

FINTECH — IN THE — CEE REGION



CEE CAPITAL MARKET
LEADERS FORUM

PARTNERS OF THE REPORT



Lesław A. Paga
Foundation

VISEGRAD / INSIGHT

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FOREWORD



Tomasz Kasprowicz

Vice-president of Res Publica Foundation

Editor at Res Publica Nowa and Liberte!

Lecturer with experience on three
continents

Entrepreneur in the IT sector

The Visegrád Group represents an interesting mix of countries. Despite their common experiences from the near past and (mostly) common heritage, one could hardly find more diverse neighbourhood in Europe. These countries are divided by the interests and geopolitical orientation. V4 is mostly a geographical phenomenon used by the West to comprehend geography of this part of Europe slightly easier.

Still, the Visegrád concept is not useless, as despite so many differences, there are some common features visible. The V4 countries all entered the 90's with no financial infrastructure, which was damaging at the time. At the same time, this also meant no legacy technologies and bizarre consumer expectations. This in turn, lead to immediate adoption of the most advanced solutions. It stroked me when I moved to the U.S. in the early 2000s. I found the consumer financial tools to be primitive as compared to the used in Poland at the time.

Therefore, it is not surprising that Central Europe is a fertile ground for the next wave of innovation in financial services, known collectively as FinTech. High international mobility, often cause by migration, and relatively high Internet saturation also contributed to development of a modern financial market. Mobile payments are on the rise and contactless payments are considered a norm. The need for cheap currency transfers and translations is an easy foothold for FinTech companies and surely we observe high development in this area.

Nonetheless, the Visegrád countries are not mere receivers of technology. They offer their own ideas worldwide. This is mainly due to high level of innovation and availability of highly skilled IT professionals. Poland is particularly interesting case as it accounted for 71% of the FinTech market in V4 in 2016, grossing 856 million euros. Polish companies provide a wide array of solutions based on private blockchain solutions (Billon), AI in investing and fraud detection (Efix), digital wallets (uPaid) and many more. It seems that the next Silicon Valley could be somewhere in the Tatra Mountains.



Marek Dietl

President of the GPW Management Board

Blockchain, Artificial Intelligence and Big Data are the key technologies which will in part, determine our future. In fact, these technologies are already key drivers of economic growth in Central and Eastern Europe, as well as transforming the rapidly developing financial sector.

Technological progress has a particular place in GPW Group's strategy, #GPW2022. In June 2018, we presented 14 strategic initiatives, many of them utilising new technologies and providing opportunities for Polish technology firms.

In Poland, the number of innovation driven companies, as well as start-ups requiring capital to grow is increasing. However, due to the risk profile of many of these technologies, many companies lack the ability to finance their growth. Warsaw Stock Exchange aims to address these needs, by facilitating a structured route to access capital, supporting them to compete against international peers.

This report highlights Warsaw's prominent position in the European start-up landscape. Poland is the biggest FinTech market in CEE, and Warsaw is home to nearly 45% of Polish start-ups. We are proud to say that it is the major hub for financial technology in the CEE region, and the region is a hot-bed of technology talent across multiples segments.

There are good reasons to feel proud, but there are also challenges ahead. The stock exchange and Polish companies aim to be competitive globally, but this can only happen through a mix of new technology, robust and scalable business models and the hard work of entrepreneurs from Poland and the CEE region.

This report describes how the Visegrád countries are working together, and are pursuing joint initiatives to develop new technology. Regional and international co-operation will ensure the necessary scale of development and the appropriate level of adoption of new technologies.

But how do we find our bearings in an evolving economy among these new technologies? And how do we combine human work and machine work? These questions are fundamental for young people, whose “jobs of the future” are emerging today. This report focuses not only on technology, but also this social and economic transition.

Real learning and knowledge are more than the collection of facts. This report summarises the efforts of participants in the CEE Capital Market Leaders Forum 2018. I am impressed that students from CEE have established a platform which allows them to exchange knowledge and experiences as part of the project. They have met with experts and market leaders, worked on case studies, and engaged in debates. I am certain that this form of information exchange and experiential learning is effective and brings genuine value to all the participants. This is why GPW is supporting the project.

ACKNOWLEDGMENTS



Konrad Radzik

FinTech Expert

Alumn of the Lesław A. Paga Foundation

FinTech has become one of the crucial elements of the financial industry digital transformation around the world. Thanks to the common access to new technologies (e.g. AI, Blockchain, open APIs, Big Data), increasingly liberal legal regulations (e.g. PSD2) and ever-changing customer expectations more and more startups appear on the market to solve the challenges of traditional finances in a faster, cheaper and more efficient way. At the same time, banks, that learnt from the experiences of large corporations from other industries, try to actively respond to the changing environment. For this purpose, they undertake many initiatives promoting an innovative approach both internally (innovation centers, spin-offs) and externally (cooperation with start-ups and FinTechs).

The purpose of this report is to present the current economic situation of the Visegrád group countries in the context of the FinTech industry. Based on the available data and numerous case studies, authors try to show main challenges of the CEE region on its way to become a leader of broadly defined financial innovations. I wish to thank the Lesław A. Paga Foundation for being an inspiration to create this publication and supporting us throughout all its preparatory stages. Thanks to initiatives such as CEE Capital Market Leaders Forum, we can listen to the voice of young and ambitious future leaders. I would also like to extend my gratitude to all authors involved in this report. Your open-mindedness and engagement have really impressed me.

Kacper Szczurek

FinTech Expert

Alumn of the Lesław A. Paga Foundation



For the last 30 years, the V4 has followed its path to prosperity. The shift to the West and joining its alliances together with free trade and free market reforms have contributed to growing region's wealth and welfare. All the progress the V4 countries have made throughout recent decades, not only makes them capable of keeping up with activities taken by developed countries in the area of technology today, but also, as shown based on some particular examples, enables them to become pioneers and global leaders in specific technologies. This is visible especially in relation to IT technologies. Thanks to their excellent skills, Central European IT specialists are able to compete with their colleagues from around the world and take advantage of the available global best practices. In recent years, 3 technological topics have gained most significant attention from European perspective. These are: blockchain, due to impressive increase in cryptocurrencies popularity; API based Open Banking, due to EU regulation PSD2 coming into force; Artificial Intelligence, due to its broad spectrum of potential applications. The Visegrád Group takes an active part in development of all three of them through centrally managed projects and individual initiatives of enterprises and other organizations from the region.

In this report, you will find a summary of V4 efforts made in relation to Blockchain, Open Banking and AI. Information we gathered and provide should bring better knowledge and understanding of cutting-edge technologies progress and perspectives for Central Europe.



Kamil Kania

FinTech Expert

Alumn of the Lesław A. Paga Foundation

The Lesław A. Paga Foundation already has 15 years of experience in popularization of knowledge on capital markets among young and ambitious individuals. CEE Capital Market Leaders Forum is a part of this mission. It takes a unique perspective on innovation and technological trends. Main conclusions of the Forum were summarized and gathered in this report in order to present them to the wide audience.

This report highlights topics like Artificial Intelligence, Blockchain, Open Banking and API and analyses an impact of those on the future of financial sector. All these trends are in the centre of disruption, that currently changes a competitive landscape of the financial industry. Growing number of FinTech raises a pressure for traditional banks and requires them to revisit their strategies. Regional character of the Forum is reflected in this report, which focuses particularly on the Visegrád Group countries.

As shown in this publication, the V4 countries not only follow the global tendencies but also play an important role in shaping them.

ABOUT THE LESŁAW A. PAGA FOUNDATION

Since 2003, the Lesław A. Paga Foundation has enabled young leaders to excel their potential by actively contributing to the shape of both Polish and CEE region future.

The Foundation aims at creating a network of highly ambitious students and young professionals, who not only seek to advance in their professional lives, but also want to make an impact in their immediate environment and society. It is also our mission to promote the highest ethical standards and culture among entrepreneurs.

The community of our educational project alumni represents Foundation in top Polish and international companies. They are given a unique chance to learn from the best experts and gain practical experience in over 200 partner companies during a long-term internships. We have about 3,500 alumni, who support each other not only professionally, but also on the private ground.

The Foundation holds the following educational projects:

- CEE Capital Market Leaders Forum
- Capital Market Leaders Academy
- Young Innovators
- IT Academy
- Energy Academy
- Healthcare Leaders
- The Businesswomen Leaders Academy
- Index Start2Star Scholarship

Our vision of promoting the highest ethical standards is not limited to professionals and students. We give secondary school students the opportunity to participate in the Stock Market Game (SIGG). As a non-governmental organization we realize the idea of social responsibility through the obligatory volunteering activities for all our projects participants.

ABOUT THE CEE CAPITAL MARKET LEADERS FORUM

In 2014, the Lesław A. Paga Foundation alumni came up with an idea for the new capital market project. Together with the Foundation and our strategic partner, the Warsaw Stock Exchange, they have held the first edition of the CEE Capital Market Leaders Forum.

The objective of the event is to establish a communication platform for regional peers where they can get to know each other through experience sharing and take part in professional workshops that combine theoretical knowledge with a capital market practice. The Forum builds a framework for making lifelong contacts aimed at developing future international collaboration in the heart of Europe.

Every year over 40 young leaders from the CEE region have the possibility to become the part of Foundation community and start their career as CEE experts.

Execution of this project is possible thanks to the co-financing by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrád Grants from the International Visegrád Fund.

FINTECH — IN THE — CEE REGION

1. VISEGRÁD GROUP ECONOMIES UNVAILED

Authors: Dmytro Bulakh, Marcell Bozsik, Marcin Nadolny

1.1. Trends in the Visegrád group economy

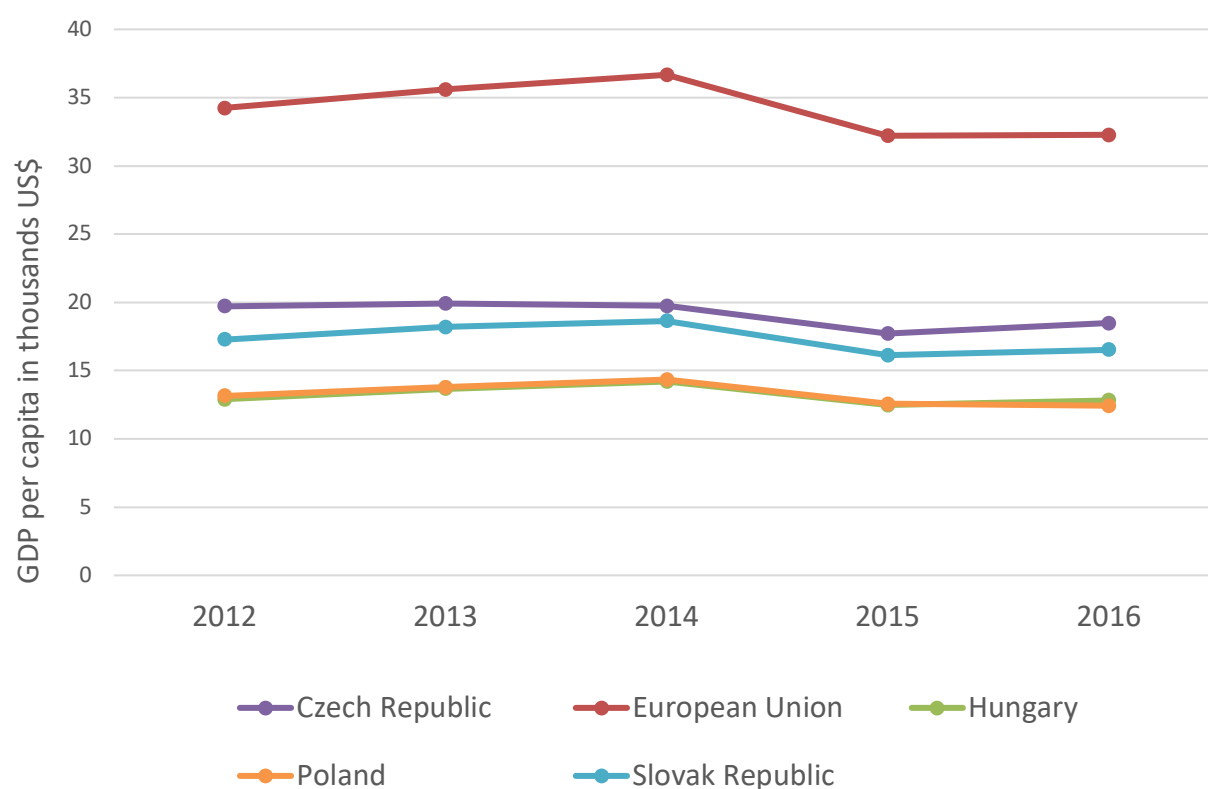
All four nations of the Visegrád Group are high-income countries with a very high Human Development Index. The V4 countries have enjoyed more or less steady economic growth for over a century. In 2009, Slovakia adopted the euro as its official currency and is still the only V4 member to do so. If counted as a single nation state, the Visegrád Group would be the fifth largest economy in Europe and the twelfth in the world.

Table 1: General statistics of the Visegrád Group and European Union

Index / Region	European Union	Czech Republic	Hungary	Poland	Slovak Republic
Population in 2016	510,278,700	10,548,058	9,821,318	38,593,160	5,429,418
Projected population in 2050	528,138,455	9,964,886	8,318,189	33,136,322	4,891,896
Surface area, m ²	4,422,773	78,870	93,030	312,679	49,035
Forecasted average GDP Growth rate 2019-2023	1.76%	2.60%	2.54%	2.98%	3.70%
Unemployment rate, 2016	8.53%	3.95%	5.11%	6.16%	9.67%
Life expectancy at birth, years, 2016	81	79.1	76.2	78	77.3
Health expenditure, % of GDP	-	7.15%	7.36%	6.52%	7.13%

Source: Eurostat and the World Bank Group

Figure 1: GDP per capita (constant prices)



Source: Eurostat

1.2. The Czech Republic

1.2.1. General overview

The Czech economy has rebounded since the 2012–2013 recession, and its GDP per capita increased by 4.3% in 2016. The general government gross debt decreased by 0.8% in 2016.

The unemployment rate is at a low level (4.0% as compared to the EU average of 8.5% in 2016¹). Due to favorable economic conditions, the employment rate, is constantly increasing. It showed a twice-as-large change as the European Union in 2012–2016. The gender gap in a percentage of employed population slowly decreases.

¹ According to Eurostat.

Table 2: Selected indicators representing the development of economic and social environment in the Czech Republic

Index/Year	2012	2013		2014		2015		2016		2012– 2016 change	EU 2012– 2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
GDP per capita (current US\$)	19,730	19,916	+0.9%	19,745	-0.9%	17,716	-10.3%	18,484	+4.3%	-6.3%	-5.8%
General government gross debt - % of GDP	52.2	54.7	+4.8%	53.5	-2.2%	52.2	-2.4%	51.8	-0.8%	-0.8%	-0.5%
CHE as % of GDP²	7.0	7.8	+11.1%	7.7	-2.0%	7.2	-5.4%	7.1	-1.3%	+1.7%	-
Employment rate by sex, % of population aged 20-64:											
Males	72	73	+1.0%	74	+1.0%	75	+1.3%	77	+1.9%	+5.2%	+2.7%
Females	80	81	+0.8%	82	+1.2%	83	+0.8%	85	+1.6%	+4.4%	+2.3%
Unemployment rate, %	63	64	+1.3%	65	+0.9%	66	+1.7%	69	+2.2%	+6.1%	+2.9%
Immigration	7.0	6.9	-0.0%	6.1	-0.8%	5.1	-1.1%	4.0	-1.1%	-3.0%	-1.9%
Emigration	34,337	30,124	-12.3%	29,897	-0.8%	29,602	-1.0%	64,083	+116.5%	+86.6%	-
People at risk of poverty or social exclusion, % of population	46,106	25,894	-43.8%	28,468	+9.9%	25,684	-9.8%	38,864	+51.3%	-15.7%	-
Gini coefficient of equivalized disposable income	15	15	-0.8%	15	+1.4%	14	-5.4%	13	-5.0%	-2.1%	-1.3%
	25	25	-0.3%	25	+0.5%	25	-0.1%	25	+0.1%	+0.2%	+0.3%

Source: Eurostat and the World Bank Group

The positive net migration rate, which drastically increased in 2016, is the reason of the country's population growth. The significant number of migrants come from Ukraine, Russia, Vietnam and Slovakia.

Percentage of population at risk of poverty decreases at a significantly faster pace than the EU average. The Gini coefficient of equivalized disposable income, 25, is lower than the EU average, which is 31.

² Current Health Expenditure (CHE) as % of Gross Domestic Product (GDP).

1.2.2. Entrepreneurial activity

The Czech Republic is competitive, as confirmed by its high 29 position in the Global Competitiveness Index³. According to the World Economic Forum, the most problematic factors for doing business remain the same year over year: with the tax regulations leading with the score of 17.6/20.0, followed by inefficient government bureaucracy (16.9), tax rates (10.9), policy instability (9.8) and corruption (9.6). Also, companies struggle with finding skilled employees: 3.3/7.0, Rank 125.

According to the Doing Business 2019 report⁴, ease of doing business in the Czech Republic is 76.10 (+0.05, Rank 35). Total number of procedures needed to establish the firm is 8.

Table 3: Number of enterprises by size (number of employees) in the Czech Republic

Index/Year	2012	2013	2014	2015	2016	Structure ⁵	2012– 2016 change	EU 2012 – 2016 change
Total	1,007,441	988,746	995,754	1,001,048	1,018,473	-	+1.1%	+9.3%
0÷9	967,067	949,260	956,420	961,287	978,289	96.0%	+1.2%	+11.0%
10÷19	19,752	19,232	19,209	19,211	19,414	2.0%	-1.7%	+6.9%
20÷49	12,517	12,242	12,112	12,363	12,435	1.2%	-0.7%	+7.4%
50÷249	6,683	6,565	6,550	6,629	6,758	0.7%	+1.1%	+2.9%
250+	1,422	1,447	1,463	1,558	1,577	0.1%	+10.9%	+6.6%

Source: Eurostat

Vast majority of enterprises, 96%, are small, counting 0-9 employees.

Number of enterprises increases steadily, mostly due to a significant reduction of time required to start a business and, also, of the cost required for the business start-up procedure.

³ The Global Competitiveness Report 2018: <http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/>

⁴ The Doing Business Report: http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf

⁵ Percentage of total.

Table 4: Selected indicators of entrepreneurial environment development in the Czech Republic

Index/Year	2012	2013		2014		2015		2016		2012-2016 change	EU 2012-2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
Enterprises birth	85,522	77,662	-	93,360	-	85,645	-	90,436	-	-	-
Birth rate	8.66	8.02	-7.4	9.13	+13.8	8.34	-8.7	8.71	+4.4	+0.6%	-
Enterprises death	95,852	80,391	-	80,791	-	90,057	-	89,794	-	-	-
Death rate	9.71	8.30	-14.5	7.90	-4.8	8.77	+11.0	8.65	-1.4	-10.9%	-
Enterprises newly born in t-2 having survived to t - number	75,180	67,340	-	55,793	-	52,747	-	65,667	-	-	-
Survival rate	67.80	64.45	-4.9	65.24	+1.2	67.92	+4.1	70.34	+3.6	+3.7%	-
Time required to start a business (days)	30.50	30.50		30.50		30.50		24.50	-19.7	-19.7%	-23.9%
Cost of business start-up procedures (% of GNI per capita)	5.11	4.84	-5.3	4.44	-8.4	4.10	-7.6	4.05	-1.1	-20.7%	-29.6%

Source: Eurostat and the World Bank Group

1.2.3. Innovation, financial sector and FinTech in the Czech Republic

The scope and structure of the financial sector in the Czech Republic offers significant potential for sector-wide growth and opens opportunities for FinTech companies.

The financial sector in the Czech Republic is gradually gaining momentum, but still has a relatively low share in the economy. In 2017, total assets of financial institutions amounted to 145% of GDP. In more developed countries, the size of the financial sector is usually higher. In 2017, the financial sector assets in the Eurozone reached 272% of GDP. So, the financial sector still has a significant room for further growth in the Czech Republic.

According to the European Banking Federation⁶, at the end of 2017, there were 46 licensed banks⁷ in the Czech Republic. Towards the end of 2017, the total value of the banking sector assets amounted to CZK 7,009.6 billion, which is a year-on-year increase of 17.6 %. Compared to the previous year, net profit for the year 2017 slightly increased to approximately CZK 75.9 billion. Return on equity reached 15.6% and return on assets amounted to 1.09%.

⁶ <https://www.ebf.eu/czech-republic/>

⁷ The structure of the banking sector consists of four large banks, five medium-sized banks, nine small banks, 23 branches of foreign banks and five building societies; 38 entities are under the control of foreign owners, including 14 banks and 23 branches. Domestic owners control nine banks, two of which are banks with state participation.

The healthy banking sector managed to boost economic growth through the supply of loans in 2017, under the tightening regulations and the increasing competition not only among banks, but also, to an increasing extent, of FinTech companies. The percentage of banked population in the country was 81% in 2017, while the EU average reached 92%⁸. Percentage of population who trust in banks was only 40%.

The insurance market offers even more room for growth. Annual insurance costs reached 3% of GDP in the Czech economy, while the average value in the Eurozone was almost 8% of GDP, even in OECD countries where it amounted to 9%. The main weakness of the Czech economy is its capital market.

In 2017, FinTech sector revenues in the Czech Republic were estimated at CZK 400–800 million. The value of returns is relatively low, but its pace is important, given the trend. This was more than 30% last year for the entire FinTech market; for end-customer services, yields even doubled. The problem is profitability and in order to achieve it, it will be crucial to get a sufficient client base. Due to the Internet importance for FinTech, Internet access is a key parameter. Although Internet access availability is slightly below the EU-28 average (82% vs. 85%), it is the best score within the V4.

FinTech Solutions are generally based on mobile phone applications, so the important factor is smartphone market penetration. This rate is 55% in the Czech Republic, while it is 63% on average in the EU. Nearly half of the population uses Internet for online banking and ordering goods or services. 36% of individuals use it for the purposes of cooperation with public authorities.

FinTech supports a significant expansion of contactless payment cards in the Czech Republic. According to the Bank Card Association (SDK), non-contact cards (NFC) participated in 83% of all card transactions in 2017, 69% in volume. Share of enterprises turnover on e-commerce is almost twice as large as the EU average: 31% compared to 16% in the EU. However, the number of enterprises using software solutions like CRM to analyse information about clients for marketing purposes slightly decreased and is still 5% lower than the EU average.

⁸ The World Savings and Retail Banking Institute: <https://www.wsbi-esbg.org/press/latest-news/Pages/Close-to-40-million-EU-citizens-outside-banking-mainstream.aspx>

Table 5: Selected indicators of innovation in the Czech Republic

Index/Year	2012	2013	2014	2015	2016	2012-2016 change	EU 2012-2016 change
Level of internet access, households, %	73	73	78	79	82	+9.0%	+9.0%
Internet use by individuals, %	74	74	80	81	82	+8.0%	+9.0%
Individuals using the internet for online banking, %	35	41	46	48	51	+16.0%	+9.0%
Individuals using the internet for ordering goods or services, %	33	36	43	45	47	+14.0%	+11.0%
Individuals using the internet for interaction with public authorities, %	31	29	37	32	36	+5.0%	+4.0%
Share of enterprises turnover on e-commerce - %	24	26	29	30	31	+7.0%	+1.0%
Enterprises whose business processes are automatically linked to those of their suppliers and/or customers, %	22	21	12	12	12	-10.0%	+1.0%
Enterprises using software solutions, like CRM to analyse information about clients for marketing purposes, %	17	17	16	17	16	-1.0%	+2.0%
Employed ICT specialists, % of total employed	3.5	3.7	3.4	3.7	3.5	0.0%	+0.5%
Research and development expenditure, % of GDP	1.8	1.9	2.0	1.9	1.7	-0.1%	+0.0%

Source: Eurostat

Total R&D intensity (research and development expenditure as a percentage of GDP) is forecast to reach 2.9% in 2020, only slightly below the EU target of 3.0%.

An important parameter for FinTech sector development is the availability of adequately qualified workforce. The share of ICT professionals in the population is 3.5%, which is less than the European average 4.5%. The local advantage is lower labor costs than in the Western European countries. In the ICT sector, the average wage was 19.8 EUR per hour in 2017, while the EU average was EUR 37.4 per hour⁹.

⁹ FinTech v ČR i ve světě, Report on FinTech by Deloitte, 2017: <https://www2.deloitte.com/cz/cs/pages/financial-services/articles/fintech-v-cr-i-ve-svete.html>

1.3. Hungary

1.3.1. General overview

The Hungarian economy from the downturn of the early 2010s Euro-crisis. In the focal period, the nominal GDP growth stayed between approximately 2–4%, while in the last years the country produced consistently 4% GDP growth¹⁰. In terms of the GDP per capita in US terms, it decreased slightly, mainly driven by the net population inflow.

Table 6: Selected indicators representing the development of the economic and social environment in Hungary

Index/Year	2012	2013		2014		2015		2016		2012–2016 change	EU 2012–2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
GDP per capita (current US\$)	12,888	13,668	+6.0%	14,201	+3.9%	12,484	-12.1%	12,820	+2.7%	-0.5%	-5.8%
General government gross debt - % of GDP	78	77	-1.7%	77	-0.6%	77	+0.0%	76	-0.9%	-3.2%	-0.5%
CHE as % of GDP	7.5	7.3	-2.8%	7.1	-2.3%	7.1	+0.4%	7.4	+3.4%	-1.4%	-
Employment rate by sex, % of population aged 20-64:	62	63	+1.4%	67	+3.7%	69	+2.2%	72	+2.6%	+9.9%	+2.7%
Males	67	69	+2.0%	74	+4.2%	76	+2.3%	79	+2.8%	+11.3%	+2.3%
Females	56	57	+0.7%	60	+3.3%	62	+1.9%	65	+2.5%	+8.4%	+2.9%
Unemployment rate, %	11.0	10.2	-0.8%	7.7	-2.5%	6.8	-0.9%	5.1	-1.7%	-5.9%	-1.9%
Immigration	33,702	38,968	+15.6%	54,581	+40.1%	58,344	+6.9%	53,618	-8.1%	+59.1%	-
Emigration	22,880	34,691	+51.6%	42,213	+21.7%	43,225	+2.4%	39,889	-7.7%	+74.3%	-
People at risk of poverty or social exclusion, % of population	34	35	+1.3%	32	-3.6%	28	-4.3%	26	-2.0%	-8.0%	-1.3%
Gini coefficient of equivalized disposable income	27	28	+1.1%	29	0.3%	28	-0.4%	28	+0.0%	+1.0%	+0.3%

Source: Eurostat and the World Bank Group

The relative gross governmental debt showed a declining trend in the given period, in addition to the lower financing costs, which created an advantage to the public finances in absolute terms as well. This phenomenon was driven by the positive outlook given by the main credit

¹⁰ Statista: <https://www.statista.com/statistics/339799/gross-domestic-product-gdp-growth-rate-in-hungary/>

rating agencies at the end of the respective period¹¹. On the other side, the health care spending remained relatively low, especially compared to other developed EU countries, which also partially associated to the “brain-loss” in the sector, creating quite pressing labour shortage in the healthcare system. By the end of the period, the government had not announced any major plans to change this trend, however, in that last 1–2 years, it showed more signs of willingness to improve the situation and contribute more funds to the sector, either public or private¹².

Promising developments in the employment and unemployment rate were seen during this period. While the labour market started to become overly heated by the end of the focal period, certain administrative measures also helped drive down the unemployment rate to unprecedented levels. The former progress started to spiral wages upwards. The latter phenomena resulted from the fact that many Hungarian citizens emigrated to other European countries, hence lowered population of unemployed job-seekers. Technically, this decreased the unemployment level, but it is hardly due to any well-thought-out economic policy. In terms of the immigration, the country also experienced a greater number of influxes. This is mainly driven by the eased, but broadly criticized, residency bond program initiated by the government in the focal time. The program was welcomed by Asian and Middle-East investors, mainly of the local higher-middle class¹³.

While the poverty rate decreased significantly, the Gini-coefficient increase by 1 point. This is associated with global trends, but on the other hand, the general taxation policy, implemented around the beginning of the period, helped strengthen this trend. In 2013, the government introduced a flat tax of 16% on all personal income which leads reductions of the tax burden on high incomes¹⁴.

¹¹ Country Economy’s Credit Rating compilation: <https://countryeconomy.com/ratings/hungary>

¹² Interview with the Human Resources Minister, who announced additional €2,2 bn investment in the hospital infrastructure: https://hvg.hu/itthon/20180719_Kasler_harom_szuperkorhazat_iger_Budapestre

¹³ Report on the Hungarian naturalization rate: <http://globalcit.eu/the-curious-case-of-hungary-why-the-naturalisation-rate-does-not-always-show-how-inclusive-a-country-is/>

¹⁴ Working paper from the Hungarian Central Bank on tax changes: <https://www.mnb.hu/letoltes/wp-2012-7-final.pdf>

1.3.2. Entrepreneurial activity

Hungary is the least competitive amongst the V4 countries. According to the Global Competitiveness Index¹⁵, it ranks only 48th.

As expressed by World Economic Forum, the most problematic factors for doing business remain getting electricity, paying taxes, dealing with construction permits, protecting minority investors, resolving insolvency and actually starting a business.

Table 7: Number of enterprises by size (number of employees) in Hungary

Index/Year	2012	2013	2014	2015	2016	Structure	2012– 2016 change	EU 2012– 2016 change
Total	528,519	499,842	514,537	536,610	551,173	-	+4.3%	+9.3%
0÷9	499,635	470,960	484,409	504,904	518,649	94.1%	+3.8%	+11.0%
10÷19	16,102	16,030	16,782	17,536	17,883	3.2%	+11.1%	+6.9%
20÷49	7,894	8,042	8,406	8,993	9,289	1.7%	+17.7%	+7.4%
50÷249	-	-	4,108	4,323	4,471	0.8%	+8.8%	+2.9%
250+	-	-	832	854	881	0.2%	+5.9%	+6.6%

Source: Eurostat

The number of enterprises remained relatively stable, with a small increase, however there are no major structural changes. Amongst the V4 countries, Hungary shows a similar ratio of enterprise number/capita to Poland and Slovakia, while a much smaller number compared to the Czech Republic.

Two major trends are outstanding from the above statistics. First, the survival rate of the enterprises increased by a relatively large margin. This can be associated with the externally favourable economic environment and overall good economic performance in the country.

However, more importantly, the cost of business start-up procedures decreased significantly, but still less compared to the overall EU-level changes. The positive changes are mainly due to the progressed implementation of Small Business for Europe (SBA) act in Hungary in the given period¹⁶.

¹⁵ The Global Competitiveness Report 2018: <http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/>

¹⁶ European Commission's report : <https://ec.europa.eu/docsroom/documents/32581/attachments/14/translations/en/renditions/native>

Table 8: Selected indicators of entrepreneurial environment development in Hungary

Index/Year	2012	2013		2014		2015		2016		2012– 2016 change	EU 2012– 2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
Enterprises birth	45,151	50,847	-	52,101	-	56,799	-	57,561	-	-	N/A
Birth rate	8.60	9.86	+14.7%	9.98	+1.2%	10.69	+7.1%	10.75	+0.6%	+25.0%	N/A
Enterprises deth	61,088	46,560	-	45,945	-	54,688	-	50,391	-	-	-0.1%
Death rate	11.64	9.02	-22.5%	8.80	-2.4%	10.30	+17.0%	9.41	-8.6%	-19.2%	N/A
Enterprises newly born in t-2 having survived to t - number	31,985	31,977	-	27,975	-	35,152	-	33,217	-	-	8.2%
Survival rate	56.74	57.43	+1.2%	61.96	+7.9%	69.13	+11.6%	63.76	-7.8%	+12.4%	N/A
Time required to start a business (days)	7.00	7.00	-	7.00	-	7.00	-	7.00	-	-	-23.9
Cost of business start-up procedures (% of GNI per capita)	8.90	8.80	-1.1%	8.50	-3.4%	7.50	-11.8%	7.10	-5.3%	-20.2%	-29.6

Source: Eurostat and the World Bank Group

1.3.3. Financial sector, innovation and FinTech

The overall statistics regarding the Hungarian population using the internet to get around and work on their everyday issues have shown a promising picture, however, there is still some headway for further improvement in the future. Internet access increased to a relatively high level, but almost 20% of the population is still does not have (one could say basic human) right to join the worldwide web. However, there are some promising signs that the government uses the EU funds wisely to develop the infrastructure to cover new areas.

On the other hand, the landscape for internet-based banking is quite gloomy. Only 1/3 of the population uses online banking systems, while the e-commerce penetration is more encouraging. In parallel, the business world is also reluctant to implement internet-based management tools on a grand scale.

As a matter of fact, one can see this shortfall as an opportunity. The market is not saturated with solutions, therefore new players could join the race to win over Hungarian online customers.

Table 9: Selected indicators regarding the potential innovation in the financial sector in Hungary

Index/Year	2012	2013	2014	2015	2016	2012 - 2016 2012–2016 change	EU 2012– 2016 Change
Level of internet access, – households	67	70	73	76	79	+12,0%	+9.0%
Internet use by individuals	70	72	76	73	79	+9,0%	+9.0%
Individuals using the internet for online banking	26	27	31	34	35	+9,0%	+9.0%
Individuals using the internet for ordering goods or services	25	29	33	36	39	+14,0%	+11.0%
Individuals using the internet for interaction with public authorities	42	37	49	42	48	+6,0%	+4.0%
Share of enterprises turnover on e-commerce, %	19	16	20	19	16	-3,0%	+1.0%
Enterprises whose business processes are automatically linked to those of their suppliers and/or customers	10	9	9	9	9	-1,0%	+1.0%
Enterprises using software solutions, like CRM to analyse information about clients for marketing purposes	7	8	9	9	9	+2,0%	+2.0%
Employed ICT specialists, % of total employed	3.2	3.5	3.5	3.6	3.6	+0.4%	+0.5%
Research and development expenditure, % of GDP	1.3	1.4	1.4	1.4	1.2	-0.1%	+0.0%

Source: Eurostat

1.4. Poland

1.4.1. General overview

With a population of about 38 million and GNI per capita of nearly US\$12,400 (2016), Poland has the largest economy in Central Europe. Since joining the EU in 2004, the country's ambitions have been marked by the desire to rapidly catch up with the core of the EU-players in terms of economic growth and living standards. Polish economy continues to perform strongly. Real GDP growth is expected to reach 4.7% in 2018, driven by domestic consumption and accelerating investments.

Table 10: Selected indicators representing the development of economic and social environment in Poland

Index/Year	2012	2013		2014		2015		2016		2012–2016 change	EU 2012–2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
GDP per capita (current US\$)	13,144	13,780	4.8%	14,345	4.1%	12,556	-12.5%	12,431	-1.0%	-5.4%	-5.8%
General government gross debt - % of GDP	53.7	55.7	3.7%	50.4	-9.5%	51.3	1.8%	54.2	5.7%	0.9%	-0.5%
CHE as % of GDP¹⁷	6.2	6.4	2.8%	6.2	-2.0%	6.3	1.5%	6.5	2.7%	5.1%	-
Employment rate by sex, % of population aged 20-64:											
Males	64.7	64.9	0.2%	66.5	1.6%	67.8	1.3%	69.3	1.5%	4.6%	2.7%
Females	72	72.1	0.1%	73.6	1.5%	74.7	1.1%	76.4	1.7%	4.4%	2.3%
Unemployment rate, %	57.5	57.6	0.1%	59.4	1.8%	60.9	1.5%	62.2	1.3%	4.7%	2.9%
Immigration	10.1	10.3	0.2%	9.0	-1.3%	7.5	-1.5%	6.2	-1.3%	-3.9%	-1.9%
Emigration	217,54	220,31	+1.3%	222,27	+0.9%	218,14	-1.9%	208,30	-4.5%	-4.2%	-
People at risk of poverty or social exclusion, % of population	275,60	276,44	+0.3%	268,29	-2.9%	258,83	-3.5%	236,44	-8.7%	-14.2%	-
Gini coefficient of equivalized disposable income	26.7	25.8	-0.9%	24.7	24.7%	23.4	23.2%	21.9	21.7%	-18.0%	-1.3%
	30.9	30.7	-0.2%	30.8	0.1%	30.6	-0.2%	29.8	-0.8%	-1.1%	0.3%

¹⁷ Current Health Expenditure (CHE) as % of Gross Domestic Product (GDP)

Unemployment at slightly above 6% is the second-lowest rate in the EU-28. Poverty and shared prosperity indicators continue to improve in light of surging private consumption that is supported by a tight labour market and government social programs.

The three main challenges for Poland are a labour shortage, structural weakening of public finances, and the upcoming political calendar. The labour shortage will eventually weigh heavily on GDP growth and be exacerbated by significant part of the workforce retiring. A scarcity of workers could negatively affect production capacities and investment, thus pressuring the government to encourage immigration, which would likely come primarily from Ukraine. The government spending plans, which include increases in social benefits and public investment as well as a reduction in the statutory retirement age, could erode the public finance structure¹⁸.

1.4.2. Entrepreneurial activity

Poland is ranked 37 in Global Competitiveness Index Rating¹⁹(second place in the V4 Group, after the Czech Republic), which proves that Polish economy is fairly competitive. Poland is also attractive for foreign investors (FDI net flow totalled 3.2% of GDP in 2014).

Table 11: Number of enterprises by size (number of employees) in Poland

Index/Year	2012	2013	2014	2015	2016	Structure	2012– 2016 change	EU 2012– 2016 change
Total	1,519,904	1,493,431	1,549,326	1,606,559	1,694,912	-	+11.5%	9.3%
0÷9	1,446,539	1,418,595	1,474,457	1,534,086	1,620,219	95.6%	+12.0%	11.0%
10÷19	31,907	34,158	34,050	31,310	32,228	1.9%	+1.0%	6.9%
20÷49	23,379	23,147	23,102	23,059	23,877	1.4%	+2.1%	7.4%
50÷249	15,061	14,550	14,620	14,913	15,273	0.9%	+1.4%	2.9%
250+	3,018	2,981	3,097	3,191	3,315	0.2%	+9.8%	6.6%

Poland also moved up in the Doing Business Ranking from 76 in 2009 to 25 in 2015. These goals could be achieved due to government policy of setting up 14 Special Economic Zones (locations dedicated to investors, where the business activity is supported with preferential conditions such as tax relief) and new, simpler business regulations²⁰.

¹⁸ <http://www.worldbank.org/en/country/poland>

¹⁹ *The Global Competitiveness Index 4.0 2018 Rankings*

²⁰ *Fintech in CEE Region*, Deloitte Report

Table 12: Selected indicators of entrepreneurial environment development in Poland

Index/Year	2012	2013		2014		2015		2016		2012–2016 change	EU 2012–2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
Enterprises birth	229,17	250,05	-	253,06	-	249,81	-	248, 38	-	-	-
Birth rate	11.52	12.41	+7.7%	12.5	+0,7%	12.13	-3.0%	12.32	+1.6%	+6.9%	0.0%
Enterprises death	222,87	233,23	+4.6%	215,06	-7,8%	213,61	-0.7%		-	-	-
Death rate	11.2	11.57	+3.3%	10.62	-8,2%	10.37	-2.4%	-			0.0%
Enterprises newly born in t-2 having survived to t - number	189,58	167,89	-11.4%	156,75	-6,6%	168,29	+7.4%	161, 77	-	-	-
Survival rate	70.15	67.93	-3.2%	68.4	+0,7%	67.3	-1.6%	63.93	-5.0%	-8.9%	0.0%
Time required to start a business (days)	39	37		37		37		37		-5.1%	-23.9%
Cost of business start-up procedures (% of GNI per capita)	13.2	13.1	-0.8%	12.9	-1,5%	12.2	-5.4%	12.1	-0.8%	-8.3%	-29.6%

1.4.3. Financial sector, innovation and FinTech

Poland is the biggest FinTech market in Central and Eastern Europe, with an estimated value of €856 million. Warsaw, home to nearly 45% of startups in the country, is also a financial technology hub in the region. The Global Financial Centres Index (GFCI) ranks capital of Poland as the 12 most competitive major Financial Centre in CEE, and 45 in the world²¹.

Just 5 years ago the term “FinTech” was not widely known in Poland. Apart from that, local financial institutions were one of the most innovative in Europe. The ‘Welcoming Innovation Revolution’ report by GE Global Innovation Barometer 2016 shows clearly that 83% of Polish companies were highly interested in new technologies. And 2018 edition of this same report proves that the innovations in Poland are driven mainly by SMEs²².

The Banks are good examples of ventures driving innovation and Polish FinTechs in general are cooperating rather than competing with them. The main reason is that both the Fintech and bank owners recognize the need for cooperation and mutual benefits resulting from it. Investments are made in many different areas, starting from modern sales channels (especially e-commerce), through remote client service technologies and digitalization of

²¹ *Fintech in Poland*, Flanders Investment & Trade Market Survey, 2018

²² *GE Global Innovation Barometer 2016*, <https://www.ge.com/reports/innovation-barometer-2016/>

traditional branches, ending with new payment methods. As a result, about 15.5 million Poles use banking services online at least once a month, according to the Polish Bank Association. That makes Polish banking sector even more innovative than in Western Europe²³.

Poland is nowadays one of the most attractive markets in terms of outsourcing. Currently, there are 524 foreign companies with Business Process Outsourcing (BPO), Shared Services Centres (SSC) and Research and Development hubs (R&D) employing over 244,000 people (according to ABSL). One of the crucial elements of the Polish BPO industry is outsourcing for global financial institutions. For this reason names like Credit Suisse, Citi and UBS have made Poland their home for all outsourcing and Customer Support. It is highly possible that Brexit will both increase the number of these 'back-offices' in Poland and the CEE region and accelerate the relocation of middle-office services. For example, one of the most prominent global banks, JP Morgan Chase, plans to run their operation and risk management processes in a newly extended centre which is to employ 5,000 professionals²⁴.

Table 13: Selected indicators regarding the potential innovation in the financial sector in Poland

Index/Year	2012	2013	2014	2015	2016	2012-2016 change	EU 2012-2016 change
Level of internet access households	70	72	75	76	80	+10,0%	+9,0%
Internet use by individuals	62	63	67	68	73	+11,0%	+9,0%
Individuals using the internet for online banking	32	32	33	31	39	+7,0%	+9,0%
Individuals using the internet for ordering goods and services	30	32	34	37	42	+12,0%	+11,0%
Individuals using the internet for interaction with public authorities	32	23	27	27	30	-2,0%	+4,0%
Share of enterprises turnover in e-commerce, %	10	11	12	13	14	+4,0%	+1,0%
Enterprises whose business processes are automatically linked to those of their suppliers and/or customers	19	17	21	21	21	+2,0%	+1,0%
Enterprises using software solutions, like CRM to analyse information about clients for marketing purposes	13	16	16	18	16	+3,0%	+2,0%
Employed ICT specialists, % of total employed	2,5	2,6	2,6	2,6	2,7	+0,2%	+0,5%
Research and development expenditure, % of GDP	0,88	0,87	0,94	1	0,96	+0,1%	+0,0%

²³ *Fintech in Poland: barriers and Opportunities*, Fintech Poland, 2016

²⁴ *Fintech in Poland*, Flanders Investment & Trade Market Survey, 2018

However, the Polish FinTech market also faces some difficulties. Poland has one of the lowest savings level in CEE (1.9% of gross disposable income). There is a relatively low number of cloud services users, both individuals and enterprises (second lowest in the EU). Use of online sales channels by SMEs is below average (EU: 14,5%, Poland: below 10%).

1.5. The Slovak Republic

1.5.1. General overview

In 2016, Slovakia recorded GDP per capita growth of 3.3%. This trends was expected to continue in 2017. The general government gross debt decreased by 0.8% in 2016.

Table 14: Selected indicators representing the development of economic and social environment in the Slovak Republic

Index/Year	2012	2013		2014		2015		2016		2012–2016 change	EU 2012–2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
GDP per capita (current US\$)	17,27	18,19	+5.3%	18,63	+2.4%	16,13	-13.4%	16,53	+2.5%	-4.3%	-5.8%
General government gross debt - % of GDP	52.2	54.7	+4.8%	53.5	-2.2%	52.2	-2.4%	51.8	-0.8%	-0.8%	-0.5%
CHE as % of GDP	7.6	7.5	-1.4%	6.9	-8.2%	6.9	-0.6%	7.1	+3.8%	-6.7%	-
Employment rate by sex, % of population aged 20-64:	65	65	-0.1%	66	+0.9%	68	+1.8%	70	+2.1%	+4.7%	+2.7%
Males	73	72	-0.6%	73	+1.0%	75	+1.8%	77	+1.9%	+4.1%	+2.3%
Females	57	58	+0.5%	59	+0.8%	60	+1.7%	63	+2.4%	+5.4%	+2.9%
Unemployment rate, %	14	14	0.3%	13	-1.0%	11	-1.7%	10	-1.8%	-4.3%	-1.9%
Immigration	5,419	5,149	-5.0%	5,357	+4.0%	6,997	+30.6%	7,686	+9.8%	+41.8%	-
Emigration	2,00	2,77	+38.3%	3,64	+31.6%	3,87	+6.2%	3,80	-1.8%	+89.8%	-
People at risk of poverty or social exclusion, % of population	21	20	-0.7%	18	-1.4%	18	0.0%	18	-0.3%	-2.4%	-1.3%
Gini coefficient of equivalized disposable income	25	24	-1.1%	26	+1.9%	24	-2.4%	24	+0.6%	-1.0%	+0.3%

Source: Eurostat and the World Bank Group

The unemployment rate is high (compared to the EU average of 8.5% in 2016²⁵) at 11.3% affecting young adults particularly severely (25%). Thanks to favourable economic conditions, the employment rate, constantly increases. It showed a twice-as-large change as the European Union's in 2012–2016. The gender gap in a percentage of employed population slowly decreases.

The positive net migration rate, which drastically increased in 2016, is the reason of the country's population growth. The significant number of migrants come from the Czech Republic, Hungary and Ukraine.

Percentage of population at risk of poverty decreases in a much higher pace than the EU average. The Gini coefficient of equivalized disposable income,²⁴ is much lower than the EU average: 31.

1.5.2. Entrepreneurial activity

The Slovak Republic is moderately competitive, as confirmed by its average 39 position in the Global Competitiveness Index²⁶. According to the World Economic Forum, the most problematic factors for doing business remain the same year over year. These are: corruption, leading with the score of 19.1/20.0, followed by inefficient government bureaucracy (15.7), tax rates (13.6), tax regulations (10.1) and restrictive labour regulations (8.6).

Slovakia moved up to 29 place in the "Doing Business Index" in 2016 from 37 position that it occupied only a year before. But in 2018, it dropped to the 45 place. Some crucial improvements occurred in 2015. Those included shortening of time required to register a company, elimination of the requirement for a notary to verify signatures, and reduction in corporate tax rates. Nonetheless, current corporate tax is still relatively high, at the level of 22%. Slovakia offers several incentives and investment support to companies operating in technological centers. Total number of procedures needed to establish a new firm is 5.

²⁵ According to Eurostat.

²⁶ The Global Competitiveness Report 2018: <http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/>

Table 15: Number of enterprises by size (number of employees) in the Slovak Republic

Index/Year	2012	2013	2014	2015	2016	Structure	2012 – 2016 change	EU 2012– 2016 change
Total	398,392	393,203	420,727	429,524	446,280	-	+12.0%	+9.3%
0÷9	384,271	379,820	406,771	414,630	432,900	97.0%	+12.7%	+11.0%
10÷19	7,638	7,009	7,829	8,564	6,241	1.4%	-18.3%	+6.9%
20÷49	3,806	3,666	3,404	3,480	4,130	0.9%	+8.5%	+7.4%
50÷249	2,162	2,200	2,199	2,319	2,454	0.5%	+13.5%	+2.9%
250+	515	508	524	531	555	0.1%	+7.8%	+6.6%

Source: Eurostat

Vast majority of enterprises, 97%, are small, counting 0-9 employees.

Table 16: Selected indicators of entrepreneurial environment development in the Slovak Republic

Index/Year	2012	2013		2014		2015		2016		2012– 2016 change	EU 2012– 2016 change
	Value	Value	YOY, %	Value	YOY, %	Value	YOY, %	Value	YOY, %		
Enterprises birth	42,79	39,67	-	86,67	-	53,89	-	49,77	-	-	-
Birth rate	10.58	9.95	-6.0	19.79	+98.9	12.07	-39.0	10.96	-9.2	+3.6%	-
Enterprises death	37,38	50,53	-	45,43	-	48,57	-	44,31	-	-	-
Death rate	9.25	12.67	+37.0	10.37	-18.2	10.88	+4.9	9.76	-10.3	+5.5%	-
Enterprises newly born in t-2 having survived to t - number	31,97	39,37	-	29,36	-	29,54	-	58,04	-	-	-
Survival rate	64.79	64.86	+0.1	68.62	+5.8	74.46	+8.5	66.97	-10.1	+3.4%	-
Time required to start a business (days)	28.50	33.50	+17.5	26.50	-20.9	26.50		26.50		-7.0%	-23.9%
Cost of business start-up procedures (% of GNI per capita)	1.80	1.50	-16.7	1.50	0.0	1.50	0.0	1.10	-26.7	-38.9%	-29.6%

Source: Eurostat and the World Bank Group

1.5.3. Innovation, financial sector and FinTech

The Slovak financial market is open to innovations and often serves as a testing ground for the deployment of new solutions developed for international banking and insurance groups or companies. The market size and attitude makes it very attractive to test innovations.

The Slovak banking sector was ranked the fourth most stable in Europe by Euromoney. It is still growing fast, with enough scope to catch up with the banking sectors of the most developed countries. On the other hand, the market size does not support a large number of

domestic FinTech companies. Those operating locally have trouble achieving critical mass to become profitable²⁷.

According to the European Banking Federation²⁸, by the end of 2017, there were 25 licensed banks in Slovakia. Total capital adequacy ratio increased to 18.81% on average, with the lowest individual level at 13.17%. Slovakia has some of the most stable and soundest banks in the EU.

Profitability and stability enable banks in Slovakia to focus on innovation. Slovak banks are among the leaders in the use of new technologies in day-to-day banking operations, e.g. contactless cards, contactless mobile payments and peer-to-peer payments. In 2017, banks, in cooperation with the Slovak banking association, developed a common API standard for communication between the banks and third-party providers based on PSD2 requirements²⁹.

Bank regulations (especially in terms of providing loans) is less restrictive than in other European markets. Slovakia is one of the few CEE countries that has joined the Eurozone and not suffered from the ramifications of FX loans.

For the year 2017, FinTech sector market size was estimated at EUR 73 m.

The percentage of banked population in the country was 84% in 2017 (+7% compared to 2016), while the EU average reached 92%³⁰. However, only 38% of population trusts in banks.

It also has one of the highest smartphone penetration indices, amounting at 65%,. Its level of internet access is high at 81%. Nearly half of the population use internet for online banking and ordering goods or services. 48% of individuals use internet for cooperation with public authorities.

The number of enterprises using software solutions like CRM to analyse information about clients for marketing purposes slightly decreased and is still 4% lower than the EU average.

²⁷ Fintech in CEE, Deloitte report on fintech: <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/central-europe/ce-fintech-in-cee-region-2016.pdf>

²⁸ <https://www.ebf.eu/slovakia/>

²⁹ Fintech in CEE – Deloitte report...

³⁰ The World Savings and Retail Banking Institute: <https://www.wsbi-esbg.org/press/latest-news/Pages/Close-to-40-million-EU-citizens-outside-banking-mainstream.aspx>

The share of ICT professionals in the population was 2.9% in 2016, which is less than the European 4.5% average.

Slovakia has one of the highest rates of cloud-computing adoption in Eastern Europe.

Table 17: *Selected indicators of innovativeness in the Slovak Republic*

Index/Year	2012	2013	2014	2015	2016	2012 –2016 change	EU 2012– 2016 change
Level of internet access, households, %	75	78	78	79	81	+6.0%	+9.0%
Internet use by individuals, %	77	78	80	78	80	+3.0%	+9.0%
Individuals using the internet for internet banking, %	40	39	41	37	45	+5.0%	+9.0%
Individuals using the internet for ordering goods or services, %	45	44	48	50	56	+11.0%	+11.0%
Individuals using the internet for interaction with public authorities, %	42	33	57	51	48	+6.0%	+4.0%
Share of enterprises' turnover on e-commerce, %	12	17	16	21	18	+6.0%	+1.0%
Enterprises whose business processes are automatically linked to those of their suppliers and/or customers, %	22	21	15	15	15	-7.0%	+1.0%
Enterprises using software solutions, like CRM to analyze information about clients for marketing purposes, %	20	19	16	17	17	-3.0%	+2.0%
Employed ICT specialists, % of total employed	2.5	2.6	2.8	2.8	2.9	+0.4%	+0.5%
Research and development expenditure, % of GDP	0.8	0.8	0.9	1.2	0.8	-0.0%	+0.0%

Source: Eurostat

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All the data as at 20.01.2019.

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2. KEY V4 CHALLENGES AND THE FUTURE OF THE ALLIANCE

Authors: Michał Dzierwa, Maciej Winiarski

2.1. Executive summary

In the era of increased global superpowers and impactful political turmoil, regional alliances are being put in the spotlight in order to secure local stability and prosperity, not only for their members but also in the region. Currently, in the face of Brexit, Europe witnesses rise of populist political options popularity and general economic slowdown. Therefore, it requires tight yet moderate actions from its leaders.

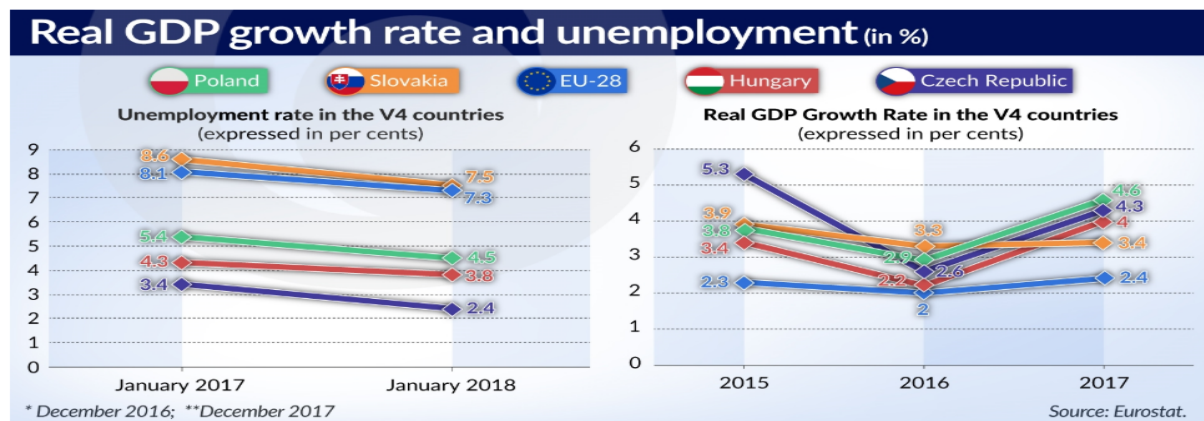
This chapter will focus on highlighting ongoing challenges ahead of the V4 alliance members from political, economic and technological point of view whilst providing outlook for the future of the group cooperation.

2.2. Economy

Despite being impacted by the global financial crisis of 2008, members of the Visegrád Group deal with relatively positive economic conditions in comparison to the region. As presented in Figure 2, unemployment rate is constantly decreasing with nominal value lower than the EU member states average (except for Slovakia).

At the same time, three year average Real GDP growth rate was higher in all alliance member states than in the EU-28 group with an almost double value for Poland (4.6% vs.2.4%).

Figure 2: Real GDP growth rate and unemployment



Source: The Central European Financial Observer

2.2.1. Global trade

As highlighted by the World Bank³¹, the Belt and Road Initiative, the program created to tighten trade relations with China, will be impacting approximately 1/3 of world trade and 60% of the world population. On the other hand, Honk-Kong Trade Development Council highlights³² the BRI opportunities in Central and Eastern Europe calling them a “16 +1” group. It is said that despite the trade imbalance, Chinese export was almost double the size of import from the countries in the region, the economic activity challenge is becoming an opportunity in the area of infrastructure investments related to transport, energy management and logistics. This report shows that compared to their peers, the V4 member states were key partners in trade transactions for both China and Hong-Kong in 2014 and 2015 with more than 70% of total export value.

2.2.2. Energy security

According to Amon³³, leadership of the V4 member states seems to be inseparably linked to the state-controlled decision making process regarding the future of their energy sector. They still rely on coal and nuclear energy sources and are rather skeptical about sustainable energy

³¹ Belt and Road Initiative <https://www.worldbank.org/en/topic/regional-integration/brief/belt-and-road-initiative>

³² Belt and Road Opportunities in Central and Eastern Europe <http://www.chinagoabroad.com/en/article/21526>

³³ Mega infrastructure projects win over clean energy in Visegrád Four <https://www.euractiv.com/section/electricity/opinion/mega-infrastructure-projects-win-over-clean-energy-in-visegrad-four/>

sources. Due to their long history of being state-owned entities, power companies are still being characterized with strong carbon footprint, often in contrary to the EU values and norms. Legislators are also considered to be unstable when it comes to renewable energy legal frameworks which discourages investors. At the same time, Western European systems seem more cooperative and open. The author mentions that Austria is able to obtain 3GW of wind energy already while, in contrary, Hungary installed stations with capacity of around 300MW with the license dated back to 2006 with no permits issued since that time. In the Czech Republic installed wind farms capacity also surpasses 300MW. Creating local energy production is considered to be a method to achieve at least partial energy independence. As opposed to that argument, Maros Sefcovic³⁴, Vice-president of the European Commission for Energy Union (2018) from Slovakia, says that the current legislation plan aims to obtain more than 70% of electricity from low carbon Renewable Energy Sources (RES) or nuclear power.

Statistics from 2016 show that the Eastern Europe economies still depend on conventional energy sources. In Poland, coal accounted for 49% of inland energy consumption, while 27% was accounted for oil, 15% for natural gas and only 9% for sustainable energy sources. In the Czech Republic: coal 40%, oil 19%, gas 17%. In comparison to Poland, the Czech Republic leverages nuclear energy at the level of 14% while maintaining 10% for renewable energy. Slovakia keeps the balance between natural gas and nuclear energy with 24% for each component. Additionally, 22% accounted for oil, 20% for coal and 10% for renewable energy. In Hungary, 33% energy came from gas, oil was responsible for 29%, nuclear sources for 17%, renewables for 12% and coal for 9% of total national production. With minor stakes represented by renewable energy sources, which are automatically associated with no foreign dependence and sustainability, the V4 members are gradually increasing their presence within national energy portfolio. With established targets for renewable energy sources, the Czech Republic and Hungary have already achieved their 2020 targets (Table 18).

³⁴ Sefcovic: Renewable energy to help electromobility <http://www.visegradgroup.eu/news/sefcovic-renewable>

Table 18: Renewable energy targets and past production in the Visegrád Group countries vs. the European Union

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2020 target
EU-28	11.10%	12.40%	12.90%	13.20%	14.40%	15.20%	16.10%	16.70%	17.00%	20.00%
Poland	7.70%	8.70%	9.30%	10.30%	10.90%	11.40%	11.50%	11.70%	11.30%	15.00%
Czech Republic	8.60%	9.90%	10.50%	10.90%	12.80%	13.80%	15.00%	15.00%	14.90%	13.00%
Slovakia	7.70%	9.40%	9.10%	10.30%	10.40%	10.10%	11.70%	12.90%	12.00%	14.00%
Hungary	8.60%	11.70%	12.70%	14.00%	15.50%	16.20%	14.60%	14.40%	14.20%	13.00%

Source: *Analysis of Energy Consumption of the Visegrád Countries*, Bozsik N. Magda R. *Visegrád Journal on Bioeconomy and Sustainable Development*

Despite current energy production in the power plants, the raw materials such as natural gas or coal originally came from the countries outside the Visegrád Group. Report published by NCSS³⁵ points that finding a direct access new source of gas would be a major change for the V4 Group members. Nowadays, the alliance members recognize different level of supply chain security with Poland and Czech Republic considered to have greater diversification than Slovakia and Hungary, whose natural gas supply strictly depends on Russian contracts. Group strategy towards energy security should be a key priority for the alliance, considering 2008–2009 gas disruption from Russia. Achieving higher level of energy independence is the crucial challenge for the region and should be overcome while leveraging the Group cooperation.

2.3. Sustainability & security

Due to the progressive digitization and dynamic development of new technologies, the global economy has become a dangerous place for entities that do not follow the latest trends in cyber security. At the same time, technology and globalization create numerous opportunities for cost synergies, rise of entrepreneurial spirit and access to capital and talent. This chapter will focus on challenges related to rise of new technology in business, knowledge based economy and its impact on the V4 countries, and current security and potential areas of challenges with the key question in mind: is the current development model sustainable?

2.3.1. Rise of technology in business

Over the last twenty-five years, Europe experienced rapid development, especially in the area of synergy between business and technology. The visible political change allowed creative and entrepreneurial spirit to be set free. An excellent example would be Hungarian Prezi with

³⁵ Energy security in V4 <http://www.visegradgroup.eu/energy-security-in-v4>

approximately 28 million users in 190 countries worldwide. It co-founder and CEO Peter Arvai anticipates that Hungary should and most likely will in the future gain recognition as a country full of talent and innovation. Another example coming from Poland is InPost who outsmarted country legislation by adding metal badges to the parcels, while all low weight post was required to be processed by national mail. Currently under EasyPack brand, the firm continues its international expansion by building the network and service which allows for sending parcels 24 hours a day on 4 continents with more than 10,000 access points by 2016.³⁶ Unfortunately, 2016 brought uncertainty within the group, and it also lost government contacts, This, in turn, led to rising debt level that caused investors skepticism. The company has taken private capital injection from one of the world's leading private equity funds—Advent International³⁷. The story can bring a lot of questions in regards to the entrepreneurial rapid development within the region and also a role of the outside capital within the process. Table 19 presents how the volume of private equity investments has changed over the 4-year period, while Figure 3 shows the 2016 division by the type of funding.

Table 19: *Volume of investments in thousands € considering the type of investment (2016)*

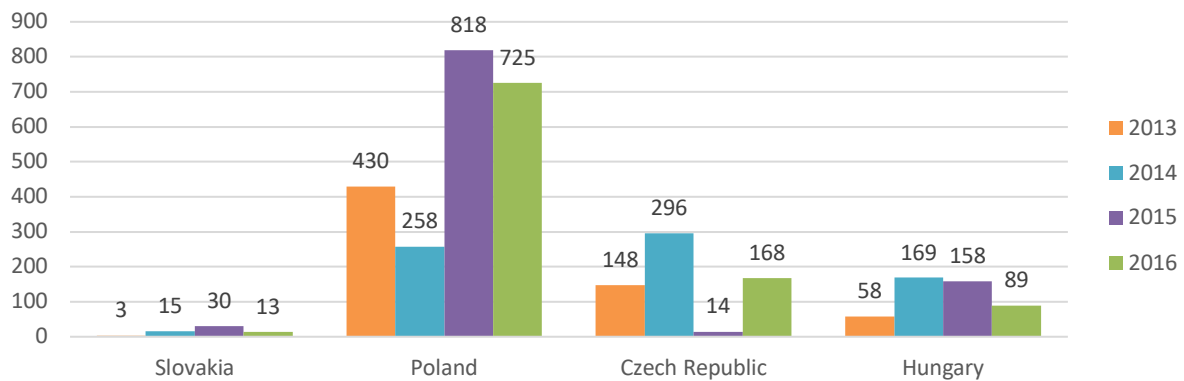
Type of investment capital	Slovakia	Poland	Czech Republic	Hungary
Seed financing	3,17	1,671	712	3,117
Start-up financing	6,801	15,067	3,488	26,025
First stage financing	0	4,696	0	2,109
Expansion financing	2,75	113,08	4,86	57,111
Rescue capital	0	0	0	0
Debt replacement capital	0	9,958	0	0
Managerial buy-outs	0	580,94	159,059	365
TOTAL	12,721	725,413	168,119	88,726

Source: Popp, J., Oláh, J., Machova, V., & Jachowicz, A. (2018). Private equity market of the Visegrád group. *Ekonomicko-manazerske Spektrum*, 12(1), 1-15. <https://doi.org/10.26552/ems.2018.1.1-15>

³⁶ Tech start-ups of New Europe <https://visegradinsight.eu/tech-startups-of-new-europe/>

³⁷ <https://businessinsider.com.pl/gielda/wiadomosci/inpost-i-integer-maja-nowego-wlasciciela-spolki-znikaja-z-gpw/66k4eqf>

Figure 3: PE investments in the V4 countries in € million



Source: Popp, J., Oláh, J., Machova, V., & Jachowicz, A. (2018). Private equity market of the Visegrád group. *Ekonomicko-manazerske Spektrum*, 12(1), 1-15. <https://doi.org/10.26552/ems.2018.1.1-15>

By reviewing the chart in Table 4 we can find that Poland outperformed the other V4 members while Slovakia is the country with lowest PE investments. On the contrary, Private Equity Investments in the Visegrád countries reached 60% of the total investments in Central and Eastern Europe. The authors point depth of capital markets, business culture and business opportunities as key factors limiting potential growth and capital activity in the region.

2.3.2. Sovereignty security in the digital era

Cybersecurity strategy is a basic approach adopted by a specific government towards security rules and cyberspace. With ongoing debate about cybersecurity independence and foreign intervention into different areas of public life from politics to economy, challenges for the region arise. After adoption of the new Visegrád declaration on 13th May 2004 in Kromeriz, the alliance put an emphasis on security of the politics-related issues, cross-border cooperation and fight against terrorism and organized crime. It seems that cybertechnology has the biggest impact on the region's modernization. The cornerstone of the cooperation are shared goals due to geographical proximity. This transforms challenge into opportunity in terms of seeking common security solutions with aspiring EU countries. Poland, Czech Republic, Hungary and Slovakia represent the actual geographical border of the European Union, hence the security priority is unquestionable. Historically, as the global digitization development started after 2000, the cyber intergradation for the V4 countries commenced at the same time as the general EU adaptation. While considering the cybersecurity, one has to always keep in mind the current integration with economic, political and geostrategic ambitions. In 2017, when Russia was accused of US presidential election tampering with

potential cyberattacks, the EU members became anxious with the upcoming elections in the region³⁸. Despite having well developed IT infrastructure nationally, the V4 countries are still being put at risk due to high number of users and global rise of cybercrimes. The example of Estonia, where countries state infrastructure was targeted by distributed denial of service (DDoS) attack in 2007, or the EU exposure during global “WannaCry” attack, which revealed major system weaknesses (including the V4 systems) shows how dangerous this environment can be. The current switch to digital economy brings back the old dependency threads as “In their strategies, the V4 states are unanimous about their plans to strive to increase national cyber-defense capabilities and expand the resources for counteracting cyber-attacks. Each of these countries also makes use of international cooperation to exchange cybersecurity intelligence and technical assistance. Membership of NATO since 1999 and the EU since 2004 has led to closer cooperation between the V4 countries and the most advanced economies in the world in the areas of policing and combating terrorism as well as military training.”³⁹

2.4. Politics

The Visegrád Group was the most active in the early period of its existence, i.e. at the beginning of the 1990s⁴⁰. This was due to the fact that after the fall of communism, Poland, Hungary and Czechoslovakia quite unexpectedly found themselves in a completely new situation. They had to take care of their political and economic situation on their own. In that case, both mutual economic cooperation and a wide area of foreign policy coordination seemed to be important assets. However, with the accession of these countries to organizations such as NATO or the European Union, the cooperation and integration of the Visegrád Group significantly slowed down. Differences in interests, different definitions of threats and different perspectives on their own role within the EU have taken up.

That is why today the Visegrád Group is quite divided internally in terms of politics. The V4 countries usually have different views on security issues and slightly different choice of foreign

³⁸ Yes, Russian Election Sabotage Helped Trump Win <https://www.bloomberg.com/opinion/articles/2018-07-24/russian-meddling-helped-trump-win-in-2016>

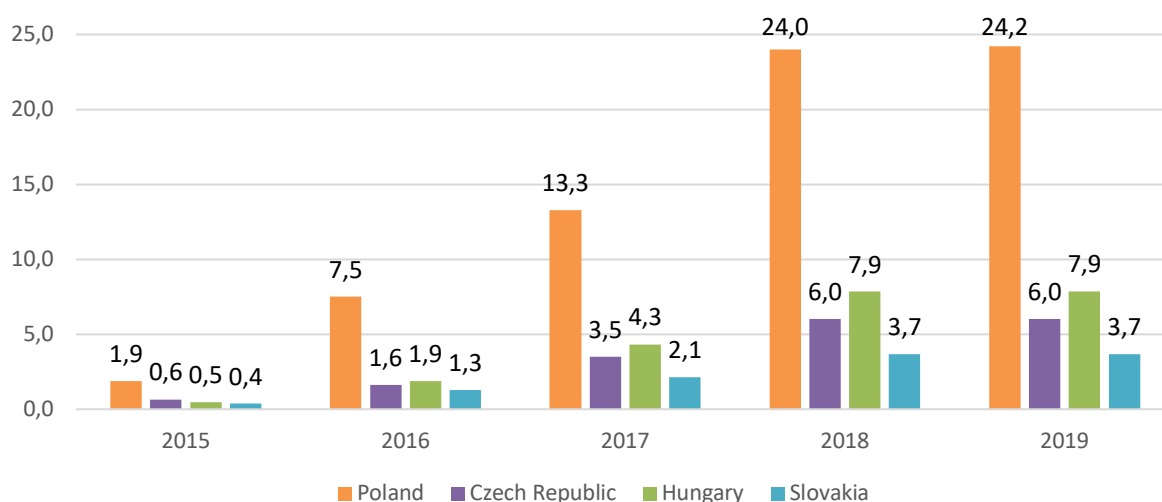
³⁹ The Cybersecurity Strategy of the Visegrád Group Countries Politics in Central Europe (ISSN: 1801-3422) Vol. 14, No. 2 DOI: 10.2478/pce-2018-0010

⁴⁰ Elżbieta Kuźelewska, Adam R. Bartnicki, *Grupa Wyszehradzka – nowe wyzwania bezpieczeństwa i perspektywy współpracy*, 10.05.2017, p. 104

policy priorities. Moreover, these states represent incomparable economic and political potential. Poland is by far the largest and the strongest in the Group. It is also a significant EU player and has ambitions for being an active decision maker regarding the development of the EU and NATO, unlike the other V4 countries. Poland held talks with key EU countries without any agreement with other V4 countries, which often contradicted their interests and consequently led to further divergences within the V4.

Nevertheless, in recent years we have seen several successes of cooperation within the Visegrád Group. One of them is the common position on the immigration crisis in 2015⁴¹. The V4 countries expressed their firm opposition to the numbers of refugees imposed by the European Commission on the EU Member States. In addition, the V4 countries consistently demanded the sealing of the EU external borders. The V4 position on the immigration crisis has led to a deterioration of relations with the EU and Germany.

Figure 4: Total EU payments all ESI Funds by countries in 2015-2019



Source: European Commission

Another important aspect that strongly affects the internal relations between the Visegrád Group countries and their relations with the EU are European funds. They were one of the main during the V4 summit in Bratislava in February 2019. German Chancellor Angela Merkel also participated in these talks. The V4 countries expressed their dissatisfaction with the EC project regarding the future EU budget. By far, the biggest beneficiary of the previous EU budget (both among the V4 countries and the entire EU) was Poland. In 2014–2020, EUR 104.9

⁴¹ The Economist, *Big Bad Visegrád*, Jan 28, 2016

billion was allocated to that country. In comparison, in the same period Hungary was granted EUR 29.6 billion, Slovakia EUR 19.5 billion and Czech Republic EUR 33.4 billion.

Other important issues raised at the V4 summit were Brexit, upcoming elections to the European Parliament and migration policy. The proof of a change in atmosphere between the V4 and Germany is a joint development project in Morocco⁴², aimed at combating the causes of migration from this country. It deserves special attention because, until now, the four states of the Group have been sharply criticizing Angela Merkel's migration policy and have equally rejected the EU system of refugees relocation. As presented in the table below, none of the V4 countries met the demands of the European Commission regarding the admission of refugees.

Table 20: *Number of immigrants taken in and asked to take in*

	Number of refugees EU asked country to take in	Number of refugees taken in ⁴³	% of requests fulfilled
Poland	6,182	0	0
Hungary	1,294	0	0
Czech Republic	2,691	12	0
Slovakia	902	16	2

Source: Euronews

During the summit, the role of economic cooperation between Germany and the Visegrád Group countries was emphasized. Currently, Germany's trade with the V4 countries is higher than with France, China or the United States (see Table 21). Angela Merkel stressed the willingness to extend economic and trade cooperation with the Visegrád Group countries, especially in the car industry. It would concern more eco-friendly drives and digitisation of the road traffic. According to the analysis of the consulting company EY, since 2010 German car manufacturers have invested EUR 9 billion in plants in Eastern Europe and created c.a. 14 thousand jobs there.

⁴² <https://www.euractiv.pl/section/grupa-wyszehradzka/news/szczyt-v4-w-bratyslawie-o-wspolpracy-brexicie-i-stosunkach-transatlantyckich/>

⁴³ As at September 1, 2017

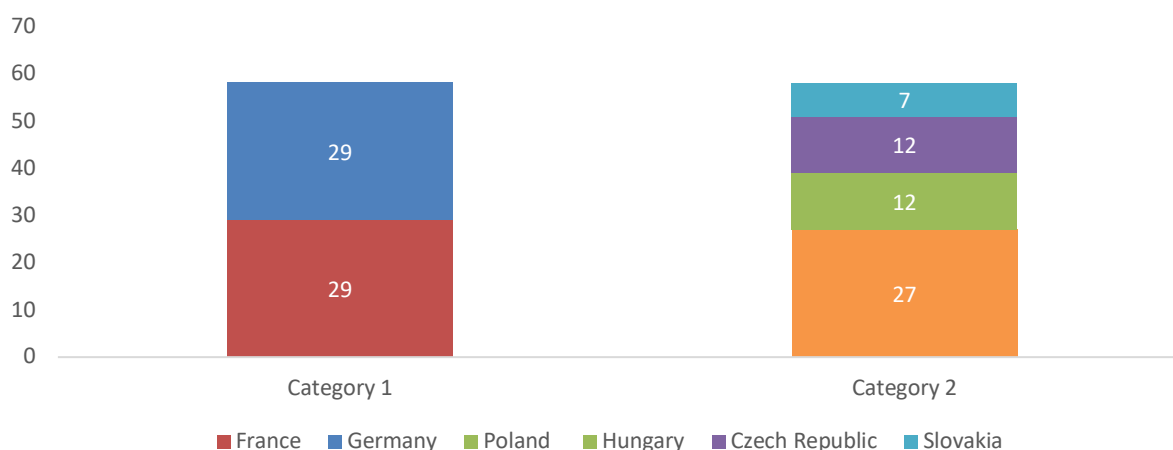
Table 21: Key German exports partners

Country	Nominal value	% of total exports
United States	USD 112 billion	8.4%
France	USD 104 billion	7.8%
China	USD 95 billion	7.1%
Poland	USD 55.2 billion	4.1%
Czech Republic	USD 42.2 billion	3.2%
Hungary	USD 26.1 billion	2.0%
Slovakia	USD 14.4 billion	1.1%

Source: Observatory of Economic Complexity

Another important political factor is Group strength in the decision-making structures of the European Union. The improvement of the relationship between the V4 and Germany is partly the result of the weakening political position of Europe's largest economy in the EU⁴⁴. Germany is looking for political partners at the European level and the V4 countries seem to be good candidates because of the number of votes in the European Parliament and the Council (see the Figure below).

Figure 5: Number of votes in the EU Council



Source: Information of the Minister of Foreign Affairs on the tasks of Polish foreign policy, Ministerstwo Spraw Zagranicznych RP, Warszawa, 2013, http://www.msz.gov.pl/pl/polityka_zagraniczna/priorytety_polityki_zagr_2012_2016/expose2/expose_2013/, 16.11.2014.

⁴⁴ The Economist, *Germany's troubled relations with the Visegrád states show the limits to its power*, June, 14 2018, Berlin

Each V4 country has one representative in the European Union Council and the European Commission. When voting by a qualified majority in the EU Council, the V4 countries have 58 weighted votes from 345 in total and a potential equal to about 64.1 million people among about 502.5 million EU citizens. Moreover, the V4 holds 108 out of 751 seats in the European Parliament,. Thanks to this, the countries of the Visegrád Group represent significant power in European political structures⁴⁵.

2.5. Future of the Visegrád Group

The future of the Visegrád Group will to a large extent be further determined by the geographic location of its member countries. In their policy, the V4 states have always had to skillfully navigate between Western Europe, the United States and the East. Currently, this maneuvering becomes even more difficult, with the appearance of another major player, China, on the European political arena. However, in the context of the Visegrád Group future, three possible scenarios can be identified, which differ in the degree of cooperation and integration of the V4 countries⁴⁶.

One of the options is that the V4 will become an organization exploiting the Benelux model, or even the so called Benelux of the East. If the Visegrád Group states decided to follow this path, one would expect a significant intensification of cooperation in the V4 framework. However, this would not preclude cooperation within other international organizations, such as NATO or the European Union. On the contrary, it is likely that for the EU this would mean additional legislative initiatives and far-reaching reforms aimed at deepening cooperation in the field of foreign and security policy. The EU transformation processes would be accelerated into an economy based on knowledge and innovation due to greater technological and research exchange. In addition, more emphasis would be put on energy security.

However, another possible scenario is development of the Visegrád Group into a well-integrated and cooperating group of states, which, however, does not take significant initiatives in the EU cooperation. It would be an alternative to integration within the EU. The

⁴⁵ Elżbieta Kuźelewska, Adam R. Bartnicki, *Grupa Wyszehradzka, nowe wyzwania bezpieczeństwa i perspektywy współpracy*, 10.05.2017, p. 107

⁴⁶ Matthias Hasler, Maria Skóra, *The Future of the Visegrád Group, Roundtable Report II: Possible Scenarios and Alliances*, October 24, 2017

main reasons for development of integration in this direction are the divergences in the political narrative and the vision of democracy between the countries of Western Europe and the V4. The V4 countries do not hide their different political views on migration, foreign, security or climate change policies. If the V4 develops in this direction, this could lead to the strengthening of the intergovernmental character as the dominant mode of governance in the European Union.

Finally, the third option may be disintegration. However, this should not be interpreted as a total disintegration of the regional alliance. This would rather be a significant limitation or temporary cessation of cooperation under the V4. In this scenario, the V4 member countries will focus their foreign policy on other countries, often neighbouring, with whom they are connected by strong economic and political ties. A good illustration of such a process would be the shift of political attention by the Czech Republic and Slovakia to Austria, in the context of the so-called 'Austerlitz-format' ('Slavkov triangle'). The activity of the Visegrád Group itself would be temporarily suspended and would not have a significant impact on the European Union politics. At the same time, it would be possible for the V4 countries to undertake spontaneous cooperation, should they have any common interests.

The Visegrád Group is currently heterogeneous in terms of the foreign policy pursued by the member states. It may seem that integration within the V4 is somewhere between a spontaneous pragmatism, as it was in the case of its single position on the migration policy, and an internal dispute (as evidenced by the election of Donald Tusk as the president of the European Council). If the above-mentioned tendency persisted, it is very likely that the V4 would move towards disintegration, only sporadically engaging in broader cooperation in matters of common interest. But, will it be so in reality?

3. FINTECH IN THE CEE REGION: ARTIFICIAL INTELLIGENCE

Authors: Agnieszka Machoń, Szymon Brodziak

Executive summary: Konrad Radzik

3.1. Executive summary

Artificial Intelligence is one of the most significant trends in recent times. This is mainly due to the very fast pace of technological development of our society. It is widely believed that AI will disrupt many industries such as healthcare, logistics, agriculture, power, entertainment and many, many others. But it is not only the future—we can already observe many existing solutions based on AI. One of the leading industries currently using AI solutions are the banking sector and FinTech companies.

The purpose of this chapter is to present how Artificial Intelligence affects FinTech industry in the Visegrád Group countries. It shows that there are many initiatives supporting development and use of AI in business. As a result, many ways of using AI in finance are already known on the CEE market, including such areas as:

- Payments and personal finance
- Capital markets and investments
- Cybersecurity
- Process optimisation

The future of AI is very difficult to predict but there are some trends one may notice. AI will certainly have a huge impact on the entire economy. For this reason, it is very important to follow changes resulting from the use of AI in order to prevent potential threats.

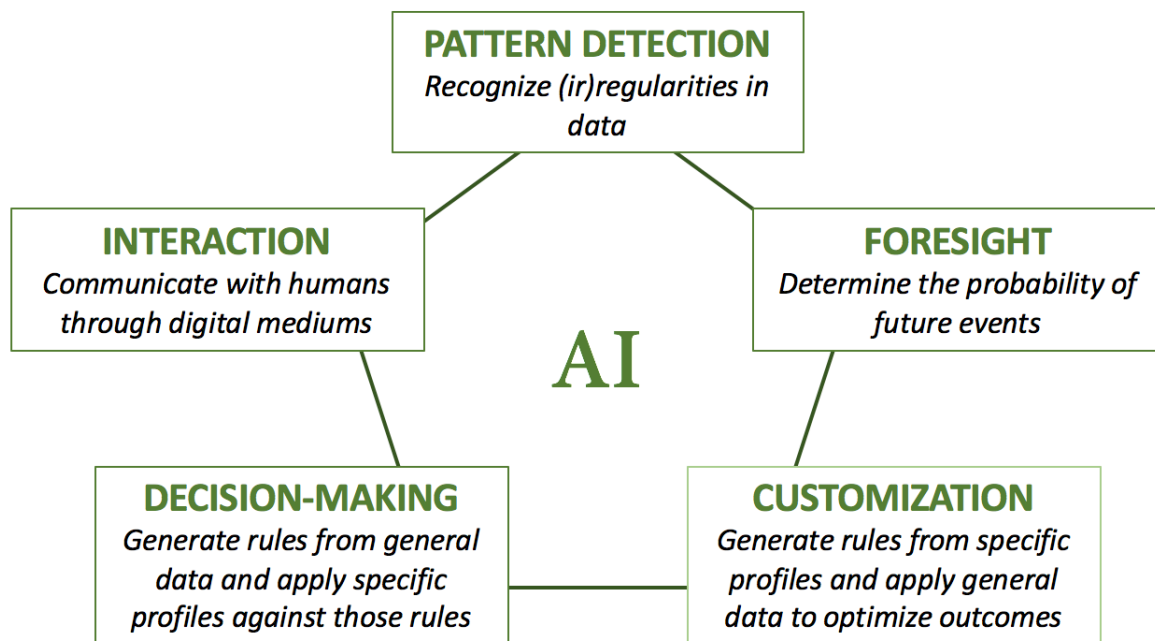
3.2. Definition of Artificial Intelligence

When discussing the problem of the sense of self in relation to the external world and its implications in the field of Artificial Intelligence, Douglas R. Hofstadter, a cognitive science professor at Indiana University and the Pulitzer Prize winner, – has quoted an adage known as the Tesler’s Theorem, commonly attributed to a computer scientist Larry Tesler: “Intelligence is whatever machines haven’t done yet”. This short paraphrase seems to perfectly embody the essence of a phenomenon called the *AI effect*, whereby as soon as AI pioneers achieve a milestone long thought to signify the achievement of *true* artificial intelligence — like 1997’s chess victory of IBM’s Deep Blue over Garry Kasparov — it instantly gets downgraded to actually not *true* at all, arguing that the said program is not real intelligence. Many people define humanity partly by our supposedly unique intellect, and whatever a machine — or an animal, for that matter — can do, must be something other than intelligence⁴⁷. The aforementioned effect is of the high importance to this report because it helps us to understand the complicated and somewhat antithetical way in which people tend to perceive AI and, especially, the paramount difficulty of all sciences concerned with defining it. It would probably be an impossible task, but if we are about to describe AI’s current, practical side and its significance for the business and FinTech world, we may as well try to answer the question of “What business people really think when they say AI?”.

As it turns out, albeit the problem of definition itself perseveres likewise in the domain of business, and while no business expert or global leader agree on what precisely AI is, they clearly do mean something when they use the term. This functional approach may help us understand this phenomenon as set of capabilities that allow leaders to run their business in an entirely new way. **At their core, they revolve around a suite of technologies (commonly associated with technical terms such as Machine Learning, Deep Learning, Big Data, etc.), enabled by adaptive and predictive power and exhibiting some degree of autonomous learning, that have made dramatic advances in our ability to use machines to automate and enhance:**

⁴⁷ Gödel, Escher, Bach: An Eternal Golden Braid. Douglas R. Hofstadter, Basic Books (1979)

Figure 6: 5 capabilities underlying the understanding of AI



Source: As grouped by the World Economic Forum's Working Group on Future of Financial Services (2018) http://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf (accessed: 05.02.2019)

What is even more important, those capabilities are not going to exist in a vacuum, as many other technological advancements are impacting the world around us right now i.a. blockchain, cloud or quantum computing. All these technologies will be influencing and mutually reinforcing each other, and so for instance, while quantum computing indeed holds the potential to break many of the encryption algorithms known today, it will also provide cutting-edge computing mechanisms and multiplied processing power that will foster the development of AI and enable it to tackle new problems that were once incalculable, such as increasingly complex and automated smart contracts that will be able to be executed, thus allowing more blockchain use-cases to enter the mainstream.

The FinTech industry will benefit from Artificial Intelligence FinTech, considering numerous possibilities of discovering new ways of operating and process automation it provides. It can also suggest some new features to products or services. It is worth mentioning that banking is a sector which is predicted to gain the most benefits from implementing AI-based solutions.

It is estimated that by the end of 2030 it will save this industry more than \$1 trillion⁴⁸. Further in this chapter, we will present how various enterprises use AI.

3.3. Current AI situation in the V4 countries

According to the research⁴⁹ of McKinsey Global Institute, Artificial Intelligence can influence global economic activity by increasing its value by \$13 trillion by 2030 (1.2% additional GDP growth per year). Therefore, in the second decade of the 21st century, global competition in this field became very intense. More and more countries were focused on developing new technologies (especially AI-based systems) to gain leading and important role in the international context.

The members of the Visegrád Group have also noticed the importance of AI. They are trying to play a significant role in digitalization in Europe. In 2018, many organizations were funded in order to support businesses in achieving this goal in CEE countries. For instance, in 2018 an Artificial Intelligence Platform was created by AmCham Slovakia (The American Chamber of Commerce) in Slovakia. Experts from this organisation have been closely cooperating with companies, universities and the government to build and reach a common vision in comprehensive AI Strategy for the future. Globally, the AI sector is highly supported by academic teams. It can be observed that this is also the case among the V4 countries. At the end of 2018, a Hungary's AI Coalition was established. Discussions between business, governmental organisations and educational institutions are expected to define directions for development of this technology. Moreover, the AI Coalition is going to study social and economic impact of AI on the society. Czech Republic has a similar approach to this topic. At the end of 2018, Office of the Government of the Czech Republic issued a report titled "Analysis of the Development Potential of Artificial Intelligence in the Czech Republic". It says that R&D expenses on AI in that country are very high and are expected to grow even more

⁴⁸ S. Maskey, *How Artificial Intelligence Is Helping Financial Institutions*, Forbes, <https://www.forbes.com/sites/forbestechcouncil/2018/12/05/how-artificial-intelligence-is-helping-financial-institutions/#5f7feb8e460a>, 2018, (accessed: 04.02.2019)

⁴⁹ McKinsey Global Institute, *Notes from the AI frontier: Modeling the impact of AI on the world economy*, <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy>, September 2018 (accessed: 04.02.2019)

(from CZK 260 million in 2017 to more than CZK 400 million in 2018)⁵⁰. Moreover, in Czech Republic there is a close cooperation between businesses and universities/research institutions. Unfortunately, there is one significant disadvantage, namely inability to retain domestic researchers. They prefer to move to private sectors. Additionally, most of the large companies that are focused on AI are under foreign control in Czech Republic. Since their parent companies are based abroad, all the results are sent to and used in other countries. The question is, whether AI-based companies reinvest their profits in Czech Republic or send money back to parent companies. The government is trying to keep as much profit as possible in the country and encourages companies with lower taxes. When it comes to start-ups, there are about 40 of them working in a field of AI.⁵¹ This is a high score for the eleventh⁵² country in Europe in terms of population. In comparison, in 2018 there were 109 start-ups⁵³ focused on this subject in France, 39 start-ups in Spain and 26 in the Netherlands.

The above arguments show that Czech Republic, Hungary and Slovakia are aware of the importance of developing AI, but what about Poland? In 2018, only 10%⁵⁴ of Polish enterprises used new technologies (excluding the financial sector). This result is unsatisfying as Poland has a great potential which is not utilised properly. It is worth mentioning, that Polish start-ups based on AI-solutions are looking for clients abroad, because the demand within country is highly limited (73% of businesses received revenue from foreign companies⁵⁵). Only 28% of businesses work in the financial industry. One of the mistakes that companies do in regards to creating scientific environment, is not supporting scientific community to grow teams within universities in Poland. They like to hire fresh graduates and experts, but long-term support would be highly appreciated. It may play a crucial role, because as it was mentioned

⁵⁰ Office of the Government of the Czech Republic, *Analysis of the Development Potential of Artificial Intelligence in the Czech Republic*, <https://www.vlada.cz/assets/evropske-zalezitosti/aktualne/AI-Summary-Report.pdf>, 20.12.2018 (accessed: 04.02.2019)

⁵¹ Ibidem

⁵² as for 2018

⁵³ <https://www.statista.com/statistics/942657/global-ai-start-ups-by-country/> (accessed: 04.02.2019)

⁵⁴ Polityka Insight, *Iloraz sztucznej inteligencji*, https://3er1viui9wo30pkxh1v2nh4w-wpengine.netdna-ssl.com/wp-content/uploads/prod/sites/58/2018/06/Iloraz_sztucznej_inteligencji.pdf, 2018, p.4 (accessed: 05.02.2019)

⁵⁵ Digital Poland, *Map of the polish AI*, <https://www.digitalpoland.org/assets/reports/map-of-the-polish-ai---2019-edition-i.pdf>, 2019 (accessed: 05.02.2019)

previously, a close cooperation between universities and companies is essential to develop AI technologies in a country.

One of the most essential topics related to Artificial Intelligence are regulations. In April 2018, members of the Visegrád Group announced their priorities regarding EU regulations on AI⁵⁶. The aim of this statement was to launch a debate involving the European Commission, businesses, public administration and citizens. The V4 covered such topics as ethical, industrial, legal and social implications of AI development. One of the issues discussed was collecting data and making it available through the creation of virtual data warehouses and data collection and management programmes for research in various fields (e.g. medicine and power). Moreover, the Visegrád countries also suggested to establish an European Artificial Intelligence Observatory, which would coordinate the cooperation of Member States in this area. They called on the European Commission to examine the impact of artificial intelligence solutions on employment in the EU Member States. In the same month, the European Commission launched the "Artificial Intelligence for Europe"⁵⁷ initiative. The aim was to have a clear vision of opportunities offered by AI, to reach an agreement on development of this technology in Europe and to prepare a society for socio-economic changes. By the end of 2020, the EU is going to spend at least €20 billion on R&D in AI.

3.4. Key drivers and challenges for the implementation of AI

As shown by the above arguments, Artificial Intelligence is going to play a significant role not only for individual companies, but also for entire economies. There are already many examples of using this technology, from voice-powered assistants like Siri or Alexa, to behavioural algorithms and autonomous vehicles. It would be interesting to consider what are the key drivers and challenges for the implementation of AI-based systems. On the one hand, AI can help to improve processes and time efficiency. On the other hand, it can be used e.g. to manipulate.

⁵⁶ Ministry of Digital Affairs, *Stanowisko Grupy Wyszehradzkiej dotyczące sztucznej inteligencji*, <https://www.gov.pl/web/cyfryzacja/stanowisko-grupy-wyszehradzkiej-dotyczace-sztucznej-inteligencji> (accessed: 06.02.2019)

⁵⁷ European Commission, *Communication Artificial Intelligence for Europe*, <https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe> (accessed: 06.02.2019)

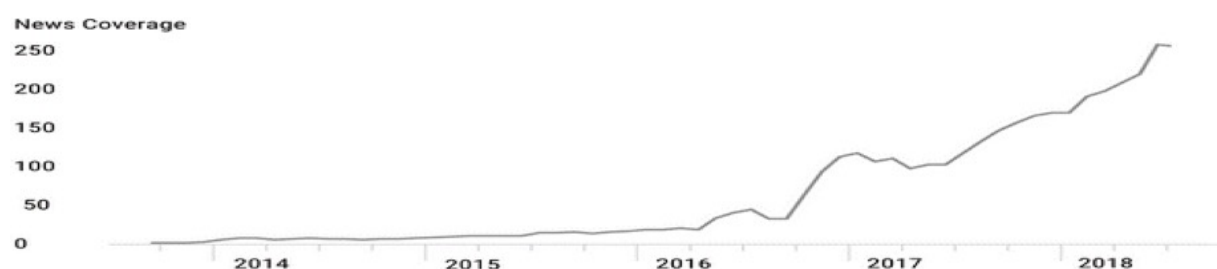
Key drivers:

- Reducing the strength of the bonds that have historically held together financial institutions and thus reshaping their traditional operating models: more specialised, leaner, relying on the competences of technology agents;
- Inversion of the competitive dynamics: agility and scale are becoming the key differentiators on the market at the expense of mid-scale and slowly adapting players. The competitive edge is given to the first-movers in the deployment of Artificial Intelligence technologies and agile innovators;
- Embodying the appropriate strategy of creating a workforce that views the implementation of AI as an advantage rather than a substitute for human talent is a crucial step for any institution planning to come out as a winner of the digital transformation;
- Elusive balance between competitive impulses and cooperative endeavors of incumbent banks and challenger FinTech institutions;
- Regulatory uncertainties influencing consumer interests and the financial system stability.

Challenges:

- No clear regulations on AI. It leads to ethical problems associated with privacy, control, etc. For instance, it is becoming difficult to differentiate whether the customer service is human or machine. The graph below presents a large increase in the number of issues mentioned in news/on the internet related to ethics and artificial intelligence. This topic is becoming more and more intriguing.

Figure 7: Quarterly news mentions of “AI/Artificial Intelligence” and “ethics” globally (2013–2018)



Source: CB Insights, Tech Cos Confront The Ethics Of AI, <https://www.cbinsights.com/research/artificial-intelligence-ethics/>, 10.2018 (accessed: 06.02.2019)

- Huge implementation costs for an organisation, mostly for small and medium enterprises;
- Data quality. System based on wrong data will be useless, because ineffective algorithms;
- Narrow perspective due to solving of particular problems. AI systems will not go beyond the scheme and will do only what they were trained for. One of the examples could be preventing frauds, while another suspicious action will take place and AI will not notice that;
- Machines are not given full responsibility, because it is hard to predict their behaviour. Nowadays, it requires a presence of a supervisor to control it and decide on critical aspects of particular operations.

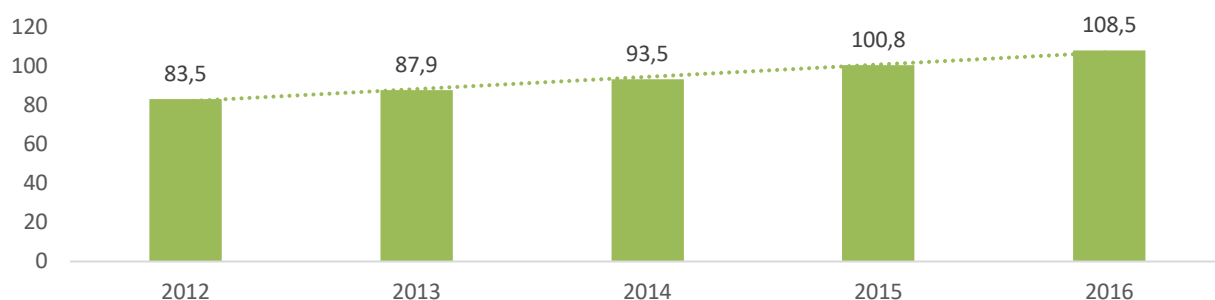
3.5. Use cases

Every year new ways of using Artificial Intelligence in order to scale a business or create a support tool to other companies are discovered. Moreover, this technology proves to be essential for FinTech due to a wide range of possibilities it gives. These include risk management, credit-scoring or financial predictions. In the Visegrád Group, it is possible to distinguish many different areas that use technology nowadays.

3.5.1. Payments and personal finance

Adoption of the liberalising second payments directive (PSD2) and the advent of open banking have obliged banks in Europe to allow regulated FinTech access to their online banking systems. Thanks to this change, the smaller FinTech companies may now develop innovative products and compete for traditional bank customers, while simultaneously being one of the causes for the rising volumes of electronic payments in the EU (Figure 8).

Figure 8: Number of non-cash transactions in the EU

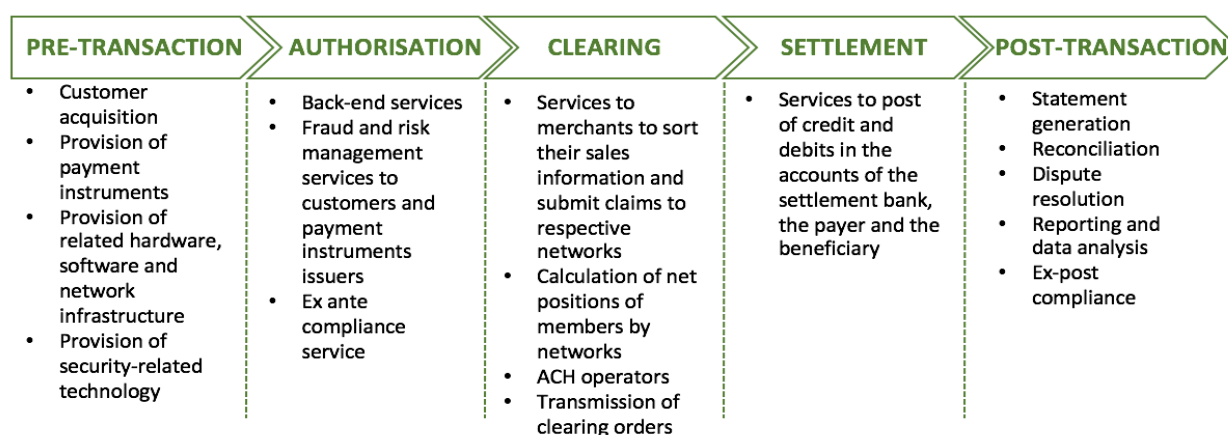


Source: Capgemini World Payments Report (2018) <https://worldpaymentsreport.com/wp-content/uploads/sites/5/2018/10/World-Payments-Report-2018.pdf> (accessed: 06.02.2019)

All incumbents have now embarked on digital transformation processes. Undertaking major strategic changes, many European incumbent banks are developing their own FinTech ecosystems, under the paradigm of “open innovation”, which usually encompasses a mix of technology, customers and regulatory compliance around innovation and business models. This paradigm involves a bank meeting with start-ups and learning from them about their technologies, business model, methodologies and cultures. This is being accomplished in a multitude of ways, usually involving research and meetings of bank representatives and start-ups to learn their methods, understand the technologies they use or getting a grasp of their business model and culture. Other incumbents have their own in-house venture capital instruments to invest in said start-ups.

The business models implemented within the payments landscape depend on the process stage (Figure 9) they are focused on, the type of customer they target at and the type of their cooperation with banks.

Figure 9: Payment chain stages



Source: Bank for International Settlements, <https://www.bis.org/cpmi/publ/d118.pdf> (accessed: 06.02.2019)

With the aforementioned increase in volume of non-cash payments, service providers depend less on manual processes and, in turn, every stage of the process from customer acquisition to ex-post compliance check is increasingly influenced by and dependent on artificial intelligence.

While AI, especially in the form of Machine Learning, is already a well-established performance-booster in credit cards (most notably in the fraud prevention procedures), there are numerous other elements of the payments value chain where a new value can be, or already is, added with its help:

In the area of **customer care and front-end services**, the AI-based revolution is already taking place, as the cognitive intelligence capabilities of machine learning are particularly well suited here. Introduction of the technologies powered by Artificial Intelligence impacts the servicing costs, making them lowest ever. Agent performance is boosted and the digital customer experience is improved as a result of reduced waiting time. A variety of relevant applications are immediately available, including virtual assistants that use natural language processing, deep insight tools and cognitive engines that can do things presently handled by humans. A convenient, frictionless checkout experience without sacrificing security is what a modern customer expects nowadays, and since the social networks have been surpassed by messaging apps (reference to: BI Intelligence “The Messaging Apps Report”, 2016), these channels became a critical target for smart retailers who now choose to enable their clients to perform payments without leaving the app. In the same manner, more and more banking organizations are leveraging AI capabilities to launch chatbot solutions, reducing costs and serving increasingly tech-savvy consumers.

CASE STUDY: Dronn Chatbot

Dronn is an intelligent virtual agent designed by Polish Alior Bank together with VoicePin to communicate with customers verbally and guide them through a custom-built conversation in a set of carefully selected use cases. Innovative user interface, powered by a suite of emerging technologies including Artificial Intelligence, natural language processing, automatic voice recognition, semantic analysis and speech synthesis (Text to Speech) is used as a new important channel of engaging with the customers in a natural-like manner. Customer service

provided by Dronn has enabled Alior Bank to reduce the cost of serving individual cases by 85% compared to contact centre agents campaigns. The amount collected during the campaigns has increased by 25%⁵⁸.

Nowadays, many people, especially the so-called ‘Millennials’, struggle to get a grip on their finances⁵⁹. Using AI in **personal finance management** to analyse spending habits and provide tailor-made advice can potentially transform lives and help place people on a solid financial base. This is especially important considering the level of savings in the V4 countries: while Czech and Hungarian household spending for the 2000–2016 period has been oscillating around the EU median, Polish and Slovakian values constantly maintain alarmingly low levels way below European average, periodically reaching values as low as 1.5%⁶⁰. Based on these trends, both major banks and FinTech start-ups are hoping to capitalize on the notion that automated financial apps powered by AI algorithms can become a way of resolving this issue by helping Millennials to manage their money easily and effectively.

CASE STUDY: Spendee

Spendee is an FinTech start-up based in Czech Republic with its main product being an AI-powered financial assistant platform that helps customers to manage their finances in an easy and convenient way. Users may connect their bank accounts, electronic wallets, crypto wallets or manually add their cash transactions, which are later synchronized and automatically categorized. Spendee tracks its user's financial behaviour and suggests them custom tailored budgets, saving and product tips and gives other useful recommendations. The app encapsulates the power of unique data analysis in an adaptable environment that automatically and thoroughly analyses customer's income and expenses, offering an intelligent advice on how to make the most of their money. Users can see their financial means analysed and expressed as informative and easy-to-read infographics. The solution is fully

⁵⁸ Data collected by Efma in the “Innovation of the Month: Dronn Agent from Alior Bank” (2016) <https://www.efma.com/article/detail/25689> (accessed: 06.02.2019)

⁵⁹ PwC „Millennials & Financial Literacy – the Struggle with Personal Finance” Report (2014) <https://www.pwc.com/us/en/about-us/corporate-responsibility/assets/pwc-millennials-and-financial-literacy.pdf> (accessed: 06.02.2019)

⁶⁰ Eurostat „EU household saving rate: trends between 2000 and 2016” <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/WDN-20180830-1> (accessed: 06.02.2019)

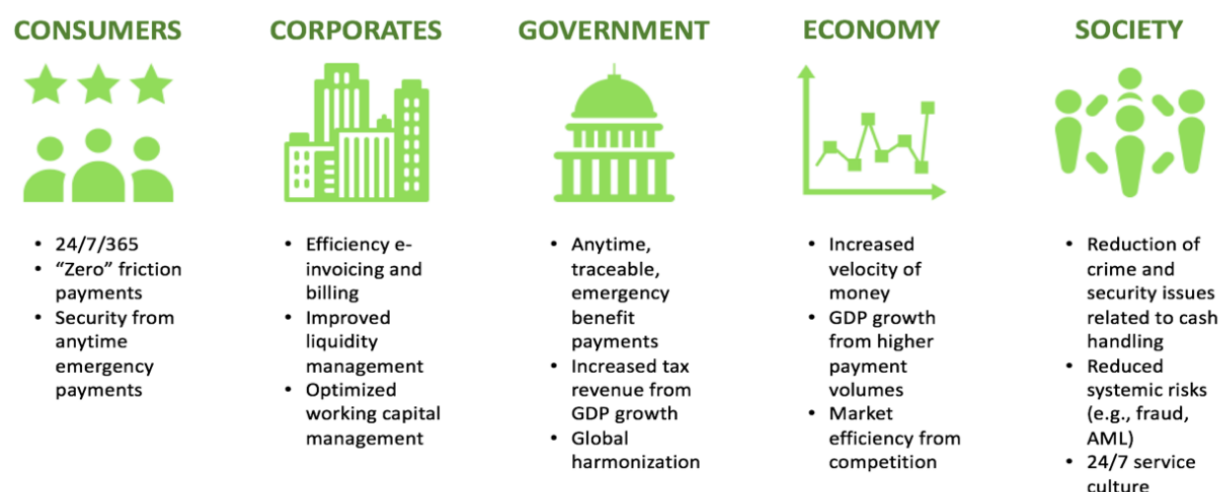
PSD2 complaint and was already downloaded over 2,500,000 times (April 2018) in 170 countries around the world.

Alumni of Google Launchpad Accelerator in San Francisco and WeXelerate program in Vienna and RBL_START in Warsaw. Winner of Deloitte Accelerator in Prague (CZ), Winner of Startup of the Year (CZ), Winner of Mobile UX Awards and many others. Regularly recommended and promoted by Apple and Google.

In **payment product sales**, Machine Learning may be used as an analytical tool to build a deeper and broader client profile and sales prospects. This is thanks to the possibility of aggregating large sets of internal and external data that is now available, but would not be attainable to process in a “traditional” way. Such an analytic system enables both banks and start-ups to cluster leads and already existing clients in more effective way, corresponding to their profiles and possible needs, which may in turn create new cross-selling possibilities.

Another consideration are the **real-time payments** (RTP). With the expansion of smartphones and e-commerce, the digitalization of the economy entails a general acceleration of payments. Online purchases are taking place everywhere and at any moment, including late night hours, holiday periods and the weekends, meaning periods when most of the conventional payment systems are not available. Thus, several European countries have already planned their own solutions to the challenge of rapid payment. Moreover, the introduction of RTPs may bring a lot more advantages to the different groups of beneficiaries (Figure 10). However, the supporting processes behind RTP need to be just as fast as the payments themselves. In this regard, AI can trim down the resources and costs banks currently sustain to facilitate operations. Automation through AI can, to a large extent, boost the efficiency and speed needed for agile instant payments.

Figure 10: Beneficiaries of the Real-time Payments introduction



Source: Mastercard “Real-time payments. Modernizing bank account-based payments” (2018) <https://www.mastercard.us/content/dam/mccom/en-us/business-payments/documents/real-time-payments-whitepaper-sept-2018.pdf> (accessed: 12.02.2019)

CASE STUDY: ACI UP Immediate Payments Solutions

In January 2019, it was announced⁶¹ that IT services company T-Systems and Takarékinfo, a Hungarian processor, will utilize ACI's UP Immediate Payments solution to enable 17 Hungarian banks to offer real-time payments as part of their digital transformation projects. Banks from this group are to connect to the country's domestic real-time payments scheme, set to launch in June 2019. UP Immediate Payments offers a complete range of capabilities—many of them centred around the use of AI technologies—for processing real-time payments, including origination, processing, clearing and settlement, fraud detection and connectivity, all on a single platform. By utilizing ACI's UP Immediate Payments solution all banks will be able to provide real-time balance data 24/7 to all customers across all banking channels. Universal Payments (UP) is at the core of ACI's strategy to provide the broadest, most integrated suite of electronic payments solutions in the market.

⁶¹ Reuters “Hungary's banks start testing instant-payments system” (2019) <https://www.reuters.com/article/hungary-banks-payment/hungarys-banks-start-testing-instant-payments-system-idUSL8N1Z316U> (accessed: 07.02.2019)

3.5.2. Capital markets and investment opportunities

It can be argued that capital markets has always been an industry interested in innovation, and the first harbingers of the changes that we observe today were visible decades before artificial intelligence became a buzzword appearing on the headlines of mainstream media. Capital markets firms, investment banks in particular, were testing the waters with precursor technologies, e.g. algorithmic trading, automation and financial data aggregators. However, until now, most firms have focused on using these technologies to cut costs, almost ignoring AI's potential to create value across the organisation in entirely new ways.

These possibilities arise according to the main trends that are now driving the industry. As both the consumers and institutions become more focused on fees, a turn from high-fee active to low-fee passive investments is visible. What is more, an overuse of traditional discretionary investment strategies is putting a constant pressure on profits as managers have to overcome such saturation by differentiating their strategies in increasingly sophisticated ways. New regulations, such as PSD2 and MiFID II (Markets in Financial Instruments Directive II), separate banking services and research fees while other parts of the industry, such as crypto-assets and ICOs remain highly unregulated, allowing non-traditional agents to freely introduce completely new ways of acquiring capital without bearing much of the usual costs. On top of it, trillions of euros are about to be passed down from Baby Boomers to Generation X to Millennials as a part of intergenerational wealth transfer⁶².

At the same time, capital markets are facing a multitude of challenges that value-seeking portfolio managers and investment bankers will have to overcome. Customer expectations concerning digitally provided services are changing, as almost a half of clients now hold that they speak to a person only when online services are not good enough⁶³. Advisory fees—and, in turn, revenues—are expected to compress by 8% in the next three years, with analysts

⁶² Investment News “The great wealth transfer is coming, putting advisers at risk” (2015) <https://www.investmentnews.com/article/20150713/FEATURE/150719999/the-great-wealth-transfer-is-coming-putting-advisers-at-risk> (accessed: 07.02.2019)

⁶³ EY “Customer Experience: Innovate Like a FinTech” (2016) [https://www.ey.com/Publication/vwLUAssets/ey-gcbs-customer-experience/\\$FILE/ey-gcbs-customer-experience.pdf](https://www.ey.com/Publication/vwLUAssets/ey-gcbs-customer-experience/$FILE/ey-gcbs-customer-experience.pdf) (accessed: 07.02.2019)

forecasting up to a 50% fall in fees⁶⁴, and this will only be reinforced by the effect of new players entering the battleground for customer experiences, as increasing number of Millennials is now open to experiment with financial services provided by non-financial brands that they know and trust, such as Google and Apple. Furthermore, revenues are also reported to be falling across capital markets' core services, as 26% decline in fixed-income trading profits was noted by the top 12 investment banks in the period between 2011 and 2016⁶⁵.

All of the above may be, to some extent, mitigated with the use of AI-powered technologies that will enable investment managers to adapt their business models by altering or replacing core differentiating capabilities:

Absorbing and aggregating new data sets about customers can make investments personalized to a greater extent, and bridging existing gaps with digital distribution is fostering the growth in **wealth management**. AI and automation solutions have the potential to decrease the cost of serving customers through reduced human capital costs and shorter service times. Enhanced advisory models can serve as a differentiator for mass-market customer segments that are traditionally under-served by advisers. State-of-the-art analytics dashboards supply the advisors with detailed insights about client needs and enable easy calculations to optimize products, services and advice. This can expand the branch adviser role by enabling less experienced or non-dedicated financial advisers to provide personal, and potentially niche, recommendations to clients.

CASE STUDY: WealthArc

WealthArc is a Polish cloud-based FinTech platform, leveraging latest technologies in big data and artificial intelligence, for private banks and investment advisors. WealthArc's value proposition lies in increasing operating efficiency, boosting revenue growth and growing client loyalty. It is achieved by a mix of technologies including advisory dashboard with a holistic view of a customer profile, consolidation across all asset classes, including non-financials held

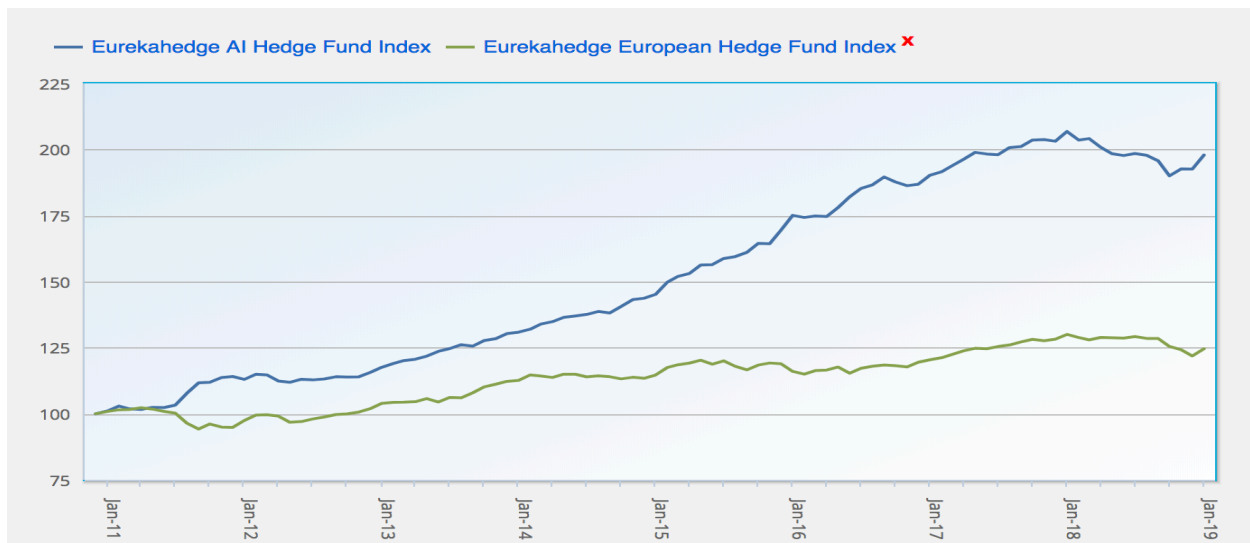
⁶⁴ Akamai "The Future of Customer Experience in Financial Services" (2017) <https://www.akamai.com/fr/fr/multimedia/documents/brochure/akamai-the-future-of-customer-experience-in-financial-services.pdf> (accessed: 07.02.2019)

⁶⁵ New York Times "What's \$27 Billion to Wall Street? An Alarming Drop in Revenue" (2018) <https://www.nytimes.com/2018/01/11/business/wall-street-goldman-sachs-fixed-income-bond-trading.html> (accessed: 07.02.2019)

at various custodians, advanced and accurate real-time analytics of financial data and extremely fast (<1s delay), real time portfolio management for a client. Recently, WealthArc has been selected for Top5 FinTech Solution in three categories by WealthBriefing European Awards 2017 (Innovative FinTech Solution, Best Client Communication, Innovative Client Solution) for its consolidation and digital interaction solutions for HNWI and their financial advisors.

Machine Learning can also empower **traders** and portfolio managers to make profit in a low-fee environment while becoming hyper-efficient, for instance by using ML algorithms to perform on the spot macroeconomic analysis for them or generate alpha and differentiate returns with the use of massive datasets analytics. Many market correlations are by nature non-linear or intricate, which makes them time-consuming, costly and hard to dissect and turn into useful conclusions by human beings. This is precisely where AI comes in handy, by automating the collection and structuring of data to support agile and effective trading decisions. One proof of this can be the following chart:

Figure 11: Comparison of AI-powered vs. traditional hedge fund's indices



Source: EurekaHedge.com (2019) <http://www.eurekaHedge.com/Indices> (accessed: 12.02.2019)

CASE STUDY: ING Katana

ING is harnessing the power of artificial intelligence to help bond traders make faster and sharper pricing decisions with a new tool called Katana, which uses predictive analytics to help traders decide what price to quote when buying and selling bonds for their clients, based on historic and real-time data. Katana learns from the history of hundreds of thousands of trades

and translates this into a prediction or suggested decision for the trader. By organising and displaying these predictions alongside relevant data in a way that can be intuitively absorbed by the trader, it is uniquely designed to complement the trader's own decision-making, not replace him. The first results of testing Katana with the emerging markets desk in London show faster pricing decisions for 90% of trades; reduction in trading cost by 25%; and traders are able to offer clients the best price four times more frequently⁶⁶.

Another area in which specialized digital tools based on artificial intelligence are getting a foothold is the deal-making value chain of the **investment banking services**, where they are shifting the workload of bankers both in the front and the back office. More and more automated investor matching processes are changing the historically dominant paradigm of the “best-connected” firms while demanding a constantly innovative approach to bank’s core competencies. There is a broad sphere of manual and low-value tasks, especially during the whole of pre-deal analysis, which are often completed by highly trained and costly investment professionals: due diligence, prospectus preparation, roadshows, pricing and other processes are labour-intensive and slow, yet they must be handled by highly skilled staff. All of these routine preparatory duties can be, to a high extent, automated with the help of innovative document-preparation tools, while the deal prospects and “partners most likely to invest” are already being synthesized using machine learning in the place of traditional, painstaking process, thus boosting sales efficiency.

CASE STUDY: JPMorgan Emerging Opportunities Engine

JPMorgan’s Emerging Opportunities Engine is bank’s new tool based on machine learning which drive predictive recommendations and lead generation for investment banking. It helps to identify clients best positioned for follow-on equity offerings through automated analysis of current financial positions, market conditions and historical data. Given the initial success of the Emerging Opportunities Engine in Equity Capital Markets, it was announced⁶⁷ that the bank is planning EOE’s expansion to other areas – like Debt Capital Markets – similarly basing

⁶⁶ ING Newsroom “Katana gives bond traders a cutting edge” (2017) <https://www.ing.com/Newsroom/All-news/Katana-gives-bond-traders-a-cutting-edge.htm> (accessed: 07.02.2019)

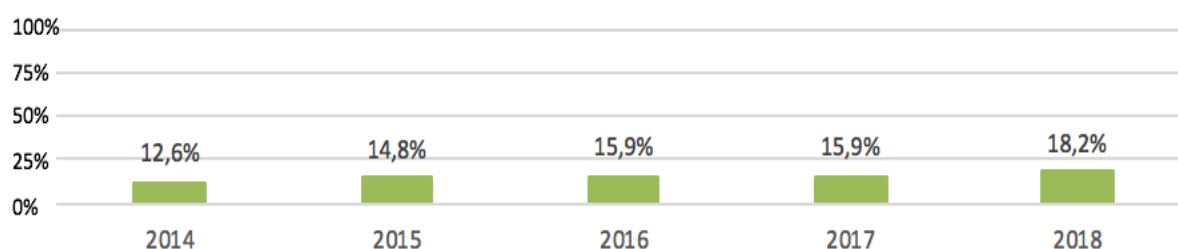
⁶⁷ JPMorgan Chase “2016 Annual Report” (2017) <https://www.jpmorganchase.com/corporate/investor-relations/document/2016-annualreport.pdf> (accessed: 07.02.2019)

predictions on clients' transaction history, market conditions and the way different industries have evolved to identify which clients are well positioned to raise debt.

3.5.3. Cybersecurity: preventing illegal actions

Artificial Intelligence is a technology that is going to be beneficial in terms of strengthening a company's cybersecurity. Automation of detecting cyber-attacks or immediate identification of frauds are main advantages of this technology. It is worth mentioning, that due to continuous acquisition of new knowledge, AI-based systems will be getting better and better in warning about suspicious patterns and actions. One of the cases, in which this skill is needed, is preventing frauds and money-laundering. By analysing historical transaction data and then signaling any irregularities or unusual behaviour on a daily basis, it would be possible to identify hackers faster. Moreover, using AI in cybersecurity will result in efficient response by IT staff after alerting them about any threat detected in real time.

Figure 12: Cybersecurity investments in Europe, 2014–2018 (as a % of a total number of deals)



Source: FinTech Global (2018)

The chart above shows that companies in Europe incurred increasing expenses related to cybersecurity in 2018. There are many areas that can be affected by AI, e.g. software, biometric authentication and password protection. Using this technology will improve a security by prioritizing traditional security issues. This topic is becoming an important issue for companies all over the world. This tendency was noticed by several start-ups from the Visegrád group that decided to counteract crimes on the Internet.

CASE STUDY: Nethone

In 2016, frauds involving cards issued in SEPA amounted to €1.8 billion⁶⁸. It implicates that payment frauds are one of the most serious threats of the 21st century. Therefore, it should not be surprising that more and more organisations are interested in effective preventive solutions. In order to reduce the aforementioned value, a Polish start-up Nethone found a solution based on AI. It can identify client's financial behaviour patterns by using rule-based machine learning methods to identify suspicious transactions. The objective is to support companies in making right and profitable decisions. The AI-based solution is already used in Europe, the United States and Latin America.

CASE STUDY: GreyCortex

Nowadays, identifying cyber-attacks is essential to businesses due to potential influence on their revenues and reputation. According to research⁶⁹ of Gartner, in 2019 global expenses on information security products will amount to \$124 billion. It indicates that the issue is serious.

GreyCortex is a Czech start-up specializing in network security and performance monitoring. Its main product is MENDEL—a tool which can detect threat, respond in a fast way to attacks and help in identifying potential risks. Target groups for this product are professionals, corporations and governments. MENDEL uses advanced machine learning to detect suspicious actions faster. A significant advantage of this tool is its ability to adapt to changing environments. Due to continuous learning, it can react faster and more accurately on anomalies and unknown behavioural detection. Malicious actions are recognised at the early stages. Using MENDEL improves overall organizational security.

3.5.4. Process optimisation

Rapid shifts in technology require ability to adapt to a new environment. Adjusting processes within organisations is a must nowadays. Optimisation aims at improving the efficiency of a business. One of the topics related to improving operation within organisations is RPA

⁶⁸ European Central Bank, *ECB publishes fifth report on card fraud*, https://www.ecb.europa.eu/paym/intro/mip-online/2018/html/1809_fifth_report_on_card_fraud.en.html, 09.2018 (accessed: 10.02.2019)

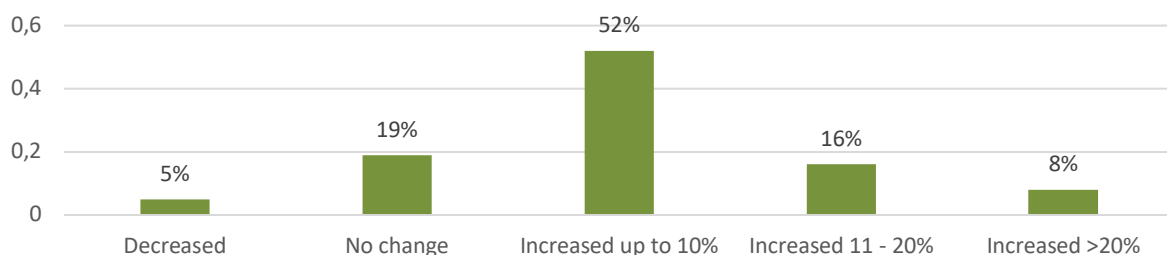
⁶⁹<https://www.gartner.com/en/newsroom/press-releases/2018-08-15-gartner-forecasts-worldwide-information-security-spending-to-exceed-124-billion-in-2019> (2018)

(Robotic Process Automation). Its main characteristic feature is a software which can be treated as a virtual assistant (robot). It is a technology that brings a lot of benefits to a business. In order to get the most value out of implementing this technology, it is important to note that companies should have data that is:

- Manual
- High-volume
- Repetitive
- Structured

Not only a possibility to automate highly repetitive tasks, but also a streamline of workflow are huge advantages of implementing RPA in the company. This technology is perceived as a fast way to reduce costs and improve tasks performed by humans. For that reason, human workers can focus on more complicated tasks. It is worth mentioning that finance sector is said to be one of the best sectors to implement RPA⁷⁰.

Figure 13: RPA Budget Change in EMEA Region in 2018



Source: ISG, *RPA in Europe*, <https://isg-one.com/docs/default-source/default-document-library/2018-q1-rpa-study-emea-aa.pdf>, 16.05.2018 (accessed: 11.02.2019)

A survey conducted by ISG shows the difference between RPA budgets in 2017 and 2018. It can be concluded that more than three fourths of companies in EMEA region have increased their expenses. They are treating this topic more and more seriously.

There are a few start-ups in the V4 group, that support companies in process optimization using AI-based solutions.

⁷⁰ Hamilton J., *The emergence of robotic process automation software*, <https://www.accenture.com/us-en/robotic-process-automation-software> (accessed: 11.02.2019)

CASE STUDY: Digital Teammates

Digital Teammates is a Polish supplier of RPA (Robotic Process Automation) in a unique Robot Rental model. They are able to estimate the robot potential, produce robots and run them at the customer's site within a few weeks. Digital Teammates' goal is to help businesses by reducing their costs and improving quality and efficiency of back-office operations.

CASE STUDY: Minit

A start-up Minit was set up in Slovakia and is a spin-off of an international IT company Gradient ECM. One of its tasks is to improve business performance and reduce risks related to operations by constant analysis of processes. Minit receives data from enterprise software applications (like CRM systems) which can be further used for robotic process automation. When it comes to finance, below actions can be performed by this software:

- Account closure and opening
- Account audit requests
- Foreign exchange payments
- Claims processing

The aim of this start-up is to provide a clear picture of how the company operates and to indicate areas for improvement. It is worth mentioning that Minit has found investors like Earlybird VC and OTB Ventures and has raised a funding round of €3.3 million.

3.6. Predicted future trends and recommendations

3.6.1. Competitive paradigm shift

Along with the AI-based transformation of the back office, competitive ground among the enterprises concerned with the financial sector will, almost exclusively, shift to the front office. As operational efficiency will be removed as a competitive differentiator, the opportunities will arise to escape an ongoing race in price competition by presenting completely new methods to distinguish oneself to customers. What is more, shared datasets will enable initiating collaborative solutions that are going to boost the accuracy and

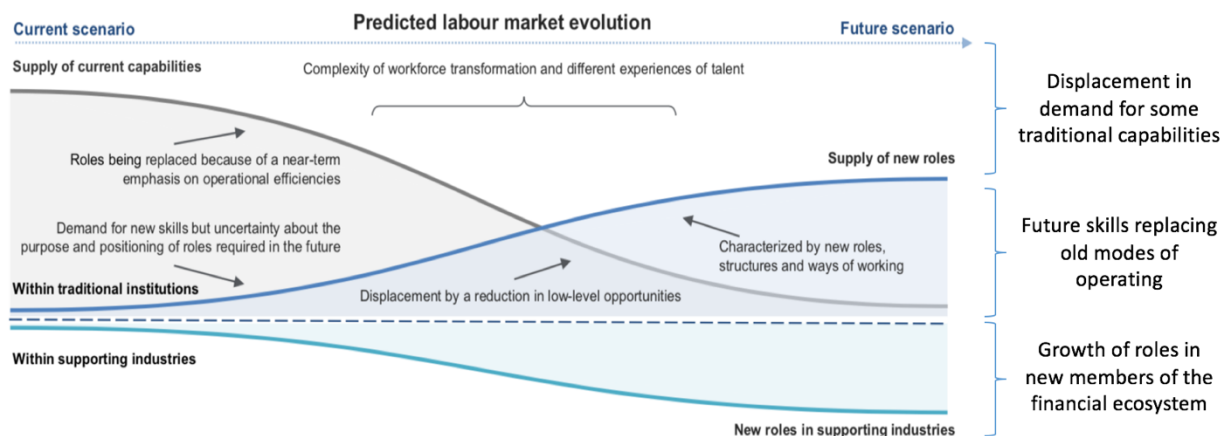
timeliness, thus creating mutual efficiencies in operations and improving the overall system safety.

Recommendation: Financial institutions need to force themselves to look for innovative areas of competitive differentiation. Alterations made in the talent distribution will also be crucial.

3.6.2. New risk factors

While AI indeed created completely new possibilities to combat problems through collective actions, it also opens up the whole industry to a new, broader risks of contagion as heightened interconnectivity between domestic and cross-border systems is required. What is more, AI-based technologies will progressively take a crucial role in the day-to-day operations of the whole industry, thus posing a new point of systemic risk with the potential to destabilize local and international economies. Ethical risks are also to be taken into consideration, as although providing new possibilities to boost performance by improving productivity and redesign staff roles, AI will also significantly decrease the need for labour across more routine functions, leaving some workers “lost” without the necessary skillset for newly created roles (Figure 14).

Figure 14: Workforce shift as an effect of more widespread AI introduction



Source: As predicted by the World Economic Forum’s Working Group on Future of Financial Services (2018) http://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf (accessed: 12.02.2019)

Recommendation: New frameworks must emerge to enable shared accountability if collective solutions are to succeed. Effective strategies must also be developed to manage the forthcoming talent shift and transition of large portions of the workforce through the Fourth

Industrial Revolution. As AI creates new types of risk in financial system, new risk mitigation strategies will be required.

3.6.3. Market structure changes

The economics of AI will push market structures to extremes, favouring scale players and agile innovators at the expense of mid-sized firms. While incumbent firms increasingly become AI service providers, firms that do not have the capacity to build similar offerings will struggle and become potential acquisition targets for scale players. AI accelerates this phenomenon by magnifying the impact of several key drivers⁷¹. Large tech companies will gain more and more distinctive advantages in attracting new customers, and the owners of customer experiences will be the ones acquiring the highest margins. As core strategies of big tech have, for years, been aimed at capturing user attention and capitalizing on accrued data by offering free to pay products, services offered by them will benefit from the existing service shelf.

Recommendation: To succeed, institutions will need to get detailed analysis of customer behaviour both in and out financial services. They will need to harvest new resources and ways of working, including technical AI skills, product development capabilities, new datasets and cultures of innovation and experimentation, while remaining highly focused on delivering what customers actually want. As for the regulators, they will have to react properly to the increased consolidation and the risk of creating new “too big to fail” entities.

3.6.4. Capital markets implications

Wealth advisory will increasingly become the centre of customers’ financial lives as it gains access to increasing volumes of data, allowing it to expand reach and take control of financial products, with portfolio management becoming digitalized and customized to the individual needs. While increased efficiency in deal-making may have clear benefits for the global economy, supervisory bodies will struggle to keep pace with innovation, creating potential

⁷¹ Economists have documented the power of information technology to drive firm structures to market extremes. Erik Brynjolfsson defined this phenomenon as being the result of the simultaneous creation of long tails in product availability, combined with a winner-takes-all superstar structure. See more at: E. Brynjolfsson, Y. Hu, M. Smith “Long Tails Versus Superstars: The Effect of IT on Product Variety and Sales Concentration Patterns”. MIT Initiative on Digital Economy (2010)

gaps in macro-prudential oversight. AI will be core to the matching of buyers and sellers, in both listed exchanges and over-the-counter markets. Increasing the speed of transactions and the velocity of money will challenge institutions and regulators to address the increased risk of financial contagion during market turbulence.

Recommendation: As data service providers become critical to the functioning of the financial markets, new standards may be necessary to ensure the quality, accuracy and availability of data. Participants must consider the risks associated with poor algorithmic decisions and the potential exposure that comes from an increasingly centralized infrastructure for investment management (e.g. shared algorithms).

4. FINTECH IN THE CEE REGION: BLOCKCHAIN

Authors: Daria Turovtseva, Gabriel Dymowski

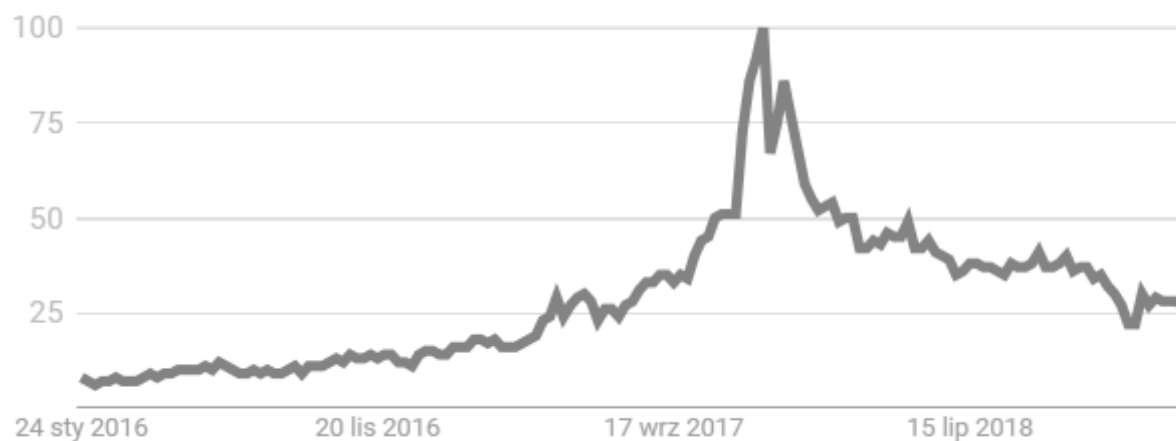
Executive summary: Kacper Szczurek

4.1. Executive summary

Blockchain has undoubtedly been one of the most significant technological buzz words in the recent years. And although hardly anyone actually understands how blockchain works, everybody who is at least a little bit interested in the world of technology or finance has heard of it.

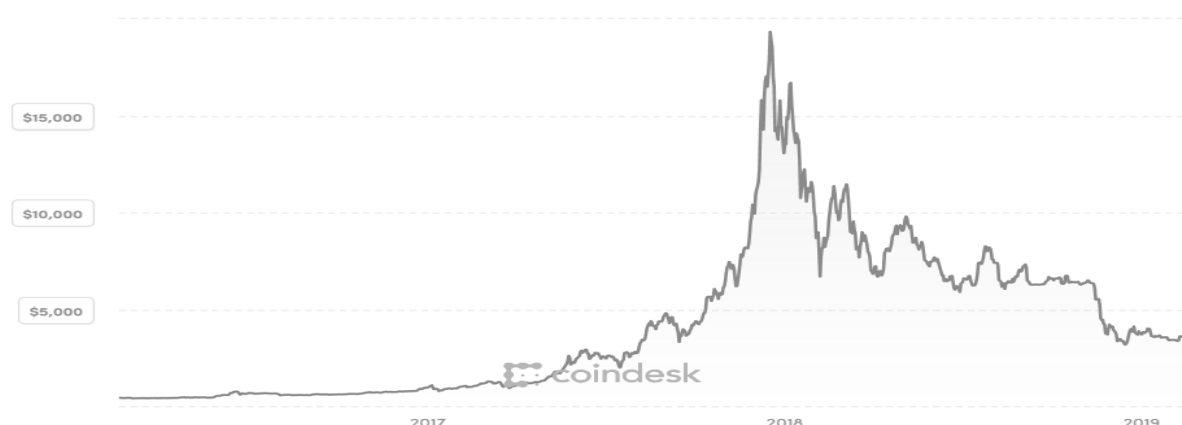
This can be mainly associated with the hype around blockchain based cryptocurrencies at the turn of 2017 and 2018, when the price of the most popular one of them, Bitcoin, was rising exponentially one week after another only to drop suddenly following the burst of a financial bubble.

Figure 15: Interest in the slogan "blockchain" in the last 3 years



Source: Google Trends

Figure 16: The average price of the bitcoin refreshed in the last 3 years



Source: Coindesk

Speculative incidents relating the early stages of new technology adoption should not however be allowed to show the technology itself in bad light. Especially, that such speculations do not necessarily mean that the technology cannot grow in steady and healthy manner afterwards. This is indeed the case of NASDAQ market and its steady growth following its “Internet Bubble” burst in 2000.

Figure 17: NASDAQ quotes



Source: Google

Blockchain growth may result only from its advantages and not from the price of individual products based on it. Therefore, its key distinguishing feature, namely transferring data in a decentralized, irreplaceable manner and with no intermediaries, should be the central point of blockchain researchers interest. Due to its transparency, blockchain has a potential to substantially influence many complex markets starting from capital transfers on financial markets through property ownership on real estate markets to autonomous contract execution.

Blockchain further development to a moment of widespread use is most probably a matter of years and not months and so supporting proper research and development of blockchain technology is what future blockchain beneficiaries should be focused on today.

However, since potential advantages seem to outmatch disadvantages and having in mind all the blockchain projects developed by significant institutions and organizations, it is very likely that in the coming years blockchain's full potential will be presented to end users bringing savings, security and better customer experience.

4.2. Current situation of blockchain technology in V4

4.2.1. General Overview

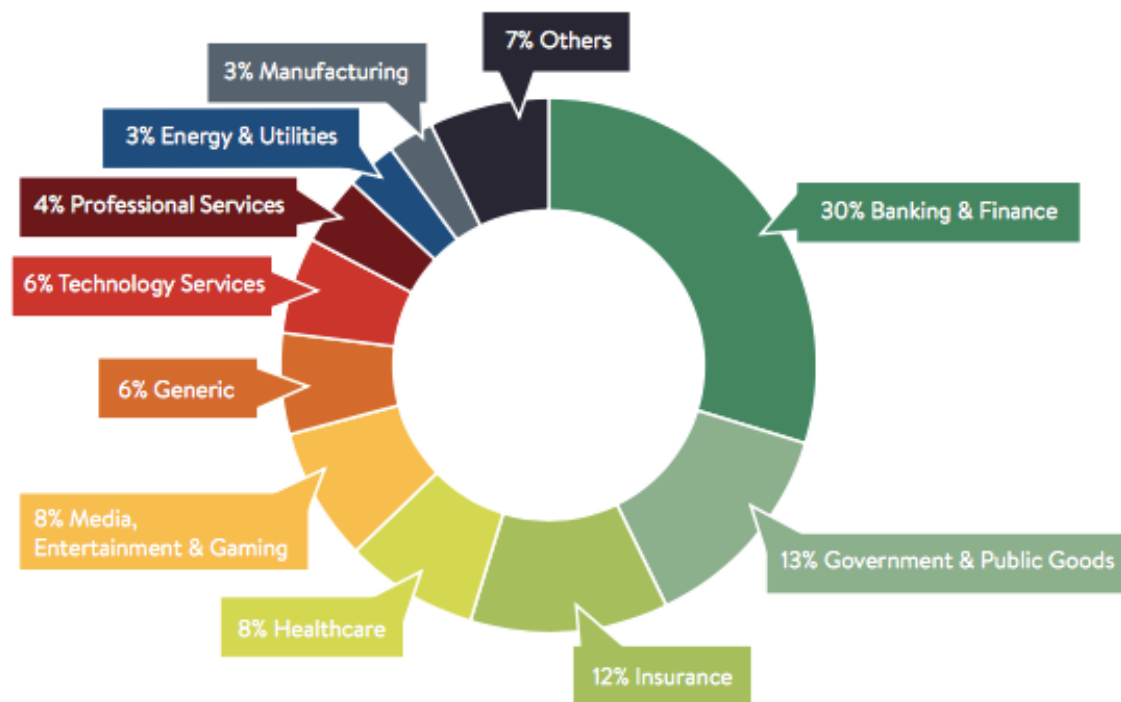
“Blockchain is on the verge of revolutionizing how we interact in the digital world”⁷²—this is how the technology innovation could be described nowadays.

Blockchain is a type of Distributed Ledger Technology (DLT), which is defined as decentralised, shared and encrypted digital database serving as an immutable repository of information across the network. It allows for cheaper and faster peer-to-peer transactions with no third party involved. Originated in 2008 as an infrastructure behind first and still most popular cryptocurrency Bitcoin, blockchain appeared to be applicable not only to the digital assets market.⁷³ Healthcare/ genetics, insurance, supply chains or entertainment are only a few great spaces for blockchain to be implemented. However, the financial and banking industry (far wider than only crypto market) is the one that could adopt blockchain technology to the full extent.

⁷² Kakavand, Hossein and Kost De Sevres, Nicolette and Chilton, Bart, The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies, 2017.

⁷³ Dr Garrick Hileman & Michel Rauchs 2017, Cambridge Center For Alternative Finance, Global Blockchain Benchmarking Study, 2017, p. 37

Figure 18: Blockchain adoption across sectors



Source: Cambridge Center for Alternative Finance report on Blockchain Benchmarking

Blockchain is an unambiguously breakthrough technology discussed and implemented worldwide. Among others, it facilitates the FinTech sector development, bringing new opportunities and experience both to B2B and B2C frameworks. Nevertheless, as every other phenomenon, especially a multipurpose one, it cannot be defined as either a good or a bad one. Watching it evolving in time, we can only share observations and practices. This article focuses on the V4 countries and FinTech market.

4.2.2. Level of acceptance

Recently, the keywords blockchain and fintech (emerging industry that uses new technology to improve activities in finance) have significantly spread across the business. They are often used together, since blockchain is indeed one of the tools driving the innovative solutions within financial industry. Assets/derivatives dematerialization, infrastructure for cross-border transactions, reporting, regulatory compliance, authentication, clearing and settlement, accounting, data security are only a few of potential areas of blockchain-based tools implementation.

Although in its infancy blockchain was considered as a framework avoiding the public sector and government intervention, as the initial philosophy behind it was to exclude any central authority from having influence on the currency market, today we see that governments are more and more open to the technology adoption and implementation. It is worth noting though, that it has not always been like this. During the past 10 years, technology has evolved and its perception by different parties has done so as well. As a result blockchain is nowadays seen rather as an opportunity than a threat not only by blockchain architects, enthusiasts and promoters but also by large institutional players, banks and state governments. Facebook, Goldman Sachs, Banco Santander, Daimler, Alphabet, Samsung, BNP Paribas, JPMorgan Chase, Bank of America are examples of prominent institutions that have already joined the “blockchain revolution”.⁷⁴

All across the world the government initiatives promoting and supporting DLT development are being established. Since V4 countries are members of the European Union and subject to its jurisdiction, below we present a EU perspective on blockchain.

European Blockchain Partnership

Since April 2018, 26 Member States, Norway and Liechtenstein agreed to sign a declaration establishing the European Blockchain Partnership (EBP)⁷⁵ and cooperate in the establishment of a European Blockchain Services Infrastructure (EBSI) that will support the delivery of cross-border digital public services, with the highest security and privacy standards.

EU Blockchain Observatory and Forum

On February 1st, 2018, the European Commission launched the EU Blockchain Observatory and Forum which main goal is to map key blockchain initiatives, monitor their developments and inspire joint actions.

⁷⁴ <https://www.forbes.com/sites/michaeldelcastillo/2018/07/03/big-blockchain-the-50-largest-public-companies-exploring-blockchain/#2b33fdaf2b5b>

⁷⁵ <https://ec.europa.eu/digital-single-market/en/news/european-countries-join-blockchain-partnership>

International Association for Trusted Blockchain Applications (INATBA)

To support blockchain and DLT in overcoming barriers to scale, the proposal has been made to create a global forum that brings together industry, start-ups and SMEs, policy makers, regulators, NGOs and standard-setting bodies.⁷⁶

Blockchain based EU services infrastructure

At the beginning of 2018, the European Commission opened a call for tender on a feasibility study⁷⁷ to assess the opportunity to pilot a EU Blockchain Infrastructure (EuroChain) to initiate an open, innovative, trustworthy, transparent and EU law compliant data and transactional environment.

Besides, EU also takes part in the international frameworks on standardisation⁷⁸:

- ISO Technical Committee 307 on blockchain and Distributed Ledger Technologies
- ITU-T Focus Group on DLT Distributed Ledger Technologies.

There are also many local initiatives set up by local councils and ministries. An example can be found in Poland where Ministry of Digitisation set up Development Groups for Blockchain and Distributed Ledger Technologies. In Czech Republic, on the other hand, Czech Blockchain Association was established. All these organisations and institutions target the optimal resources management on the way to digitisation and technological improvement.

4.2.3. Regulations

Regulatory framework is one of the most challenging aspects of innovations implementation. Despite great progress, regulators still acknowledge risks associated with technology adoption within different areas of operation.

In its report “The Distributed Ledger Technology Applied to Securities Markets”⁷⁹, ESMA defines the following risks of blockchain implementation:

⁷⁶ <https://ec.europa.eu/digital-single-market/en/blockchain-technologies>

⁷⁷ <https://ec.europa.eu/digital-single-market/en/news/study-opportunity-and-feasibility-eu-blockchain-infrastructure>

⁷⁸ Factsheet Digital Single Market by EU http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=49649

⁷⁹ https://www.esma.europa.eu/sites/default/files/library/dlt_report_-_esma50-1121423017-285.pdf

- risk of fraudulent activities and money laundering
- operational risks (e.g. mistakes in coding smart contracts)
- unfair competition (early adopters can impose additional conditions on network newcomers),
- data exploitation,
- risk of complexity increase rather than simplification of certain operations.

In its report “The Prudential Risks and Opportunities Arising For Institutions From Fintech”⁸⁰, EBA notes that rapid evolution of FinTech industry may be followed by the increasing number of risks for both institutions and customers. Considering 7 cases, it concludes that lack of technical skills, shortage of expert staff and the inadequacy of technology infrastructures could harm innovations application. It is, however, indicated that with a proper regulatory policy, testing environments and education program, those innovations are a great opportunity for the financial sector.

In terms of regulations around blockchain, EU Blockchain Observatory and Forum is concerned with⁸¹:

- legal, fiscal and accounting status of tokens,
- rules surrounding the exchange of cryptoassets and fiat money,
- ensuring bank accounts compliance with legitimate blockchain projects,
- implementing “regulatory” sandboxes.

All of the units mentioned above also consider **blockchain and GDPR** (General Data Protection Regulation) adoption to be the priority. Since blockchain is about public decentralization of data storage, it is an obstacle on the way to the compliance with GDPR. EU Blockchain Observatory and Forum defines 3 GDPR-associated issues⁸²:

- identification and obligations of data controllers and processors,
- anonymization of personal data,

⁸⁰<https://eba.europa.eu/documents/10180/2270909/Report+on+prudential+risks+and+opportunities+arising+for+institutions+from+FinTech.pdf>

⁸¹ <https://www.eublockchainforum.eu/reports>

⁸² https://www.eublockchainforum.eu/sites/default/files/reports/20181016_report_gdpr.pdf

- exercise of some data subject rights.

These issues are still not solved. However, as major obstacles on the way to blockchain implementation, they are constant topics of discussions.

4.3. Key drivers and challenges for the blockchain implementation

Undoubtedly, the Distributed Ledger Technology and blockchain may inspire many new business and government approaches. This comes with key drivers and challenges which blockchains projects will have to face. At this point, it is very important to underline that nowadays we can distinguish two general types of blockchains: private and public.

4.3.1. Public blockchains

Public blockchains are understood as networks that anyone can contribute to, read its history and participate in its maintenance. Public chains are decentralized which means that there is no central authority with control over the network. Peers in the network are equal by definition. Unless there are only a few participants, the structure of this technology ensures safety, stability and sustainability. In such case there are hardly any chances to interrupt and manipulate the history of the ledger.. One of the well-known examples of a public blockchain is Bitcoin, cryptocurrency released as an open-source software in 2009⁸³. The enormous hype leading to a great popularity and, in fact, a financial bubble enabled Bitcoin to prove that value can be transferred around the world without an intervention of third party institutions like banks or other “trusted” institutions. Instead, with the use of Internet, cryptography and blockchain, it can be transferred directly from one peer to another.

4.3.2. Private blockchains

From the technical point of view, private blockchains work similarly to public ones. However, in this case participants of the network have to obtain a permission to become a part of this ledger. It means that peers and the owner of the ledger know each other identity and the same principle applies to the peer-to-peer relationships. In addition they may gain special

⁸³ Davis, Joshua (10 October 2011). "The Crypto-Currency: Bitcoin and its mysterious inventor". The New Yorker. Archived from the original on 1 November 2014. Retrieved 31 October 2014.

rights and do not need to be treated equally. Private blockchains have one or multiple entities which have control over the network. A private blockchain is also called a permissioned ledger due to a process of Know-Your-Customer (KYC) or Know-Your-Business (KYB) which enable white listing or black listing of particular users. One of examples of a private blockchain could be Hyperledger, established in December 2015 by the Linux Foundation⁸⁴.

4.3.3. The main drivers for the public blockchain implementation

It is a tendency to overestimate short-term effects of applying a specific technology, while ignoring its long-term potential. The evolution of the Internet and its impact on society not only can be seen as an argument for this thesis but it also shows that estimating the scale of long-term effects of technological innovations can be difficult. Nonetheless, some promising drivers for the long-term success of blockchain technology could be e.g.:

- Disintermediation

The chain of blocks does not include intermediary elements, because it grants itself the role of a digital broker who follows the rules strictly. Replacing one intermediary with others is perhaps not particularly accurate, but the replacement of an organisation operating based on human potential with a trust-based software system that encrypts trust is definitely a great achievement. Moreover, it may prove to be a great advantage to replace the chain of brokers with one system that directly supports the interaction of its participants in a secure manner.

- Automation

To act as a digital broker blockchain uses automation. The larger the scope of using the blockchain, the more it will replace tasks performed manually by specific intermediaries with the automatic interactions of their participants. Therefore, as the next advantage of blockchain, we could recognize its potential to support automation. To enhance this area of development special contracts have been created, which are maintained by the nodes of the network, and can be performed automatically should the specific conditions be met. These are known as smart contracts.

⁸⁴ "Linux Foundation Unites Industry Leaders to Advance Blockchain Technology - The Linux Foundation". The Linux Foundation. 2015-12-17. Retrieved 2018-04-28.

- Standardization

The foundation for automated transactions processing provided by the blockchain are rules and standards. Therefore, the greater the use of the blockchain, the more transactions and interactions between contractors will be standardized.

- Streamlining processes

As a result of standardization and automation, business processes become more transparent and begin to run more efficiently. Many organizations evaluate and analyse their own business processes in preparation for the incorporation of the blockchain technology. The assessment of the existing business processes, and their redesigning and refining, could therefore be seen as the next advantage of a potentially sustainable chain of blocks.

- Costs reduction

Automation, disintermediation and standardization often results in a cost reduction. By reducing costs the effects of automation have had an impact on the development of a way many industries work, and as a result, many goods became available to a larger number of people. The reduction of brokerage costs could perhaps be the most economically noticeable long-term blockchain advantage.

4.3.4. The main challenges for the public blockchain implementation

In addition to positive effects and actual advantages, the use of the blockchain can also cause unwanted side effects and even negative consequences. The biggest challenges include:

- Lack of privacy

Although peers in the network can remain anonymous, public blockchains do not hide any data. Everyone can read an entire transaction history. This level of transparency is frightening for those who care about protecting their privacy. These fears are understandable when we consider how huge amounts of personal data have already been accumulated and used by large corporations and institutions. A proper attitude towards this practice may favour development and dissemination of advanced security protocols. It can also initiate work on

the concept, according to which we will become the owners of their personal data, and the right to access them and use their debts could sell. As a result, contributors, such as search engine providers and social media platforms, may lose users and market shares.

- Decline of responsibility

The disappearance of personal responsibility is often considered a consequence of disintermediation. Intermediaries not only communicate parties with each other but can also provide guarantees. They offer arbitrage in situations when transactions do not function as intended and are required to take responsibility for their actions. The change in the very nature of trust from relying on people and organizations that users associated them with to having to trust in protocols and technologies may lead to the fact that initiating contractual interactions and carrying out settlements arising from them will not be handled by people, and hence will cease to be associated with personal responsibility of specific units. Due to still valid questions regarding the legal acceptance of the blockchain, doubts arose as to whether the blockchain as a fully automated transaction mechanism based on a specific protocol can assume responsibility for its own operations in the same way as traditional intermediaries do. This issue may, however, encourage initiatives to clarify problems related to the legal status of the blockchain.

New technologies are the subject of active research and continuous development work and therefore their future is uneasy to be predicted. However it seems that in the future public and unlimited blockchains will become less and less important from the commercial applications point of view due to limited scalability and privacy gaps. On the other hand, it seems that the growing interest in business agendas will contribute to the interest in private and limited blockchains.

Governmental projects can be initiated and conducted under e-government initiatives aimed at digitizing processes handled manually or changes in the infrastructure. Benefits related to the use of blockchains can be seen in the tax sphere, in the areas of payment monitoring and digital identity, record management or monetary policy. A significant limitation to the use of technology in the public sector may, however, turn out to be unresolved legal doubts and binding regulations in the field of data security and privacy.

4.4. FinTech use cases

V4 area offers numerous FinTech projects, start-ups and solutions based on blockchain technology. According to a recent worldwide study estimating which country has the best IT developers, Poland comes third, Hungary fifth and the Czech Republic ninth. This shows how well prepared the V4 region is for technology transformation and how significant growth opportunities the V4 region provides. Below, we present the most significant blockchain initiatives from each V4 country.

4.4.1. Poland

One of the most significant examples of blockchain applications in regular business is Polish Billon.⁸⁵ Billon's blockchain is an open network that is controlled by several owners. Everyone can join it, but some participants have special rights that guarantee compliance with regulations and security standards. Billon's blockchain is one of the best platforms for building decentralized applications in the Visegrád Group.

Billon is a blockchain-based system that allows users to transfer data and money in a super-fast way,. The company has already signed the first big contract, they entered the world of bloggers and micropayments. All users need to do is to install an application and top up their account, for example via a bank transfer.

This Polish start-up was the first one to transfer a British pound using blockchain technology and was granted the title of the Most Disruptive company by the European Commission in 2018.

4.4.2. Hungary

A Hungarian startup Income Locker offers its own cryptocurrency lending platform. Their technology is directed at helping lenders compete for borrowers who wish to use cryptocurrency. InLocker connects companies who begin to exploit the larger benefits of blockchain technology.

⁸⁵ <https://billongroup.com/>

This platform has set up a marketplace which stimulates lending and uses smart contracts to ensure that all lenders receive an equal chance to find borrowers. It can reach out to those who previously were unable to get loans as well as consumers who perform a small number of bank transactions. The company claims that their main goal is to find solutions which potentially connect the traditional and the cryptocurrency financial world.

Similarly to other technologies based on blockchain, one of the company's most significant challenge is to face regulatory issues.. Nevertheless, InLocker pioneers in providing a financial technology that offers a transparent and secure lending marketplace in the V4 region and beyond.

4.4.3. Slovakia

Pygmalios⁸⁶ is a company which helps marketers create an engaging and personalized shopping experience for their clients. Due to sophisticated algorithms and intelligent sensors, this project can measure many aspects of customer behaviour. When a customer visits a store, they can assess what their demographic characteristics, loyalty, or how long they stayed in the shop. The main goal is not to create a personal profile of a visitor through his personal data. The sensors recognize details that could only be detected by a person standing physically in the shop and only to gauge the statistical indicators. It is very important to underline that this data is anonymous. All collected data is evaluated automatically and as a result, the company receives only anonymous and general statistical indicators such as: average time of visits, favourite customer routes or the average occupancy of the store in given hours and days.

It is very important to underline the fact that Pygmalios closely follows new EU rules on personal data protection: GDPR and ePrivacy Regulation. Their business model is as follows: the collected information is not associated with any other database and data is deleted once the statistical evaluation is finished. Since the personal data protection is a very sensitive topics in the EU market, privacy is the top priority in this project. Users only have access to aggregated data for selected monitored periods and only entitled entity can handle this data.

⁸⁶ <https://pygmalios.com>

4.4.4. Czech Republic

The recently established Blockchain Connect Association plans to introduce the development of blockchain technologies to the public and economic spheres.

There is a deep belief that this technology has the potential to significantly mitigate corruption, fraud, and theft in various markets. The members of the alliance are: Adel – a blockchain project accelerator, a consulting firm PwC, a technology company IBM and a law firm Squire Patton Boggs.

Blockchain Connect has recognized several markets to apply the technology: real estate, financial services, automotive, healthcare and the FMCG industry.

4.5. The future of blockchain technology

4.5.1. Predictions

- In Europe the blockchain technology market is expected to grow at a CAGR of 35.8% (2018-2023) and generate a global revenue of USD 4.3 billion by 2023.⁸⁷
- 10% of global GDP could be stored via digital assets through blockchain technology in less than 10 years.⁸⁸
- The FinTech blockchain market is expected to grow from USD 370.3 million in 2018 to USD 6,228.2 million by 2023, at a Compound Annual Growth Rate (CAGR) of 75.9% during the forecast period.⁸⁹

4.5.2. Recommendations

Regulatory and supervisory authorities are preparing clearly defined strategies and plans also in case of new technologies and FinTech industry. In its FinTech Roadmap⁹⁰, EBA specified particular actions for 2018/2019:

⁸⁷ Business Wire, Europe Blockchain Technology Market 2018-2023, 2018

⁸⁸ Factsheet Digital Single Market by EU http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=49649

⁸⁹ ResearchAndMarkets, 2018

⁹⁰ <https://eba.europa.eu/documents/10180/1919160/EBA+FinTech+Roadmap.pdf>

- **monitoring the regulatory perimeter**, including assessing **current authorisation and licencing approaches** to FinTech firms, analysing **regulatory sandboxes and innovation hubs** with a view to develop a set of best practices to enhance consistency and facilitate supervisory coordination;
- **monitoring emerging trends and analysing the impact** on incumbent institutions' business models and the prudential risks and opportunities arising from the use of FinTech in order to enhance **knowledge sharing**;
- **promoting best supervisory practices** on assessing **cybersecurity** and promoting a common **cyber threat testing framework**;
- **addressing consumer issues arising from FinTech**, in particular in the areas of unclear regulatory status of FinTech firms and related disclosure to consumers, potential national barriers preventing FinTech firms from scaling up services to consumers across the single market, and assessing the appropriateness of the current regulatory framework for **VCs**;
- **identifying and assessing ML/TF risks** associated with regulated FinTech firms, technology providers and FinTech solutions.

EU Blockchain Observatory and Forum also prioritizes several directions regarding the blockchain implementation. These could be used as an example also in the V4 countries:

- Need to clarify the legal and regulatory framework (e.g. establish testing sandboxes).
- Need to continue to focus on education and research (entrepreneurs and executives need accessible means by which they can learn about blockchain's potential and use cases, and be inspired to build the new platforms and business models that blockchain can engender).
- Need to drive the adoption of blockchain technology by the public and private sectors. The pursuit of flagship projects that provide real benefits to users and demonstrate the value-add of the technology, will have the dual effect of creating a domestic market for innovative entrepreneurs, and encouraging investors to fund more local projects.
- Europe should continue to promote collaboration in the blockchain space. Certain areas could be positively impacted by a closer collaboration between the governments and companies.

- Europe could also foster blockchain innovation by continuing to study the ecosystem and providing data on its growth and condition.

4.5.3. Summary

To sum up, blockchain technology in both FinTech and other markets should be seen as a breakthrough technology. However, despite the 10-year history, it is still infant and immature. Regulations, research, awareness, investments and education are the necessary ingredients of a successful blockchain implementation.

The V4 countries are doing great job, bringing value to the EU-level organisations, as well as promoting local initiatives. There are many blockchain-based FinTechs originated in the V4 region which have the potential to operate globally. However, Western European and Northern countries are still more rich in terms of a number of FinTechs and capital investments.

5. FINTECH IN THE CEE REGION: OPEN BANKING AND API

Author: Przemysław Kondraciuk

Executive summary: Kamil Kania

5.1. Executive summary

Technology has shaped competitive landscape of many industries for decades, but tensions that it creates vary from sector to sector. According to Digital Pulse 2015 survey, financial industry is one of the most sensitive to digital disruption, right after media and telecommunication. Open banking is a trend that will change the game in the upcoming years, creating business opportunities for fintech companies. This article aims at presenting how open banking will change the industry as well as summarizes key consequences that it brings. The main points of the article are:

- **PSD2.** Open banking in the European Union is mostly driven by the regulatory framework. PSD2 is a European Commission directive that aims to create a legal framework for development of open banking.
- **Third Party Provider (TPP).** New kind of payment market players that appear on the market. TPPs democratize financial services by providing Payment Initiation Service (PIS) and Account Information Service (AIS) in their basic form.
- **API.** In external channels, financial services are performed with API. There are no API standards defined by PSD2, but national initiatives determine them in a few countries.
- **Competition.** Industry is supposed to experience new entries from sectors like hi-tech, that will attempt to take over their relationships with customers.
- **New business models.** Open environment will push banks to redefine their strategies. They may position themselves as white label service providers or front-end platforms.

All those points above were analysed with a special focus on Visegrád Group countries. This article shows that banks in these countries are on the forefront of technological changes.

5.2. Open Banking as a new environment of financial services

The long history of banking is an indication that financial institutions such as banks will always be necessary⁹¹. This attitude among banks, combined with their monopoly on providing a specific range of services, has resulted in a relatively low ability to respond to changes in their environment. We can take the Kodak case as an analogy. Kodak was a leader in the photography industry, which, at a time of technological breakthroughs triggered by the emergence of digital photography, had all the tools to anticipate further development of market trends. However, Kodak found it particularly difficult to abandon its business model and transform the company in order to adapt to the new business environment. One of the main reasons behind this was the fact that the business model of that time was generating huge profits and changing it would mean “stepping into the unknown”. This approach proved to be deceptive, and as a result of delaying the technological transformation, Kodak was on the verge of bankruptcy. In this story, we can see many similarities to the transformations currently observed in the financial sector. On the one hand, **there are more and more FinTech companies in the competitive environment**, which utilise the latest technologies (e.g. blockchain or artificial intelligence described in the previous parts of this report) to build their solutions. On the other hand, it is necessary to mention **Open Banking**. Together, **these two trends form new rules in the financial services sector and force traditional financial market players to redefine their strategies and business models**, which may be crucial for their future market position⁹².

5.2.1. Definition and drivers of Open Banking

Lately, a wide range of FinTech companies' activities has resulted in the emergence of strong networks between start-ups and traditional financial institutions (i.e. incumbents), such as banks. Thus, **complex digital ecosystems involving financial services are created**⁹³. The ecosystems can be described as a **dynamic network of many “actors” that constantly interact**

⁹¹ McKinsey & Company, 2017, *The Phoenix Rises: Remaking the Bank for An Ecosystem World* McKinsey Global Banking Annual Review 2017, from <https://www.mckinsey.com/industries/financial-services/our-insights/remaking-the-bank-for-an-ecosystem-world>, p. 22

⁹² Efma, Gartner, 2017, *Digital business in banking*, from <https://www.efma.com/study/detail/27255>, p. 6

⁹³ Nicoletti B., 2017, *The Future of FinTech: Integrating Finance and Technology in Financial Services*, Palgrave Macmillan, Basingstoke, New York, pp. 17-18

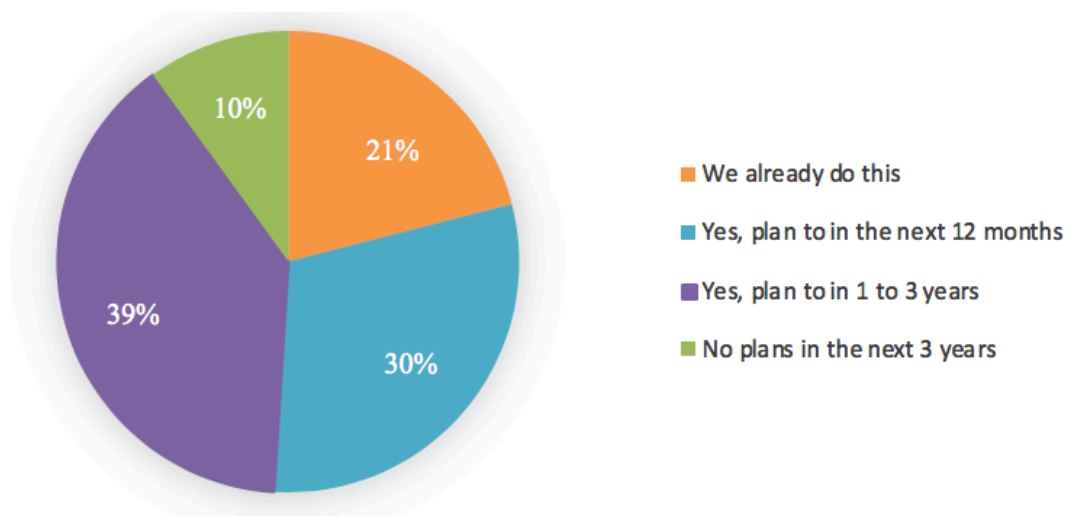
with one another in order to generate mutual benefits and even exchange them. This model is also intended to create a new standard that allows the end user (i.e. the client, who is also one of the “actors”) to experience an end-to-end process, having access to a wide range of products/services at the same time and place. Other “actors” are, of course, representatives of various sectors providing digital access to their offers, including representatives of the financial sector. Taking into consideration the high level of clients’ trust and the safety of funds covered by guarantee mechanisms, today banks play an active role in building the ecosystems and even seem to be naturally predisposed to play a leading role in their functioning in the future. After all, they understand client needs and have data on their daily behaviour collected over the years⁹⁴.

A perfect example is the fact that some banks enter the market of online payments, constituting them as a relevant part of one of the main business lines: credit activity. In 2018, the ING in Poland took such steps by launching a payment gateway imoje with a built-in option that enables deferred payments. This was possible thanks to investing in Twisto, a start-up that has been providing such service in the Czech Republic for several years now. A similar strategy was adopted by Alior Bank, which invested in a similar start-up PayPo in 2018. Acquisitions are not the only way for banks to participate in market changes and in building the ecosystems described above. Other ways include partnerships with start-ups or corporate venture building. However, **participation in creating such cooperation models requires from banks to open up to other “actors”, i.e. other commercial entities.** As Open Banking develops, such efforts are currently being observed in banking sectors all over the world. In 2017, as much as 90% of banks declared that within the next 3 years they will be open to partners from digital ecosystems⁹⁵ (Figure 19).

⁹⁴ Efma, 2017, *An open future. Navigating the hurdles of open banking*, from https://www.efma.com/web_v2/public/assets/content/study/2017/23DH/Efma_Digest%20Open_Banking.pdf, p. 15

⁹⁵ Efma, Gartner, 2017, *Digital ...*, op. cit., p. 4

Figure 19: Plan to become an “open bank”



Source: Efma, Gartner, 2017, *Digital ...*, op.cit.

Therefore, **Open Banking is based on democratisation of financial services by unleashing the distribution of banking services and data collected by banks.** Until now, in order to check the account balance or make a transfer, the client had to use an official bank channel, either by visiting a bank branch, contacting a call centre, or logging in to the online or mobile banking applications. Even though banks, thanks to the dynamic development of digital channels, enabled clients to meet their needs independently at any place and time, they still dictated the conditions of providing these services. Open Banking is to change this state of affairs and allow the clients to use bank services outside the official channels branded with the bank's logo. **Clients will be able to decide for themselves whose services they want to use, they will be able to connect their bank account, for example, to their Facebook account and make transfers directly through Messenger, or check how much money they have in all bank accounts by talking to Amazon's Alexa at breakfast.**

Open Banking is a global trend with different initiatives across the world⁹⁶. There are two approaches: either the **financial sector independently implements Open Banking through market initiatives (e.g. USA, China), or it is implemented through regulations (e.g. the European Union, Australia).** The second case is particularly noticeable in Europe thanks to the Second Payment Service Directive, commonly referred to as PSD2. The entire world is now

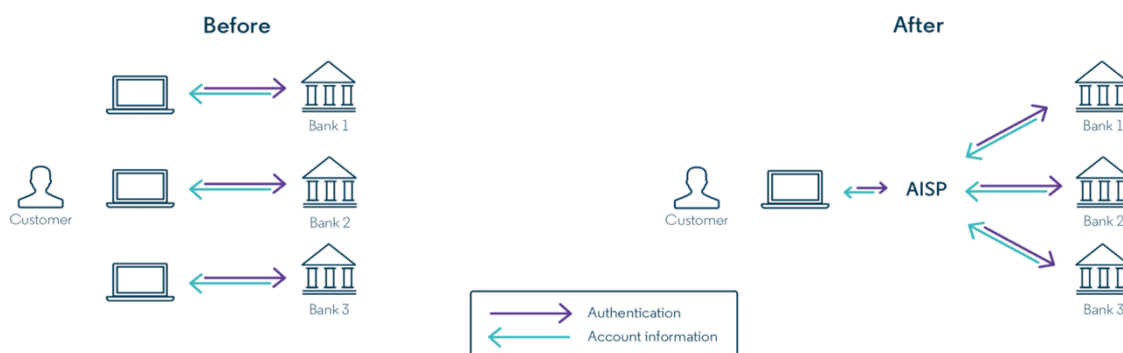
⁹⁶ HSBC, 2018, Europe: Open Banking and Regulation, from <https://www.business.hsbc.com/hsbc-in-europe/europes-open-banking-and-regulation-driving-change-and-innovation>

watching the events on our continent, because the step taken by the European legislator is unprecedented. It will determine the banking structure for many years, and it may affect not only Europe, but also, indirectly, other parts of the world. Nonetheless, **thanks to the PSD2, Europe has now become a world leader in the implementation of Open Banking**⁹⁷.

5.2.2. PSD2 as a driver of Open Banking in the EU and V4

The Directive adopted in November 2015⁹⁸ is a response to the changing payments market landscape in Europe and its main objective is to increase the security of transactions and reduce their costs. These objectives are to be achieved by introducing supervision of new payment services and standardisation of payments across the European Union⁹⁹. **Legislation has defined a new type of market players, commonly referred to as Third Party Providers (TPP). These entities will be able to provide Payment Initiation Service (PIS) and / or Account Information Service (AIS) in the basic form, which have so far been reserved only for banks as Account Servicing Payment Service Providers (ASPSP).** As a result, banks would no longer be the main point of information on the accounts, and payments could be scheduled without having to visit the bank's website, e.g. directly on the merchant's website¹⁰⁰ (Figures 20, 21).

Figure 20: Example of an Account Information Service (AIS) before and after PSD2 implementation



Source: Evry, 2016, PSD2..., op. cit.

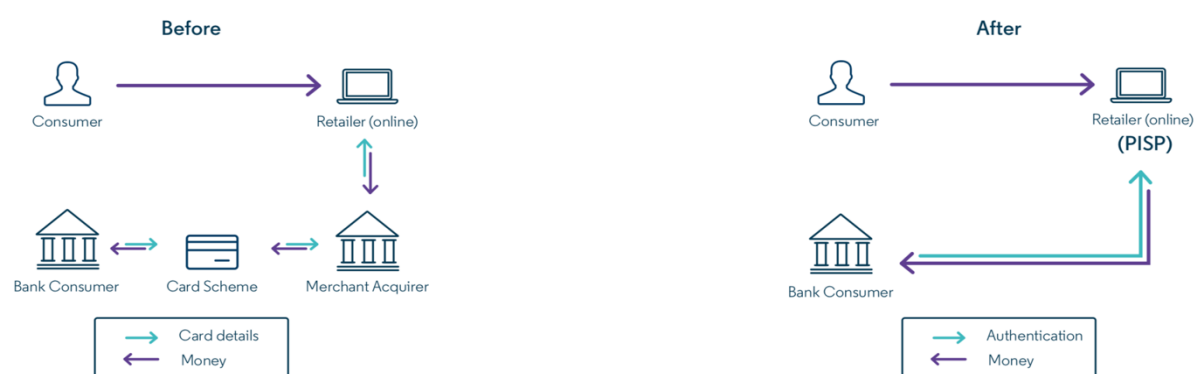
⁹⁷ EY, 2017, *#payments – insights. opinions*, from [http://www.ey.com/Publication/vwLUAssets/EY_-_Payments_nl_vol_18/\\$FILE/ey-payments-nl-vol-18.pdf](http://www.ey.com/Publication/vwLUAssets/EY_-_Payments_nl_vol_18/$FILE/ey-payments-nl-vol-18.pdf), pp. 3-4

⁹⁸ However, the Directive required Member States to implement its provisions into their national legal systems by January 2018.

⁹⁹ Dec P. [2018], *Innowacyjne usługi finansowe*, [in] Pietrewicz J. W., Sobiecki R. (ed.), *Innowacyjna fala w społeczeństwie i gospodarce*, Warsaw School of Economics, Warsaw, p. 217

¹⁰⁰ Evry, 2016, *PSD2 – Strategic opportunities beyond compliance*, from https://www.evry.com/globalassets/bransjer/financial-services/bank2020/wp_psd2/psd2_whitepaper.pdf, pp. 9 -10

Figure 21: Example of a Payment Initiation Service (PIS) before and after PSD2 implementation



Source: Evry, 2016, PSD2..., op. cit.

Therefore, **payments can become effortless and invisible, as is already the case with Uber.** However, the activities of TPP operators will be registered and, in the case of PIS, they will also be licensed by the supervisory authorities of the Member States¹⁰¹. Nonetheless, it seems that at least **initially, it would be mainly the banks themselves that would benefit from this mechanism**, since they would also be able to enjoy the benefits of the Directive and act as TPP and, **with the consent of their clients, would gain access to their data from competitors, i.e. other banks.**

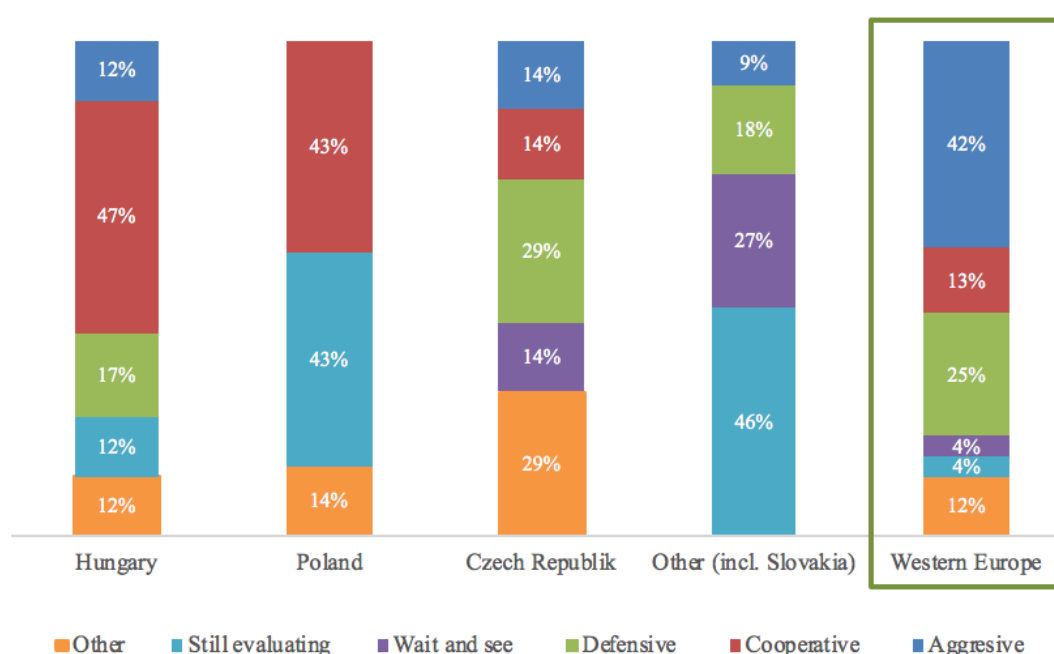
The Directive required Member States to adapt their legal systems to the provisions by January 2018. Most EU Member States have managed to meet this obligation. Among the Visegrád Group countries, the Czech Republic, Hungary and Slovakia have implemented the provisions within the prescribed deadline. The only exception in this regard was Poland, which adapted its national legislation to European law only in June 2018 (6 months delay). Despite the change in local regulations, the implementation of services resulting from the Directive (i.e. AIS and PIS) depends also on the Regulatory Technical Standards (RTS), a Delegated Act supplementing the Directive. The RTS were officially published only in March 2018. The banks have 18 months to meet the requirements imposed by the RTS¹⁰². Thus, **the services**

¹⁰¹ European Commission, 2015, *Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC*, from <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2366>

¹⁰² European Commission, 2018, *Commission Delegated Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication*, from <https://eur-lex.europa.eu/legalcontent/EN/TXT/?qid=1549044127150&uri=CELEX:32018R0389>

introduced by the Directive will not be effectively available until September 2019. This also applies to the Visegrád Group countries. Interestingly, banks in CEE have adopted a different approach to the Directive, and Open Banking in general, than their counterparts from Western European countries. In Western countries, banks tend to adopt an aggressive approach (i.e. proactively embracing PSD2 as an opportunity and leveraging it to gain market share), while in CEE, the vast majority of banks prefer a cooperative approach (i.e. using PSD2 to drive new business strategy and pivot to digital, leveraging the new cooperation opportunities it presents). This is particularly noticeable in Hungary and Poland, where more than 40% of banks are in favour of such an approach¹⁰³ (Figure 22).

Figure 22: Adopted strategies to the PSD2 by banks in CEE vs. Western Europe



Source: Deloitte, 2018, *European ...*, op. cit., p. 17

5.3. API as a technological component of Open Banking

Open Banking should be considered at two levels: business (described above) and technological. According to the PSD2 Directive, TPP operators will have direct access to banks through dedicated Application Programming Interface (API) mechanisms. In crude terms, **API**

¹⁰³ Deloitte, 2018, *European PSD2 Survey. Voice of the Banks*, from https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/Deloitte_European_PSD2_Voice_of_the_Banks_Survey_012018.pdf, pp. 13-17

is “a way for two computer applications to talk to each other over a network (predominantly the Internet) using a common language that they both understand”¹⁰⁴, or in other words, “electrical sockets that have predictable patterns of openings into which, other applications that match those patterns can plug in and consume them in the same way electrical devices consume electricity”¹⁰⁵. **API is nothing new in the technology world.** Salesforce and eBay were the first to allow access to their web services API as early as 2000. Over the years, APIs have become the standard way of communication between various IT applications around the world. Nowadays, building modern business models based on API has become a trend. Uber is one of the perfect examples of successful API usage¹⁰⁶.

5.3.1. API technology in financial services

In the context of banking business, API technology is not a novelty either. Banks have been using the API standard for a long time, e.g. to communicate banking applications with IT systems of their corporate clients or even to improve communication between various internal IT applications. In the PSD2 era and with the need to open up to the outside world, it is important to distinguish three main types of APIs in banking¹⁰⁷:

- **internal API** – between internal applications of the bank,
- **partner API** – between the bank applications and external applications of the bank’s business partners (e.g. corporate client systems),
- **open API** – between the bank applications and any other external applications of non-business partners.

API should be considered as a new kind of a bank “product” and its “clients” are software developers. While the first type of API is purely internal, the other two are exposed outside the banks’ internal IT infrastructure. They can be used by developers not employed by banks. While in the case of partner APIs there is a business relationship between the bank and the

¹⁰⁴ Jacobsen D., Brail G., Woods D., 2012, *APIs: A Strategy Guide*, O’Reilly, Sebastopol, p. 5

¹⁰⁵ Zachariadis M., Ozcan P., 2017, *The API Economy And Digital Transformation In Financial Services: The Case of Open Banking*, Swift Institute Working Paper No. 2016-001, from <https://ssrn.com/abstract=2975199>, p. 4

¹⁰⁶ PwC, 2016, *Catalyst or threat? The strategic implications of PSD2 for Europe’s banks*, from <https://www.strategyand.pwc.com/media/file/Catalyst-or-threat.pdf>, p. 6

¹⁰⁷ The Open Banking Project, University of Warwick, Bank Innovation, 2017, *Understanding APIs in Banking 2017*, from <https://www.openbankproject.com/wp-content/uploads/2018/10/BANKING-APIS-2017.pdf>, p. 5

partner and it is possible to provide APIs details without the need to make them available to the public, and to adapt the technology to the needs of both parties, this is not possible in the case of open APIs. Therefore, open APIs should meet generally accepted programming patterns. **By its very nature, open API is publicly available.** There are dedicated websites, known as API developer portals, which provide not only APIs technical documentation and sample APIs applications, but also a test environment (sandbox) and technical support (i.e. FAQ section or even a contact form that can be used to ask questions to APIs' authors).

With the PSD2 Directive, banks in the European Union are required to publish open API mechanisms and thus provide access to basic services (i.e. AIS and PIS). In terms of performance parameters, **the mechanisms should operate on principles of no lower quality than processes offered by banks to their clients through electronic banking channels** in terms of access to account information and payments initiation. In the era of digital banking, this means that **APIs should respond to APIs calls from TPP in real time** (i.e. in milliseconds). Moreover, unavailability of APIs for 30 seconds will translate into TPP being able to use a fall-back interface, which in practice means screen scraping – automatic logging in to the banking systems using client's credentials. Detailed rules for the functioning and maintenance of bank APIs are defined in the aforementioned RTS. According to these rules, banks in Europe are required to submit APIs documentation and provide a sandbox by March 2019, whereas APIs production environment should be launched six months later, in September 2019. Therefore, **2019 is expected to mark a breakthrough in terms of effective deployment of APIs across Europe.**

5.3.2. Open APIs standardisation initiatives in Europe

Although the quality standard and structure of API mechanisms were defined by the European regulator in the RTS, their architecture and exact scope of data to be shared by banks were not clearly specified. Therefore, it allowed banks to develop their own interpretations of APIs. However, **sector entities have been working together on broader initiatives to build API standards**¹⁰⁸.

¹⁰⁸ Kondraciuk P., Kurkliński L., 2017, *Open banking w wydaniu europejskim*, Miesięcznik Finansowy BANK, No. 11, pp. 83 - 84

Some of the best-known are:

- **Open Banking Standard** – a standard introduced to the British market¹⁰⁹ (slightly derogating from the directive as a result of national legislation¹¹⁰),
- **Stet** – a standard developed in France by a national payment operator (established by the leading French banks)¹¹¹,
- **NextGenPSD2** – a standard developed by the Berlin Group, a pan-European coalition of payment industry representatives¹¹²,
- **CAPS** – a standard developed under the model of broad coalition of payment market players from different countries¹¹³.

However, the **standards developed through national initiatives deserve particular attention**. This is how the **Polish API** and **Slovak API** standards were developed.

5.3.3. Case Studies: PolishAPI and Slovak Banking API Standard

The PolishAPI standard is an initiative established in 2017 by 40 participants of the Polish payment market, both from ASPSPs (i.e. banks) and from TPPs, chaired by the Polish Banks Association. The initiative aims at developing a standard that complies with the PSD2 and RTS regulations, as well as with national implementation of these regulations. The Polish Bank Association is also contributing to the work of the Berlin Group in order to discuss common points of both standards, as well as analyse differences. The first version of the standard was developed, publicly consulted and then published in April 2018. Subsequent versions of the standard were published in July, October and December 2018 due to continuous improvement of the standard and its adaptation to new guidelines issued by the European Union bodies. The PolishAPI standard is completely optional for banks. The most important aspects of the

¹⁰⁹ <https://www.openbanking.org.uk>

¹¹⁰ The United Kingdom is an exception in the European Union, as along with the PSD2 Directive it was processing internal regulations to be implemented on the internal market in the area of Open Banking. As a result, open banking, albeit to a slightly modified extent than defined in the PSD2, has become effective on this market earlier, as early as the beginning of 2018. The United Kingdom is an example that implementing Open Banking poses difficulties even for the largest banks, since most of the British banks were lagging behind in implementing the API standard. In addition, it took relatively long time before the market started using published APIs.

¹¹¹ <https://www.stet.eu/en/psd2/>

¹¹² <https://www.berlin-group.org/nextgenpsd2-downloads>

¹¹³ <https://www.caps-services.com>

standard are the two methods of client authentication, compliance management by TPP, communication using eIDAS certificates and the scope of information published through AIS. At the preparatory stage, the Polish Bank Association held an Open Banking Day and Open Banking Hackathon events in order to evaluate and promote the proposed solution¹¹⁴.

The Slovak initiative was developed under the leadership of the Slovak Banking Association (SBA) in cooperation with the National Bank of Slovakia. The first version of the standard was published in December 2017. The next version was issued six months later, in June 2018. This standard presents the minimum requirements required to implement PSD2 compliant APIs, so that any bank that joins the standard can extend the scope and interface to include other services on a voluntary basis. This standard is not mandatory for SBA members, but it is mandatory for the participants of the project. The key aspects of the standard are data security issues (e.g. communication based on TLS 1.2 and eIDAS-secured communication), optional services (e.g. e-commerce payment support, list of client accounts) and maximum compliance with the ISO 20022 standard. Throughout the process, SBA discussed the standard with the Czech Banking Association in order to share experiences¹¹⁵.

These two Visegrád Group countries are the leaders of the API standardisation movement at the national level in the European context. These initiatives are not comparable to any of the previous ones, as they are marked by the voluntary commitment of market participants to develop a common, universally accepted standard adapted to local realities.

However, at the community level **doubts are raised concerning the multiplicity of standards and the fact that each bank can come up with its own solution.** Therefore, the regulator's idea related to issuing a directive on the standardisation of the entire market may be difficult to achieve, but **gaining access to client data and distribution of basic financial services outside banks will inevitably lead to a further increase of the importance of financial start-ups**¹¹⁶.

¹¹⁴ <https://polishapi.org/en/>

¹¹⁵ <https://www.sbaonline.sk/ProjectDetail?name=slovak-banking-api>

¹¹⁶ Kondraciuk P., Kurkliński L., 2017, *Open banking ...*, *op. cit.*

5.4. Consequences of Open Banking and APIs expansion

Open Banking will be one of the biggest challenges of the global financial market in the years to come. This challenge will be incomparably greater than the application of the latest technologies, such as blockchain or artificial intelligence. Although these technologies will certainly be important, they can only affect the operational efficiency of the banking business and should not be perceived in terms of revolution, but rather as a technological progress¹¹⁷. **Open Banking influences the whole business model and requires banks to change their strategy.** In this sense, it may prove to be a far greater challenge for the sector¹¹⁸. However, the effects of Open Banking can be considered at both micro and macro level.

Firstly, at the macro level, **Open Banking will definitely increase the importance of alternative providers of financial services.** Not only FinTech companies, but also technological giants (e.g. GAFA – Google, Amazon, Facebook, Apple) and other companies offering digital services (e.g. e-commerce) will be able to provide financial services more easily. Consequently, the structure of the payment market will change in favour of these companies. **Systemic risks will also increase, as these companies are not subject to regulation and control as much as banks**¹¹⁹.

At the micro level, Open Banking is a trend that somehow forces traditional financial institutions to evolve towards new business models, i.e. platforms. **Abandoning the current banking model that has been used for years would pose a significant threat to maintaining current profitability, but there are indications that adopting an appropriate strategy for ecosystem participation and transformation in this direction is necessary to preserve business profitability.** The first area of focus could be customer attrition reduction and cross-selling opportunities related to it that would increase the ROE of banks even by about 2 percentage points in the future. The second area of focus is the acquisition of new customers, which best case scenario translates into an increase in ROE by as much as

¹¹⁷ Zaleska M., 2018, *Innowacyjna bankowość*, Gazeta Bankowa, No. 7, p. 68

¹¹⁸ Kondraciuk P., Kurkliński L., 2018, *Innowacyjny fenomen fintechów a konkurencja z sektorem bankowym*, [in] Pietrewicz J. W., Sobiecki R. (ed.), *Innowacyjna fala w społeczeństwie i gospodarce*, Warsaw School of Economics, Warsaw, pp. 233 - 255

¹¹⁹ Financial Stability Board, 2017, *Financial Stability Implications from FinTech*, from <http://www.fsb.org/wpcontent/uploads/R270617.pdf>

1 percentage point¹²⁰. **For banks, API mechanisms will be a gateway to the external world, i.e. to the whole ecosystem of partners. They will also become a chance for banks to obtain data about their clients from hitherto unknown sources, i.e. competitor's databases.** Best case scenario, the consumption of APIs of other banks may increase the acquisition of new customers. **However, the use of API alone is not enough in any case.** To be competitive in such a homogenous market and under conditions of increased competition, **it is essential to be able to take advantage of the data, especially in the big data area and to process it in real time, e.g. through cloud computing.** Creating the **best, data-led customer experience** will involve the **most advanced personalisation** of the products and services, and it appears that this factor will be crucial in maintaining relations with clients¹²¹. Banks able to accomplish such tasks will not only maintain their current market position, but also get a chance to improve it¹²².

¹²⁰ McKinsey & Company, 2017, *The Phoenix ...*, op. cit., pp. 37 - 38

¹²¹ Stroud M., 2019, *Open Banking Demands a New Approach to Customer Engagement*, International Banker, from https://internationalbanker.com/banking/open-banking-demands-a-new-approach-to-customer-engagement/?fbclid=IwAR3XXDEX7_yIPml6BmgUu7mvFrLSNBVb6IR5VaQuushPMmVAW8zR0-dKrgw

¹²² Campos M. J., 2017, *Wielowymiarowa konwergencja*, Miesięcznik Finansowy BANK, No. 12, pp. 86 – 88.

AUTHORS – ALUMNI OF THE CEE CAPITAL MARKET LEADERS FORUM 2018

Marcel Bozsik



Marcell has a strong interest in strategy consulting and financial sector, however currently working in the supply chain management industry, as an in-house consultant for one of the major global Logistics player. Previously, he studied International Economics with Finance Major at Budapest University of Technology and Economics. Later he finished his Master studies in the Netherlands at Rotterdam School of Management, where he studied Strategic Management. During his university years, he was very active from all the three main perspectives. His engagement in student life was topped by serving as the President at Liska Tibor College of Advanced Financial Studies. He worked at several internship positions, Citibank, McKinsey, PwC and for a small Berlin start-up as well. Thirdly, he was very active with business and management competitions as well, where with his team he achieved great successes. He has an interest in tennis and swimming in his free time.

Dmytro Bulakh



Dmytro is a last-year Master's of Finance and Accounting student at the Warsaw School of Economics. He is a passionate of M&A, strategic management and technology. He has also obtained a Master's degree in Environmental engineering at the Warsaw School of Technology. During studies and after graduation, he worked as a Mechanical Engineer at a leading engineering consultancy, his portfolio includes such projects as the Varso Tower, Museum of the Polish Army, Überseequartier Hamburg or Warsaw Metro. After several years in the industry, he decided to switch his career towards corporate finance. Dmytro took part in multiple extracurricular activities – CEE Capital Market Leaders Forum, Deloitte Dealmaker Academy, volunteered during the EFA Annual Conference in Warsaw. He is also a Candidate Member of the CFA Society Poland. In his free time Dmytro enjoys learning foreign languages, studying, travelling, cinematography and music.

Szymon Brodziak

Szymon is an undergraduate student, currently completing his 4th year of Master of Law degree at the Jagiellonian University in Krakow. His scientific interests are revolving around the matters of theory & philosophy of law and economy, with a special focus on questions relating to various ethical, legal and practical business implications of the widespread adoption of AI and other emerging technologies. Previously, he has spent a semester as a Visiting Student at the Columbia University in the City of New York and has worked as an Associate at the Corporate Banking Division of Citigroup in Warsaw.



Gabriel Dymowski

Graduated from the European Business Administration at the Faculty of Law and Administration of the University of Gdańsk, currently Gabriel is a second-year student at the Warsaw University of Technology. Combining passion for the worlds of finance and technology, he picked the topic of his bachelor thesis to be "The European framework on FinTech". For two years already he has been staying close to blockchain tech, participating in projects and ventures related to the real use of this technology. As an employee of Accenture, he applied his skills in the implementation of unprecedented solutions based on a DLT, at the national level. Today, Gabriel remains close to the startup environment, being involved in projects related to blockchain markets.



Michał Dzierwa

Michał holds a B.Sc. degree from University of Nottingham, and spent one semester at its campus in China. Returning from the UK, he joined Goldman Sachs in Warsaw as a graduate hire in their New Analyst Program. After a stint at the American investment bank, he decided to return to his alma mater and is currently pursuing a Master's Degree in Computer Science. Alongside the studies, he holds an advisory role and reports directly to the Financial Director at FASING Capital Group, and a supporting role for projects at Boston Consulting Group. He is passionate about disruptive technology in capital markets and aspires to become an expert in the field. Michał is an Alumni of Capital Markets Leaders Forum IV. He also has a soft spot for art, and is contributing to this hobby by volunteering at Muzeum Śląskie whenever time allows him.



Przemysław Kondraciuk



Przemek is a young professional with a proven track record in digital transformation of financial services with special focus on FinTech area. He is also an expert in the field of Open Banking and new business models development. Currently he is supporting digital transformation initiatives and facilitating innovations and partnerships with start-ups at the biggest bank in the CEE region. Previously working for one of the most innovative and digitally advanced banks on the Polish market, Przemek was engaged in the building of digital strategy and participated in the projects pivotal for viability of the organization (e.g. Open Banking implementation, corporate venture building or setting up the innovation hub). He graduated from the Warsaw School of Economics and holds a MSc in Finance and Accounting, specialization in Banking. His academic achievements include publications (i.e. research papers) and conference speeches focused on innovations in the financial services. Przemek was a recipient of the Rector's scholarship for the best students for four years in a row. He is also an alumnus of the European Financial Congress Academy organized by Gdańsk Institute for Market Economics, the Summer School in Economics organized by Bank Guarantee Fund in Poland and of the CEE Capital Market Leaders Forum organized by The Lesław A. Paga Foundation. In his free time Przemek is passionate about traveling and tennis.

Agnieszka Machoń



Agnieszka has recently graduated from Warsaw School of Economics with master degree in Finance & Accounting with specialization in Corporate Finance. She also holds a Bachelor Degree in Quantitative Methods in Economics and Information Systems. Moreover, Agnieszka completed an exchange program at the Frankfurt School of Finance and Management. During her studies she coordinated a project which aim was to encourage women to discovery opportunities within IT. She has a work experience in various industries such as banking, assurance and consulting. Her internship at Deloitte Consulting in digital strategy team ensured her that digitalization is a key issue for enterprises in the 21st century. This is why she decided to develop herself in this field. Her master thesis was about impact of digitalization on retail industry. She is passionate about musicals and new technologies.

Marcin Nadolny

Marcin is currently working as a Management Associate in Citi Handlowy. He is taking part in projects regarding small and medium enterprises, as well as global clients in Poland. His main responsibility is Fintech area and future PSD2 implementation. Previously employed on internships at Idea Money and Accenture. He graduated from Kozminski University, finance and accounting faculty. He is a new financial technologies enthusiast and a big fan of football. In his spare time he manages a volunteer project which helps elderly people avoid digital exclusion.



Daria Turovtseva

Daria is a digital innovations supporter with one-year experience in SME fundraising, alternative finance and FinTech sectors. Being a Warsaw University graduate on the english-speaking Master program “Quantitative finance”, she acquired strong analytical and communication skills. She conducts her own research within blockchain and finTech markets. She took part in various Polish and international branch events such as FinTech and InsurTech Digital congress, Impact CEE Fintech ’18, Hard Fork Decentralised, infoShare, Blockchain Alliance Warsaw – recently rocking the scene as a speaker. Interested in the development of innovations on the state and international levels, Daria also joined the government initiative - a Development group on DLT and blockchain supervised by the ministry of digitalization - to represent the business environment. Currently employed at Artemis Creation – the agency driving growth and development for aware entrepreneurs and innovation leaders, Daria is responsible for financial and blockchain-based projects.



Maciej Winiarski

Maciej is a graduate of the Warsaw School of Economics, where he obtained a bachelor's degree in finance and accounting. Currently, he is studying simultaneously at the Warsaw School of Economics and at the University of Warsaw, where he is pursuing Master's Degrees in finance and law. He started his professional career as a Summer Analyst at Goldman Sachs in Warsaw. Subsequently, he worked in one of the largest investment boutiques in Warsaw - Azimutus, where he participated in M&A processes in various sectors, mainly in Poland. He currently works as an intern in ForeVest Capital Partners – one of the leading Private Equity firms in the CEE region. This internship sparked his interest in the Private Equity industry, in which he plans to specialize in his further endeavours.



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The project is co-financed by the Governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.