció pp 160. (ISBN: 978-963-490-401-4), pp 120-144
- Magyar Nemzeti Bank (2017). *Innováció és stabilitás: Fintech körkép Magyarországon*. Consultation document, Magyar Nemzeti Bank, Budapest. Available: <http://www.mnb.hu/letoltes/konzultacios-dokumentum.pdf> [10 Apr 2019]
- Magyar Nemzeti Bank (2018a). *Bankok a történelemben: innovációk és válságok*. Magyar Nemzeti Bank, Budapest. (ISSN: 2416-2841)
- Magyar Nemzeti Bank (2018b). *Fizetési rendszer – Jelentés 2018*. Magyar Nemzeti Bank, Budapest. (ISSN: 2064-9037).
- Müller J. – Kerényi Á. (2021). *Kiütkeresés a digitális pénzügyi innovációk labirintusában – A digitális pénzügyi rendszer szabályozási kihívásainak csapdája*. Hírelintézet Szemle, 20. évf. 1. szám, 2021. március, 103–126. o. DOI: <http://doi.org/10.25201/HSZ.20.1.103126>
- Németh M. (2019). *A fintech hatása a bankok üzleti modelljeire*. FINTECHZONE.hu, Available: <https://fintechzone.hu/a-fintech-hatasa-a-bankok-uzleti-modelljeire/> [20 Jul 2020]
- Pál Zs. (2018). *Pénzügyi kultúra az átalakuló bankszektorban* (FINTELLIGENCE Tudományos Pénzügyi Kultúra Körkép) A közgazdaságtani-módszertani képzés fejlesztéséért Alapítvány, Miskolc. (ISBN: 978-615-80543-7-9)
- Peters B. (2021): *Fintech Cybersecurity Trends in 2021*. *IT Security Expert Blog* https://blog.itsecurityexpert.co.uk/2021/02/fintech-cybersecurity-trends-in-2021.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+securityexpert+%28IT+Security+Expert%29 [18 Aug 2021]
- Póta Cs., P., Veres, M., Dávidházy G., Á., Becsky-Nagy P. (2021). *Kényszeradta lehetőség a pénzügyi digitalizációban*. Controller Info IX. Évf. 2021. különszám 2-7 DOI: 10.24387/CI.2021.különszám.1

- T-Systems Magyarország Zrt. (2016). *Üzleti intelligencia megoldások*. Available: https://www.t-systems.hu/static/sw/file/Uzleti_intelligencia.pdf [25 Aug 2019]
- Turzó Á. P. (2016). *Mindent átrendező technológiai forradalom söpör végig a bankokon*. Portfólió.hu, Available: <https://www.portfolio.hu/uzlet/20160418/mindent-atrendezo-technologiai-forradalom-sopor-vegig-a-bankokon-230011> [28 Aug 2019]