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Digital Transformation of World Finance

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Abstract

The boundary between the physical and a virtual world is not clearly visible nowadays, the 4.0 industry utilizes artificial intelligence, distributed ledger technology, quantum computing, advanced visualization and other advanced technologies. The surge of capital flows in financial technology is visible wherever we look. Classical businesses face a challenge to connect and create partners with the companies that are technology savvy because this may impact their future success. The strategy for digital business must be thought over very thoroughly since it represents the success threshold in contemporary digital environment. The classic banking system faces the threat or opportunity of an open banking system and banks are forced to be prepared to offer next generation services benefiting from third party channels. The short history on the banking industry including digital banking along, with fintech as a financial institution showing its power to compete sophisticatedly, will shift the studied digital transformation phenomenon into a dilemma whether we indeed face a cashless society challenge, whether the governments should start to accelerate their decisions on Central Bank Digitalized Currency – CBDC or how far several countries already are to become a cashless society. At last, potential security, trust and fraud issues will close this chapter.

Keywords: digital transformation, digital strategy, modern banking, fintech, CBDC-Central Bank Digital Currency and Cashless Society

1. Introduction

Emerging digital technologies, such as artificial intelligence (AI), AI enabling machine learning, blockchain, internet-of things (IoT), robotics and automation have enormous effects on contemporary businesses that are evident everywhere presently. Expectations of digital-era customers have been growing, forcing enterprises to innovate and introduce new business models relying on digital technological progress. Consequences of zero activity may lead to losing millennial customers because of becoming obsolete in the digital competitive market. To stay competitive, traditional businesses requires to stop avoiding digital the transformation process, on the contrary they must seize opportunities, resulting in beginning a transition towards adoption of a model meeting digital economy expectations.

Emerging digital channels such as web, search, messaging, applications, digital media and others are a big challenge for the traditional banking industry. Especially old-fashioned banking models that do not satisfy the expectations of millennial customers. The evolving trends in the banking industry are dictated by new entrants, such as newly established digital banks and fintech companies deploying

technologies at a radical speed and attracting customers with their innovative digital products. Therefore, it is inevitable for companies, not only in the banking industry, to adopt a radical shift from creating and managing financial products, to providing modern, financial management tools demanded by customers and tailoring the offerings to the clients' requirements.

Ten years ago, corporations such as Exxon, GE, Microsoft, Gazprom and Citigroup were included in the five most valuable firms of the S&P 500 Index, only Microsoft was a digital company at that time. In April, 2020 the S&P's top five most valuable firms were all digital corporations; Microsoft, Apple, Google, Amazon and Facebook. All five companies have collectively added \$4.4 trillion in market cap gains since 2013 and are now the 5 largest stocks in the S&P 500. Moreover, Covid –19 pandemic situation strengthened in having a digital alternative almost for each area whether an industry sector, non-profitable enterprises or governmental departments or any other type of institutions, financial or non-financial ones. The area of finance in businesses, or financial payments by businesses, households, by consumers is evolving and therefore we focus on the transformation process in this area.

Looking forward to the future the obvious question is raised and discussed: What kind of money and payments will be needed to satisfy the needs of a steadily evolving digital economy? Classical banknotes — the Bank's most accessible form of money — is being used less frequently to make payments. At the same time, fintech companies have commenced to alter the market place introducing new forms of money and innovative revolutionary methods of payments.

2. Objectives and methodology

The research subject of the scientific study is the digital transformation in the area of the financing. The main goal of the submitted study is the transformation process of the finance in a global view. Transformation processes are built on the strategy for digital business since it represents the success threshold in contemporary digital environment. The classic banking system faces the threat or opportunity of an open banking system and banks are forced to be prepared to offer next generation services benefiting from third party channels. The partial objectives cover the journey of the banking industry development up to date when digital banking along with fintech as a financial institution compete sophisticatedly to gain the clients to their side. The investigation of the recent growth fintech companies is analyzed, and based on the results, challenges of the digital transformation process are highlighted. Secondary data were used to analyze the development trend in the fintech companies and their growing significance. This transformation possibly will shift the studied phenomenon of digital transformation into the environment of cashless society challenges and proposal of their solutions. Classic research methods are used, critical analysis and synthesis, comparison and deduction and knowledge systemisation. The situation and conditions globally are analyzed leading the governments to make decisions on Central Bank Digitalized Currency – CBDC. The research sample of selected countries is assessed and pointed out whether selected investigated countries have achieved a certain degree towards becoming a cashless society. At last, potential security, trust and fraud issues will be examined resulting in emphasizing advantages and disadvantages virtual world.

3. Digital transformation

The need for business entities' digital transformation is a consequence of the progress in digital technologies, increasing digital competition and resulting

digital customer behavior. Verhoef et al. [1] identify three stages of digital transformation: a) digitization -the action to convert analogue information into digital information [1], b) digitalization – the process of deployment of IT or digital technologies for efficient utilization in the business in order to alter existing business processes [2], and c) digital transformation (see systemization of it in **Table 1**).

The result of digitization is analogue information that is encoded into a digital format (0,1). Research also refers to digitization as a change of analogue to digital tasks [2]. Digitalization describes how IT or digital technologies can be used to alter existing business processes [3] and to adopt them for efficient business operations. New online or mobile communication channels, nowadays, enable all customers to connect easily and deal with enterprises immediately without leaving the company’s office place. Companies save costs by digitalization, in addition, they operate augmented processes which satisfy customer’s demands. Digital transformation is a radical implemented change throughout the company leading to the development of a new business model [4, 5]. Technological progress creates conditions for a company to compete in the digital environment e.g. by creating digital business models that even enhance the company’ competitive advantage. In this context the competitive advantage is defined as a value creation process and its ability to be delivered to customers, followed by converting payments received to profits [6]. Digital transformation introduces a new business model by implementing a new business logic in order to create and capture the value [5, 7]. In a digitalized economy, businesses interact with users through many different types of online, or web-based interfaces, often called platforms.

For digital transformation, each of its phases requires digital resources. They are essential for transforming a classical company into a digital one. The influence on organizational structure is enormous, because the changes in the organizational structure must support introduction and adoption of digital changes. But digital technology itself does not guarantee the success unless digital growth strategies are implemented. The successful implementation and results are measured by metrics that also have been altered to adjustments needed in incorporating digital aspects [1].

3.1 Digital transformation strategy for banking industry

Updated business strategy into a digital environment, market position and human capital capabilities are the threshold for the financial institution’s success. The emphasis on reshaping of the distribution models, improvement of the value propositions and development of an entirely digitized process for the client will lead

Digital transformation		
Digitization	Digitalization	Digital transformation
Analogue ➡ digital task	Alteration of existing business process	New business model development
Digital resources required in each phase:		
Digital assets – storage of data, information and communication infrastructure	Digital agility Digital networking capabilities	Big data analytics capability
Goals that should be achieved:		
Cost savings Efficient use of existing resources	Cost savings & revenue increase Efficient production (via reengineering)	New cost-revenue model, reconfiguration of assets to develop new business models

Table 1.
Three phases of digital transformation elaborated by the author [1].

to augmenting growth and customer satisfaction, forming a steady foundation on which the financial institutions can build and carry on with their innovated activities. A digital transformation strategy should be built on four pillars. The priorities of the banking industry, not only for the banking institutions, but also for similar financial business entities are anchored into four pillars structure [8]. **Table 2** demonstrates briefly their individual characteristics, as follows:

1. The first pillar stresses the goal to digitize the operation process entirely. Digitization of the banking activities from the beginning to the end – all steps are digitized, such as prospecting, advice, sales, onboarding, transactions, and administration.

Benefits: customers' satisfaction, banking employees may be freed for performing more valuable tasks (e.g. sale of different products to the same customer called cross selling, building relationship with clients, or costs saving owing to streamlining a business process).

2. The second pillar encourages to benefit from valuable information being collected, quantitative and qualitative, what is enabled by digital technology. Information itself obtained in time is a tool for success. The manager efficiently converts the information for his company's new revenue opportunities due to Big data analytics - real time analytics, pursuing the spirit of "right insights delivery, to the right person, in real-time". These analytics tools are used, as follows:

- a. Data analytics – for better clients' understanding, identifying opportunities,
- b. Advanced analytics - for better prediction of loan defaults or improving pricing.
- c. Granular cluster analysis - for comparing an individual consumer product mix to the average for that consumer type (benefit from this information in cross-selling and deepening relationships.)
- d. Data mining -for identifying better prospects and targeting new clients, better pricing (customizing pricing to client's preferences - a tool of increasing revenues and client's satisfaction as well.)
- e. Behavioral analytics -for identifying consumers who show signals of dissatisfaction and plan to change to another bank (a need to create an individual action plans to persuade and keep the client loyal).

3. Third pillar evaluates what possible models may be applied by business entities. There are three digital models proposed: a) as Business as Usual Plus, b) Digital as New Line of Business and c) Digital native. They represent a shift (from a to c) from a partially digital coverage model to the digital native model (newly created digital company, e.g. digital bank). Management should select and support the model with an increasing impact on their customers' experience. Top management should judge the situation and make a decision on investing into technology, new forecasts of potential revenues or possible costs savings should be prepared, so as schedules of activities from retraining older employees, hiring new employees. In addition, implementation of scheduled activities for adopting a needed change must be run. How this can be achieved? Monitoring what qualification must employees have and evaluate if they have capabilities to go through new courses or training, what skills need to be trained obligatorily, decision must be made whether older employees should be requalified or new staff should be employed.

1st Pillar	2nd Pillar	3rd Pillar	4th Pillar
Priorities to focus on under each pillar			
Re-innovation of the client's process	Leveraging of the power of data	Redefinition of the operating model	Building of a digital driven organization
Highlighting activities to be accomplished			
Adoptions:	Tools for success:	Digital models:	Digital business
New operating processes adoptions: <ul style="list-style-type: none">• rapid digital onboarding• automated digital lending decisions	<ul style="list-style-type: none">• Data analytics• Advanced analytics• Granular cluster analysis• Data mining• Behavioral Analytics	Evaluations and selection of the model best suitable for the company <ul style="list-style-type: none">• Business as Usual• A new business Line• Digital native	Finalization of digital business entity Setting the priorities of the digital business

Table 2.
Digital transformation pillars.

Many financial institutions run all three models in different markets, regions and business lines. Hybrid experience links human interaction with digital and self-service functionality into a resulting financial solution offered by the banking industry, it is called a bionic network. It is expected to achieve a 15% increase in revenue, at the same time achieving up to 35% reduction in branch costs and 15% increase in customer satisfaction [8].

4. The fourth pillar supports all activities leading to the final step for the organization which is building a digital driven organization.

A digital driven company sets its priority with a clearly articulated strategy, financial resources available/or to be made available, human capital with specific knowledge, capabilities or digital/analytics skills, agile approach to working duties and an organizational culture with a risk affinity. The best example of a digitally driven organization is fintech companies.

The effective and business supporting legislation for the digital companies in effect is crucial for the smooth operation of any business in the digital environment.

4. Actors of the banking industry in the EU

Most National Banks of the members of the European Union, as e.g. the Slovak National Bank is in the Single Supervisory Mechanism (SSM)¹, which is the first pillar of the Banking Union in the EU. Under the SSM, the European Central Bank (ECB) is the central conservative supervisor of all financial institutions in the euro monetary area and non-euro EU countries that decide to join the SSM. The ECB directly supervises the largest banks, while the national banks act as national supervisors monitoring the other commercial banks in the country. The ECB and the national supervisors work closely together to check that banks comply with the EU banking rules and act immediately when problems arise.

The European Supervisory Authority (European Banking Authority) ('EBA'), established by Regulation (EU) No 1093/2010 of the European Parliament and of the Council (5), EBA's responsibilities comprise in developing and contributing to the consistent

¹ Council Regulation (EU) No 1024/2013 establishes the SSM as a system to supervise banks in the euro area and other participating EU countries.

application of the single rulebook applicable to all Member States and in enhancing convergence of supervisory practices throughout the European Union as a whole² [9, 10].

The central bank is an independent national authority in charge of monetary policy, bank regulation and providing financial services. Central banks issue regulations for their members i.e. commercial banks and supervise financial market participants. For instance, regulations are related to the reserves due to acid asset losses to strengthen the stability of the financial system, deposit protection etc. [11]. The National bank apart from other activities, also supervises financial institutions providing payments of a limited or unlimited scale, financial institutions of electronic money (of a smaller volume scale) Financial institutions whose average monthly payments performed (within last 12 months) have not gone over 3 million Euros, those ones operate without a banking license and these are financial institutions of limited financial payment services. Otherwise, over 3 mil Euros, a banking license is required in the EU so as in Slovakia and Czech Republic.

To get to the point of the contemporary situation in banking many relevant achievements have been marked throughout history, as significant landmarks that remind the commencing journey of a “quasi” banker from Babylonia functioning as a safe depositary up to present bankers almost invisible in the world of digital banking.

4.1 Traditional versus digital banking

The history of banking dates back to 2000 BC, when the wealthy people needed to deposit their money safely. The brief history highlighting and summarizing the milestones that significantly influenced development process of the banking industry is illustrated in the series of **Tables 3–5** starting with the function of depositaries until we gradually reach the level of digital banking of the 21st century.

4.1.1 Banking industry: beginnings up to 19th century

2000 BC	Origin of an authorized depositary, predecessors of the banking in Babylon empire, valuables deposited with a trustworthy person, depositary -paid service Greek churches – due to deposit protection, safe deposits, vaults - special rooms in the churches at the beginning free service, only gifts donated to the priests, later paid service, analogy with a contemporary, strong room in the banks.
700 BC	Origin of currency, first coins, in 1600 BC, the precious metals used for payment, that many years later led to coins rise, but bank notes used first time in China 700 AD.
400 BC	Origin of the bankers, evolved from depositaries
1200 AD	The first bank in 1157 in Venetian bank in Italy
1400 AD	The boom of the banks - Florence, Milan, Venezia, Siena (here still exists the oldest functioning bank of the world)
1600 AD	17th century is characterized by the modern banking rise, due to the state regulation needed, central banks arose. Origin of the Central bank-1668 AD Sveriges Riksbank
1872 AD	The first cashless electronic transfer of money using telegraphic network by Western Union

Table 3.
History of banking beginnings - up to 19th century.

² Regulation (EU) No 1022/2013 aligns the existing legislation on the establishment of the EBA to the modified framework for banking supervision.

1950 AD	Mainframe computer - the first hall computers for processing information and numerous transactions
1958 AD	First credit card – Bank of America (later Visa) (with magnetic strip, verified by a cardholder’s signature)
1967 AD	ATM machine, the first cash machine in London, Barclays Bank, with first time used PIN for verification
1968 AD	Clearing system, in Great Britain, first time automated clearing system BACS (Banker’s automated clearing services) needed due to the use of cheques and promissory notes since 18th century
1980 AD	The first telephone banking, by the bank Girobank in Great Britain
1984 AD	The first online shopping in Tesco, using the videotext through television, in Great Britain
1984 AD	The first debit card
1994 AD	The first chip and PIN – technology used in debit and credit cards in order to process the payment or to withdraw cash from ATM, a cardholder must authorize the transaction by entering personal identification. EMV -technological standard for smart payment cards, introduced in Europe, a payment method (Europay, Mastercard and Visa created this standard)

Table 4.
History of banking – 20th century.

4.1.2 Banking: 20th century

The development in the sector of financial technologies is not entirely new, but it definitely effected the financial institutions and commercial banks. It is worth focusing on the era beginning in 1950s and 1960s when the financial industry began its transition from an analogue to a digital industry [12]. The important milestones such as launching of online banking, latest IT developments in internal system of banks and spreading of World Wide Web and the Internet usage led to revolutionary innovations, the most relevant are summarized in the **Table 5**.

4.1.3 Banking: 21st century

Technology progress opened opportunities towards new ways of managing finance, or providing payments among businesses. Bloomberg, a media that delivers business and market news and data and analysis, invented a software called Bloomberg Terminal aimed at professionals for a use in the financial services sector by being able to summon real-time market data. The company is considered as one of the first Fintech companies [12].

4.1.4 Online banking versus digital banking

The global banking arena is going through huge alterations. Digital technology is bringing the progress that has an incredible impact on the way how money is managed. Digital-only alternatives compete with traditional banking. Digital banking is the digitization (or a shift into an online space) of all the traditional banking activities and programs services that were historically only available to customers when physically inside of a bank’s branch (**Table 6**).

This includes activities: a) money deposits, withdrawals, and transfers; b) checking/saving account management; c) applying for financial products; d) loan management; e) bill pay and f) account services.

Traditional banks are showing initiative in transforming their operations into digital banking services to attract a millennial generation customer with modern, digital offerings. BNP Paribas (France), JP Morgan Chase (USA), Santander (Spain), HSBC, Barclays (UK), Bank of America (USA), UniCredit (Italy),

History of digital banking	
1993	Temenos AG is founded, a banking software systems provider to retail, corporate, universal, private, Islamic, microfinance, community banks.
1994	Online banking -first time introduced by Stanford Federal Credit Union via their website Microsoft offers integrated online banking via its application Microsoft Money personal finance, 100,000 households in the USA started to use it.
1997	'Tangerine' start - becoming the first digital-only bank in Canada.
1998	First Internet Bank starts, becoming the first digital-only bank in the U.S.
2000	First client-side account aggregation invented by eWise in Europe in 2000. eEwise is considered as the origin of FinTech companies, a pioneer of Financial Data Aggregation and Money Management APIs, a market leader of Personal Money Management solutions that are based on the patent: personal Data Vault technology. In the USA similar services were introduced by the Yoodle (an innovative software development company providing CMS, customs mobile application and web application services in the USA.
2002	Avoka was founded to help banks and financial institutions in their digital transformations.
2007	The first contactless card introduced in Europe, in 2011 the bank Barclays launched the contactless card for public.
2007	The launch of the iPhone begins shifting digital banking from desktop computers to smartphones. Kony, Inc. is founded to help banks transform their banking operations with a cloud-based mobility, omnichannel and internet-of-things systems and services software platform.
2011	The first payment by the phone launched by Google via application Google Wallet, today known as Google Pay Send.
2016	Millennials succeed in shifting digital banking preferences, signaling to banks that they must move all services online.
2018	Temenos acquires Avoka, the leading provider of digital customer onboarding solutions for financial institutions.
2019	Temenos launches Temenos Infinity, a breakthrough digital front office product with the most advanced cloud-native, cloud-agnostic, API first technology and design led thinking. Temenos acquires Kony, the leading provider of mobile banking apps that support conversational interfaces, artificial intelligence, augmented reality and wearable technologies. According to Temenos' 2019 State of Digital Banking Report, 65% of digitally active large banks reach the 'Digital Promised Land'.

Table 5.
History of banking – 21st century.

Online banking is made with fiat money	Digital banking is made with virtual money
Internet banking/virtual banking/e-banking primarily focuses on	Focuses on
<ul style="list-style-type: none">• Remote deposits,• Money transfers,• Bill pay• Basic online management of accounts	Digitizing the “core” aspects of banking: every program and activity undertaken by financial institutions and their customers

Table 6.
Differences between online and digital banking.

RBS Group (Scotland), DBS Bank (best digital bank in the world - Singapore), Juniper (BBVA Bank-Spain) are among the top 10 digital banks that succeeded the transformation process [13].

4.1.5 Fintech companies

Digitalization is indeed a breakthrough, also in the world of finance affecting the functioning of all financial services and the way banks provide their services. Most of the changes were a natural result of internal needs of the banks in order to provide higher quality services to customers. The banks themselves took an initiative of innovating their services at the end of the 20th century and beginning of the 21st century. Global economic results were growing, companies invested into modernisation, as many opportunities arose for new players to compete for a market share due to increasing customers’ demand. Bankers started placing their goals before the goals of satisfying their clients’ needs, not always playing fair that also led to entrance of new competitors. This boom was ceased by the financial crisis, many banks bankrupted, in many cases banks revealed malpractices of the management, corruption and the companies lost the trust towards their banking institutions. Money being as scarce resource, in some way forced companies to hide cash flows or looking for alternatives offering payments much cheaper and even more efficiently. These also were reasons leading to fintech companies rise.

Fintech as “technologically enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services” [14]. Some fintech companies began as start-up companies, some of them are already well-established in the global market, representing a sophisticated competitor in the market place. Online shopping developed because of the possibility to make/receive payments, via internet enabled by companies such as PayPal [15]. The need for the capital might be solved by raising the capital through a crowd funding or peer-to-peer lending. **Figure 1** shows the fintech adoption of 6 selected countries according to E&Y survey since 2015.

E&Y survey shows very successful results for FinTech industry that has evolved much faster than the official prediction was. FinTech challengers at present have transformed into professionally managed companies with operating worldwide with a variety of products offered globally. Emerging market countries are world leaders, both China and India achieved the adoption rate of 87%, followed closely by Russia and South Africa, both with 82% adoption. Results for developed countries are best for the Netherlands, the UK and Ireland [16].

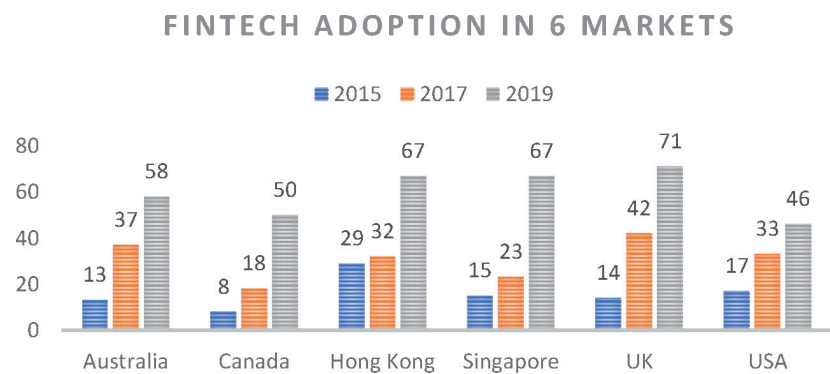


Figure 1.
FinTech increase within 5 years in selected countries.

Challengers and incumbents now compete and they also face a new competitive threat from outside the financial industry. Non-financial services enterprises e.g. retailers, technology platforms, and automakers are evolving their own technology-enabled financial services offerings. These businesses make use of old, existing relationships with customers to offer products enlarged by complementary service offer e.g. insurance and lending, taken by old customers before from the financial providers.

68% of consumers would consider a financial product offered by a non-financial services company. They have trust to retailers (45%), telecommunication firms (44%) as service providers. They prefer using money and making payment using FinTech services e.g. digital-only banking and multi-merchant eWallets [16].

Across the five markets China reaches the highest FinTech adoption rate at 61%. The adoption rate globally is 25%.

SMEs select FinTech globally for offering: a) a range of services/product functionality and features - 66%; b) availability 24 hours a day, 7 days a week - 55%; c) ease in setting up, configuring and using the service 53%, d) more attractive rates/fees - 39%; e) compatibility with daily operations and infrastructure - 38% and f) trust in the providers' team and their reputation - 31% [16] (Table 7).

The next paragraph illustrates examples of selected digital banks [17]:

- a. Neat (Honk Kong, 2015)- it offers corporate Master cards with competitive exchange rates, budget management software and recording of transactions for expensing purposes. The Neat business account is principally aimed at startups and SMEs, as an alternative to establishment of national business banking options.
- b. Doconomy – (Stockholm, Sweden, 2018) - Eco mobile banking service. Doconomy is aimed at users' understanding the environmental impact of their purchasing decisions. Its first solution DO - the world's first credit card enabling users to track their carbon impact and compensate by investing in sustainable, positive impact projects.
- c. Nubank, leading fintech in Latin America (Sao Paolo, 2014) launched first fee-free product credit card.
- d. Number 26 -N26 – a German digital bank (2013) – one of the cutting edge-digital banks, it offers its clients a current online account, with an intuitive application, money management solutions and fee-free foreign currency withdrawals.
- e. Up - Banking (Melbourne, Australia, 2017), a product of collaboration between banks Ferocia and Bendigo Bank. It offers a standard card and current account service; it provides a financial insight – analysis of spending for its users.
- f. Tangerine Bank – a subsidiary of Scotia Bank (Canada, 2012) offers more specialized products (backed by a larger traditional bank) -a money back credit

SME globally used FinTech services in 2019 (in last 6 months)				
China	USA	UK	South Africa	Mexico
61%	23%	18%	16%	11%

Table 7.
SME FinTech adoption rate.

card, low-fee investing, business accounts, GICs, mortgages, tax-free savings accounts etc.

- g. Three UK banks: Starlink Bank (2014), a provider of business banking services, digital checking account; Revolut – challenger banking (2018), online service enables its users to convert money into 24 currencies, up to 5000 GBP a month, money management tools and engages in cryptocurrency trading and Monzo – UK challenger bank with free international payments, money management advice [17].

4.2 Business Payments and Legislation for the EU Banking Industry

The past decade is marked by accepted regulations introduced for banking payment services. E-money licenses (regulated under the second Electronic Money Directive 2009 — 2EMD) are granted to eMoney issuers for the issuance of eMoney.

The Payment Services Directive (PSD) approved in 2007 and effective for use in 2009, permitted payment institutions (PIs) to enter payment services markets. PIs are non-bank business entities that execute payment services of a lower risk. PSD was proposed to guarantee the equal conditions for payment services throughout the Europe, fast service, protecting the customer and a variety of services.

The PSD2 followed the first Payment Services Directive. PSD2 enables two new financial service providers to enter the market:

- Payment initiation service provider (PISP): is able to develop a software bridge between a payee (e.g., a merchant) and payer (i.e., consumer) in order to verify availability of the funds needed for a transaction at payer's account and to initiate a payment, money is transferred from the payer's account to the payee's one.
- Account information service provider (AISP): is able to aggregate online information on one or more payment accounts for a user, accessed via online interfaces of the account servicing payment service providers (i.e., banks).

Introduced changes have had a significant impact on banks and other payment service providers. A new third-party entity enters as a payment provider between the bank and a customer. Banks have to allow the third parties to integrate with their online banking platforms and banks have to provide Third Party Payment Service Providers access to bank's customer account's information, with the consent of the customer. The problem may be trust that is built with time and providing reliable and high-quality service. Banks used to represent a trustworthy business entity [16].

The objective of the EU is to ensure the common payment area, where the fees and terms of payments are equal for citizens and business entities across the EU. Electronic payments, or cash collections, debit/credit card payments, smart phones and online payments. Directives created a base for SEPA payments (Single Euro Payments Area) - fast payments denominated in EURO within EU member states.

5. Digital currency – Fiat currency versus virtual currency

Nowadays, the use of electronic money is growing in popularity, electronic money is a broad term for any money, currency or asset lacking physical substance – it may include representations of a sovereign currency or claims on a real-world commodities [18]. Digital and virtual currencies can either be

centralized or decentralized. A centralized currency is any currency that is issued and maintained by a central group or organization, while decentralized currencies are not. For instance, Bitcoin is fully decentralized and its most unique feature is no central authority guaranteeing it or having control over it, as central banks are for conventional currencies [19, 20]. Many investors considered Bitcoin as a speculative bubble rather than a proper currency system [20, 21]. Nowadays, the value of a currency reflects the best judgment about the monetary policy and the “health” of its economy [22].

Virtual currency is distinguished from fiat currency (real money or national currency), i.e. the coin and paper money of a country that is designated as its legal tender. However, it is distinct also from e-money (digital representation of fiat currency).

Digital currency is digital representation of either virtual currency (non-fiat) or e-money (fiat) and it is often interchangeably used with the term “virtual currency”. Cryptocurrency refers to a math-based, decentralized convertible virtual currency that is protected by cryptography [23].

Central bank digital currency (CBDC, also called digital fiat currency, digital base money) is the digital form of fiat money (a currency established as money by government regulation and monetary authority or law).

The Bank of England was the first institution to initiate a global discussion on the prospects for the introduction of a CBDC. The central bank of Sweden, Riksbank, is, however, the closest to consider its implementation and started testing technical solutions for its e-krona in 2020 (Table 8).

The European Central Bank (ECB) assumes so far conservative and wait-and-see attitude towards CBDC.

The main risk is linked with the fear of introducing a CBDC would precipitate potential bank runs and thus make banks’ funding position weaker.

5.1 Central Bank Digital Currency (CBDC)

Bank of England’s highlights primarily two relevant models for organizing a CBDC system, so does the Central Bank of Norway [25, 26]:

- **an account-based model**, both value storage and transaction processing are centralized. Money is held in accounts and moves from one account to another within the system;

Digital currency is a digital representation either of			
Virtual currency (VC)			
Fiat currency (money) Real money/national currency, e-money	Central Bank Digital currency (CBDC)		Non-fiat currency (money)
Centralized	Decentralized		
versus Fiat money - Paper bank notes, coins “ - Legal tender” Country’s officially used currency	E-gold	CB issued cryptocurrency Sovereign “SOV” “Petro” (CBCC)	Cryptocurrency Math-based convertible VC - Bitcoin

Table 8.
Digital currency [24].

- **a value-based model**, value storage and processing are decentralized. Money is stored locally in a payment instrument, typically a card or smartphone application. Transfers take place directly between parties, without the intermediation of a central third party.

Hybrid variants that combine elements of both primary models are also possible. An example is a model where the money is stored locally, but transactions need to be verified by a third party with a register of all transactions and holdings.

A third model, which can also be considered a hybrid variant, is based on distributed ledger technology (DLT).

Criteria that must be met by a CBDC: three basic functions of money: a) a means of payment that can be used to transfer value between parties, for example in connection with the purchase of a good or service, b) a practical storage of value, and c) a unit of accounting facilitating a value comparison of different goods and services [22].

CBDC can enable a wider access to central bank money, and this would open new opportunities for payments and the way central banks maintain monetary and financial stability. The newly created financial ecosystem could include the following participants: payment providers, mainly payment service providers and electronic money institutions and other non-bank financial institutions.

Although the term CBDC includes the words ‘digital currency’, CBDC would be something fundamentally different from ‘cryptocurrencies’ (or ‘crypto-assets’), such as Bitcoin. Many crypto-assets are privately issued and not backed by any central party. They are not considered a currency or money because they do not meet all three criteria, mentioned above. They are too volatile to be a reliable storage of value, they are not widely accepted as a means of exchange, and they are not used as a unit of account. It is stressed that despite the surge in interest in cryptocurrencies, they are no substitute for cash or payment cards, since cryptocurrencies such as Bitcoin are failing as a form of money and have shown clear signs of being a financial bubble, but their technology could improve the financial system in future [27].

5.1.1 Wholesale and retail CBDC projects

Two main types of CBDC, wholesale and retail sale CBDC are at focus. **Wholesale CBDC** has been the major area of focus, with several central banks around the world launching initiatives as part of an effort to modernize their payments systems.

Wholesale CBDCs are restricted-access digital tokens for wholesale settlements such as interbank payments or securities settlement and are meant to be used by commercial banks, clearing institutions or any other entity that traditionally have had access to central bank reserves. Experiments in this field generally focus on replacing current technologies to realize efficiency gains [28].

Retailsale CBDCs - in Sweden, for example, Riksbank began testing its e-krona digital currency meant for retail use in February 2020. If the e-krona comes into circulation, it would be used to simulate everyday banking activities such as payments, as well as deposits and withdrawals from a digital wallet [29, 30].

In China, the country’s central bank has been working on a retail CBDC that would act as an alternative to cash and coins for retail use. In March 2020, the People’s Bank of China (PBoC) started trialing the state-run digital currency in several cities including Shenzhen, Suzhou, and Chengdu, as well as a new area south of Beijing, Xiong’an, and areas that will host some of the events for the 2022 Beijing Winter Olympics [31].

A survey among 66 central banks by the BIS found that a large number of central banks around the world are actively developing retail CBDCs. More than 80% of them are currently working on a CBDC project, whether wholesale or retail [31].

5.2 CBDC efforts worldwide

5.2.1 China

China has already been among the global leaders in the transition from a cash to a cashless economy powered by blockchain technology. China's new system is built on digital wallets, QR codes, and utilizing own big tech firms, such as Alipay operating through Alibaba (China's version of Amazon) and WeChat Pay operating via Tencent (China's version of Face-book) [32]. China's system largely disintermediates banks from payment transactions robbing banks of an important and long-standing source of revenue. It creates an alternative payment ecosystem with different incentives between merchants, consumers, and payment system providers.

The PBoC confirmed China's CBDC continuation in pursuing its original plan. As the coronavirus epidemic has caused to speed up global digitization, people are all concerned about the PBoC's issuance and circulation of digital currency, the specific progress is expected with worries [31]. Nowadays, more than 95% of daily micropayments are realized through mobile payments or internet payments.

The Chinese authorities have made an effort to reduce the use of paper money in the economy in a desperate attempt to control the spread of Coronavirus. Authorities still do not have an answer about the speed of the corona spreading among people. In order to control the spread of the deadly coronavirus, the Chinese Central Bank recently announced removal of paper money out of circulation. The People's Bank revealed the plan of disinfecting notes from the economy. The central bank further gave instructions to return disinfected notes back to circulation after holding them minimum one-two weeks depending on a riskiness of region locality. The Bank recommended used notes originating from Hospitals, Wet markets and public transportation to be incinerated [31].

There are numerous established cashless digital payment solutions already established in China. Platforms such as Alipay and WeChat allow users to shop all over the country from the comfort of their smartphones or computers [32]. The bottom line remains paper money as a medium that can spread multitude of human diseases in the most blistering possible way making it a dangerous medium of exchange between humans.

5.2.2 Sweden – the Riksbank's e-krona pilot

The recent sharp decrease in the use of cash in Sweden has made it more difficult to use cash in certain parts of Swedish society. The Riksbank sees potential problems with the marginalization of cash and has therefore initiated a pilot project to develop a proposal for a technical solution for a central bank digital currency, an e-krona that can work as a complement to cash, based on Distributed Ledger Technology (DLT).

Raisons d'être for e-krona - there is no digital state money available to the general public, however, and digital money and payment methods that are available are provided by private market players. The digital money is, therefore, a claim on a private player in contrast to cash which is a claim on the state. An e-krona would offer the general public continuation of accessing the central bank money but in digital form., as it was possible with classic cash.

To be able to, at this stage, test how an e-krona might look and function, the Riksbank is running a pilot project with Accenture to construct a technical platform for the e-krona. E-kronor shall be available 24/7/365 and payments shall be instant. The pilot project will also examine the possibility of building a technology in which the e-krona can be used offline. Accenture's assignment in the e-krona pilot project will run until February 2021.

DLT is a technology that allows to keep databases operated by independent parties synchronized. The network ensures that only valid transactions are recorded. Each participant in the DLT network runs one or more nodes. In the e-krona network, the nodes store e-kronor and receive, validate and forward e-krona transactions.

The test environment will be structured in two tiers. In the first tier, the Riksbank will issue e-kronor to participants in an e-krona network, such as banks. In the second tier, participants will distribute e-kronor to end-users. Similar to today's cash, only the Riksbank will be able to issue and redeem e-kronor.

Participants in the e-krona network distribute e-kronor to end-users and end users can then use various payment methods for e-krona. The consumer or merchant controls their e-kronor with a digital wallet installed as an application, for example, in mobile phone or in the merchant's cash register (terminal). In addition to a mobile application, the pilot will also develop a digital wallet for use in smartwatches and cards. In the future, digital wallets could be created for additional device types and integrated with a payment service provider's mobile application [29, 30].

To be able to use e-kronor for payments, the digital wallet must first be activated at a participant connected to the e-krona network. After activation, the user can, for example, receive e-kronor as payment from another user, pay a retailer with e-kronor, make transfers from their bank account to the digital wallet (and vice versa), and check their e-krona balance.

The e-krona network is private and only the Riksbank can approve and add new participants to the network. All transactions in the e-krona network occur separately from existing payment networks [29, 30].

5.2.3 Bank of Japan and CBDC

The Bank of Japan reported the examination of the concept and role of digital currencies if placed in the general monetary system. The report "Digital Innovation, Data Revolution and CBDC," explains classification of CBDCs into possible two categories: one used by the common public instead of fiat money; and large-value settlements, that are based on the Bank of Japan deposits and adopt modern technologies like blockchain [33].

5.2.4 Norwegian Central Bank developing plans to move to cashless society

The Central Bank of Norway, Norges Bank, also added the study on Central Bank Digital Currencies (CBDCs) dealing with the necessity for forming Norway's cryptocurrency and evaluates this proposition as the one that should have a positive impact on the ability of banks and other financial institutions in offering loans.

The increasing urgency of tackling this matter is a discovery that the contingency of issuance of CBDCs has become more significant because of technological advances and cash usage reduction. Momentarily, Norges Bank has only completed the initial stage of analyzing the need to form a digital currency. There is a plan of continuation if a particular matter requires it [26].

5.2.5 USA - digital dollar

A digital dollar issued by the Fed would enhance scope, access, diversification and resilience in dollar payments and support retail, wholesale and international payment use-cases:

- **Retail payments** on-line cannot be conducted in central bank money. Banknotes remain important in particular to make small payments, although

on average physical cash is in decline as a percentage of broader monetary aggregates. A digital dollar would offer a new choice for digital transactions, offer instantaneous peer-to-peer payments, and provide diversification of payment rails, in particular, to grant greater autonomy, especially in times of heightened financial distress. A digital dollar could be distributed to the end-user through commercial banks and trusted payment intermediaries and offer additional mechanisms to ensure and facilitate financial inclusion.

- **Wholesale payments** rely on national payment systems and are usually conducted via inter-bank clearance using central bank money to settle securities and other large-value payments. The important role of central bank money to conduct large value payment transactions implies that access to central bank money has important distributive effects. A digital dollar would offer more diversified access to large-value payments and support the emergence of digital financial market infrastructures [34].
- International payments cannot be conducted digitally in U.S. dollars. A digital dollar would allow establishing more direct monetary relations, reduce risks, address persistent deficiencies of the existing correspondent banking model, enhance competition in international payments and advance financial market integration. The use of a digital dollar in cross-border and offshore transactions would allow making digital payments in central bank money for remittances and large-value payments, including the possibility to conduct offshore securities settlement [34].

A Central Bank Digital Currency (CBDC) would be an electronic form of central bank money that could be used by households and businesses to make payments and store value.

5.3 “De-cashing” - moving to cashless society?

European banks are keen to minimize the rotation of cash and more often propose to shift to digital banking usage. Alike, Norges Bank confirmed continuation of cash issuance as long as there is a demand for it. In the case of cash usage declining, a CBDC can be an alternative to deposit money. The primary purpose of a CBDC is to ensure confidence in money and the monetary system. E-money and crypto-assets are hardly viable alternatives in the near and medium-term.

In addition, the Bank of France also perform out multiple trials to check the integration of a CBDC for cross-bank transaction settlements and encourages all the interested and qualified candidates from the EU to submit their applications [35]. Having followed France’s lead, the Bank of Korea has launched a pilot project to test a digital won that will last for 20 months. The system will first be used for micro-payments, and if the tests are successful, it might be fully deployed in late 2021. They are responsible to act and rely on the results of testing before making a decision for the end-users.

A consortium of powerful interests that include Visa and Mastercard, the International Monetary Fund, billionaire Bill Gates and the US Treasury have commenced the process of lobbying for cash to be abolished worldwide and replaced with digital-only currencies. This is still not entirely supported, because people care a lot about their right to use cash. Because of this resistance of the population the consortium may only use indirect measures, like regulations for banks that make cash more inconvenient and expensive for them, a cost, which they pass on to customers. Is it ethical? Many may raise this question, but power what consortium

of the well-off companies have is abused by them for their own benefits. There has even been a study elaborated by the IMF that recommends such indirect measures to get around the resistance of the cash-oriented population [36, 37]. There are arguments where digital payments are safer, maybe much more difficult to be abused by corrupted companies or politicians, therefore the decision should be made with a caution, because people cannot be forced to use digital cash if they do not have a trust towards it. It may have serious psychological consequences on this vulnerable part of population.

Switzerland as the leader in numerous economic sectors, as a driver of innovation, it possesses characteristics that make it a suitable candidate for further development of Blockchain. The Swiss Confederation should aim to become the central global contact for Blockchain opinion leaders, start-ups and related firms at the cutting edge of Blockchain innovations [38].

Czech Republic also sees attractiveness of blockchain which would enable “central bank digital currency bypass the financial sector and issue money to end-users directly through the balance sheet of the central bank. Similarly to cash, digital money would constitute a liability of the central bank. Instead of being the bank of banks, the central bank would become the “bank of the people” or “for the people”. Each household or business entity might hold an account at the central bank directly, not using the services of the intermediary [39].

5.3.1 Better Than Cash Alliance BTCA

Based at the United Nations, the Better Than Cash Alliance is a partnership of governments, companies and international organizations that accelerate the transition from cash to digital payments to advance the Sustainable Development Goals. The Alliance has 75 members (national governments from Africa, Asia-Pacific and Latin America, global brands across the agriculture, garment and fast-moving consumer good sectors, UN agencies and humanitarian NGOs) which are committed to digitizing payments to boost efficiency, transparency, women’s economic participation and financial inclusion, helping build economies that are digital and inclusive [40].

Main reasons to support digital money are as follows:

- Cost savings through increased efficiency and speed
- Transparency and security by increasing accountability and tracking, reducing corruption and theft as a result
- Financial inclusion by advancing access to a range of financial services, including savings accounts and insurance products
- Women’s economic empowerment by giving women more control over their financial lives and improving economic opportunities
- Inclusive growth through building the institutions that form the bedrock of an economy and the cumulative effect of cost savings, increased transparency, financial inclusion, and greater women’s economic empowerment [40].

5.3.2 EU situation

Digitisation is transforming the European financial system and the provision of financial services to Europe’s businesses and citizens. “In monitoring the evolution and uses of technology, the ECB respects technological neutrality. We do not serve

technology – technology serves us. We will only introduce a digital currency if we become firmly convinced that it is both necessary and proportionate to fulfil our tasks in ensuring the stability of our currency. If and when the time comes, we want to be ready – and we will be ready” [41].

The financial ecosystem is continuously evolving, with technologies such as Blockchain, Artificial Intelligence and the Internet of Things moving from the experimental phase, to pilot testing and the deployment stage. Indeed, digitisation of the financial sector can only be expected to accelerate because of the Coronavirus pandemic. At the same time, as people access to their bank accounts and other financial services remotely, and as financial sector employees work remotely, the digital operational resilience of the financial sector has become more important than ever. Digital finance can contribute to tackling the Coronavirus crisis and its consequences for citizens, businesses, and the economy at large in some ways. For several years, the European Union have been embracing digitisation and innovation in the financial sector [42, 43].

5.3.3 CBDC fighting Covid-19 plague

One way of ceasing Coronavirus to be spreading is to reduce the use of cash (paper money) in the economy. The COVID-19 pandemic might push the development of CBDC. The current situation challenges the momentum of a try and implementation of these initiatives. As coronavirus is raging in the entire world and countries are in a strict lockdown, the society looks for a digital alternative to traditional cash payments.

As coinidol.com, a world blockchain news outlet has reported that many countries including China and Hungary are looking to minimize cash use. It might even lead to an overall decrease in cash circulation. In spite of debates on Central Bank Digital Currencies (CBDC) have been ongoing for a long time, we are witnessing the attempts and efforts of practical implementation also under these coronavirus pandemic times.

The coronavirus crisis is forcing the EU to redraw its digital strategy and important legislation is now likely to be delayed, according to several people involved in the process. Working remotely is also causing considerable strain on the EU's IT system [44]. To make sure the compliance requirements are met, banks will need the digital support of Fintech firms more than ever.

6. Digital transformation challenges

Each industry, but especially financial and banking industry are exposed to enormous progress in the technology, digitisation, social media and mobility that may be used to benefit the people and companies. As there are steps of governments introducing and preparing to move ahead from cash to cashless economy, the success of the digital transformation can be influenced by several factors, for instance:

- a. The level of internet in the countries, its speed and price availability for companies, institutions and population.
- b. Cybercrime, risk of piracy versus security issues

The digital media industry has not been able to fully monetize possible losses due to the cybercrime and piracy. Weak IP regulations and ineffective enforcement has discouraged players to produce original content and IP.

As the digital channel in financial services continues to evolve, cyber security has become a business risk, rather than simply a technical risk. Security breaches can damage reputations and destroy trust, thereby jeopardizing the investments made in digital solutions. Hacking and losses caused by it discourage supporting investment into absolute work digitalisation.

- c. Trust towards highly digital products, fear of losing identity, fear of being monitored by SOMEBODY, loss of control.
- d. Online payments and their understanding: One of the primary forces impeding the growth of subscription and pay-per-view revenue models are the hassles that the consumer faces while making payments on digital platforms, even when they are willing to pay. This is on account of low credit card penetration, fear of using net banking and credit cards online due to security threats and the lack of experience of making transaction online.
- e. Speed of introducing the knowledge and training of required skills into each level of education.
- f. Social impact on people, isolation leading to individualism.
- g. Potential collapse of the system, losses made by this

7. Conclusion

Digital currencies and the emergence of 'Big Tech' are simply the most visible examples of a fundamental transformation. It is a change that is bringing innovation and making many European cities hubs of a demonstrating new FinTech culture. Success of a digital business comprises in an elaborating and implementing digital strategy thoroughly.

The EU has been at the forefront of enabling innovative Fintech solutions, in particular in the payments sector. EU legislation in this area is a key to promoting a transparent, innovative and competitive payments market in the EU. The Electronic Money Directive (EMD) and the first Payment Services Directive (PSD) introduced a licensing regime that allows the issuance of electronic money and the provision of payment services by non-bank financial institutions. This enables the rise of several FinTechs operating in the payments sphere; a trend that has accelerated via new business models based on data sharing.

The EU's 2018 Fintech Action Plan has also supported these developments, and its implementation has recently been concluded with a look to the future by the Expert Group on Regulatory Obstacles to Financial Innovation [45].

In contrast to crypto-assets, a central bank digital currency would be centralized, and so a blockchain or other distributed ledger would not be required (or useful).

More research is required in confirming or refuting possible pros and cons arguments to eliminate subjective opinions (**Table 9**).

New technology in particular has both encouraged and enabled utilizing it in the real life, especially in the financial sector and in turn the market with customers in it, been fuelled by a huge deluge of new providers and products, all eager to enter the payments space.

Cash is still a leader for many countries, therefore to achieve 100% cashless society is not feasible for near future, but the country, government, companies and population must be prepared to face this challenge.

Pros	Cons
Technological efficiency	Requirement of employee requalification in each industry
Financial safety	
Financial inclusion	Lack of qualified labour force
Safety of payments systems	High-quality of IT control required
Protection of money as a public utility	Abuse of IT positioning
Preventing illicit activity (Tax Collection, Combating crime)	Lack of finance/finance redirected into the area which brings benefits to small group of mankind
Banking competition	Innovation race
Monetary policy transmission	Loss of financial control
Issuance of the money under control	Reliance on IT expertise performing audits
	Collapse of the system
Preservation of seigniorage income	Increase in energy consumption

Table 9.
Room for future research.

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References

- [1] Verhoef P.C., et al.: Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*. <https://doi.org/10.1016/j.jbusres.2019.09.022>
- [2] Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O.: How big old companies navigate digital transformation. *MIS Q. Executive*. 2017; 16(3):197-213.
- [3] Li, F., Nucciarelli, A., Roden, S., & Graham, G.: How smart cities transform operations models: A new research agenda for operations management in the digital economy. *Production Planning & Control*. 2016; 27(6):514-528.
- [4] Kane, G.C., Palmer, D., Philips, A. N., Kiron, D., & Buckley, N.: Strategy, not technology, drives digital transformation. *MIT Sloan Management Review* an *Deloitte University Press*. 2015; 14:1-25.
- [5] Pagani, M., & Pardo C.: The impact of digital technology on relationships in a business network. *Industrial Marketing Management*. 2017; 67:185-192.
- [6] Teece, D. J.: Business models, business strategy and innovation. *Long Range Planning*. 2010; 43(2-3):172-194.
- [7] Zott, C., & Amit, R.: The fit between product market strategy and business model: Implications for firm performance. *Strategic Management Journal*. 2008; 29(1):1-26.
- [8] Boston Consulting Group. The Four Pillars of Digital Transformation in Banking [online] 2019. Available from: <https://thefinancialbrand.com/71733/four-pillars-of-digital-transformation-banking-strategy/>
- [9] European Commission <https://ec.europa.eu/info/business-economy-euro/banking-and-finance/>
- [10] Lex <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1022>
- [11] Amadeo, K.: Central Banks' Function and Role. *The Balance*, 2018. [online] Available at: <https://www.thebalance.com/what-is-a-central-bank-definition-function-and-role-3305827>
- [12] Teigland, R, Siri, S., Larsson, A., Moreno, A.P., Bogusz, C. I. The Rise and Development of FinTech: Accounts of Disruption from Sweden and Beyond. London, Routledge, 2018, p. 4.
- [13] Marcus Lawrence. Top digital banks [online] 2018. [cit. 2018-01-10]. Available from: <https://www.fintechmagazine.com/top10/top-10-digital-banks-0>
- [14] Monitoring of FinTech, Financial Stability Board, [online]. 2020. Available from: <http://www.fsb.org/whatwe-do/policy-development/additional-policy-areas/monitoring-of-FinTech/>.
- [15] The official websites of the company PayPal. [online] 2018. Available from: <https://www.paypal.com/uk/webapps/mpp/about..>
- [16] The official websites "EUR-Lex", the details regarding national transposition of the PSD2. [Online] 2018. Available at: <https://eur-lex.europa.eu/legal-content/EN/NIM/?uri=CELEX:32015L2366>.
- [17] Ernst & Young: EY FinTech Adoption Index 2019. 2019, [cit. 201804-20]. Available from: <http://www.ey.com/blockchain+Dig.%20Economy/ey-global-fintech-adoption-index-2019.pdf>
- [18] Ferebauerová, R., Pekárek, O. et al. 2019. *Digitální ekonomika a společnost*. 1. vyd. České Budějovice: VSERS, 113 s.

- [19] Bouri, E., Molnár, P., Azzi, G., Roubaud, D., & Hagfors, L. I. 2017. On the hedge and safe haven properties of Bitcoin: Is it really more than a diversifier? *Finance Research Letters*, 20, 192-198. doi:10.1016/j.frl.2016.09.025
- [20] Selmi, R., Mensi, W., Hammoudeh, S., & Bouoiyour, J. 2018. Is Bitcoin a hedge, a safe haven or a diversifier for oil price movements? A comparison with gold. *Energy Economics*, 74, 787-801. doi:10.1016/j.eneco.2018.07.007
- [21] Kristoufek, L. 2013. Bitcoin meets Google Trends and Wikipedia: quantifying the relationship between phenomena of the Internet era, *Sci. Report*. 3 . 3415.
- [22] Bariviera, A. F., Basgall, M. J., Hasperué, W., & Naiouf, M. 2017. Some stylized facts of the Bitcoin market. *Physica A: Statistical Mechanics and Its Applications*, 484, 82-90. doi:10.1016/j.physa.2017.04.159
- [23] Financial Action Task Force. Virtual Currencies, Key Definitions and Potential KYC/CFT Risks, FATF Report. [online]. 2014. Available from: <http://www.fatf-gafi.org/media/fatf/documents/reports/Virtual-currency-key-definitions-and-potential-aml-cft-risks.pdf>
- [24] Saxunova D., Slivka P. From cryptoanarchy to cryptogovernance environment is Europe successful in managing transition? Digitalization & smart green (r)evolution conference: In: *Proceedings of the international scientific conference*. 1.st ed.. Bratislava.2018.: EKONÓM. ISBN 978-80-225-4588-4.
- [25] Bank of England. Central Bank Digital Currency: opportunities, challenges and design. A Discussion Paper. [online]. 2020. Available from: [https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/central-bank-digital-currency-](https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/central-bank-digital-currency-opportunities-challenges-and-design.pdf?la=en&hash=DFAD18646A77C00772AF1C5B18E63E71F68E4593)
- [opportunities-challenges-and-design.pdf?la=en&hash=DFAD18646A77C00772AF1C5B18E63E71F68E4593](https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/central-bank-digital-currency-opportunities-challenges-and-design.pdf?la=en&hash=DFAD18646A77C00772AF1C5B18E63E71F68E4593)
- [26] Norges bank Papers. Central bank digital currencies. [online].2018. Available from: <https://static.norges-bank.no/contentassets/166efadb3d73419c8c50f9471be26402/nbpapers-1-2018-centralbankdigitalcurrencies.pdf?v=05/18/2018121950&ft=.pdf>
- [27] Carney M. Cryptocurrencies failing as money but technology has promise. [online].2020. Available from: <https://www.reuters.com/article/us-britain-boe-carney/cryptocurrencies-failing-as-money-but-technology-has-promise-carney-idUSKCN1GE18N>
- [28] Fintechnews Switzerland. Interest in Central Bank Digital Currency Surging. [online].2020. Available from: https://fintechnews.ch/blockchain_bitcoin/interest-in-central-bank-digital-currency-surging/35840/
- [29] Sveriges Riksbank . Technical solution for the e-krona pilot. [online].2020. Available from:<https://www.riksbank.se/en-gb/payments--cash/e-krona/technical-solution-for-the-e-krona-pilot/>
- [30] Sveriges Riksbank. The Riksbank's e-krona pilot.[online] 2020. Available from: <https://www.riksbank.se/globalassets/media/rappporter/e-krona/2019/the-riksbanks-e-krona-pilot.pdf>
- [31] China Briefing. What is the China Standards 2035? Plan and How It Will Impact Emerging Industries. [online].2020. Available from: <https://www.china-briefing.com/news/what-is-china-standards-2035-plan-how-will-it-impact-emerging-technologies-what-is-link-made-in-china-2025-goals/>
- [32] Auer, R., & Böhme R. The technology of retail central bank digital Currency, *BIS Quarterly Review*. [online]

Available from: https://www.bis.org/publ/qtrpdf/r_qt2003j.pdf (2020).

[33] Yanagawa N., Yamaoka H. Digital Innovation, Data Revolution and Central Bank Digital Currency, Bank of Japan. 2020. [online] Available from: https://www.boj.or.jp/en/research/wps_rev/wps_2019/data/wp19e02.pdf

[34] Fineksus. 2020. How is coronavirus affecting the financial payments industry and compliance [online]. Available from: <https://fineksus.com/how-is-coronavirus-affecting-the-financial-payments-industry-and-compliance/>

[35] Digital Dollar Project. Digital Dollars: Electronic Cash vs Digital Currency [online]. 2020. Available from: <https://www.digitaldollarproject.org/electronic-cash-vs-digital-currency>

[36] Banque de France . Central Bank Digital Currency. [online] 2020. Available from: https://publications.banque-france.fr/sites/default/files/media/2020/02/04/central-bank-digital-currency_cbdc_2020_02_03.pdf

[37] Agur I., Ari A., & Dell’Ariccia G., International Monetary Fund . Designing Central Bank Digital Currencies, IMF Working Papers. [online].2019. Available from: <https://www.imf.org/en/Publications/WP/Issues/2019/11/18/Designing-Central-Bank-Digital-Currencies-48739>

[38] Better Than Cash Alliance . Government Toolkit. [online] 2020. Available from: [https://btca-prod.s3.amazonaws.com/toolkits/2/downloads/btca-\]government-toolkit-FINAL.pdf?1433186805](https://btca-prod.s3.amazonaws.com/toolkits/2/downloads/btca-]government-toolkit-FINAL.pdf?1433186805)

[39] Hampl. 2017. Central banks, digital currencies and monetary policy in times of elastic money. Central Bankers’ speeches. BIS. Speech by the Vice Governor of the Czech National Bank, at the Official Monetary and

Financial Institutions Forum (OMFIF) Roundtable, London, 11 July 2017.

[40] Mersch Y., European Union. [online] Available from: 2020. <https://www.bankingsupervision.europa.eu/press/speeches/date/2020/html/ssm.sp200511~9f9eec5592.en.html>

[41] Deloitte. Innovation – Blockchain – (R)evolution-Swiss Perspective - White paper. [online]. 2017. Available from <https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/innovation/ch-en-innovation-blockchain-revolution.pdf>

[42] Ciaian, P., Rajcaniova, M. & Kancs, D. 2016. The economics of Bitcoin price formation, *Appl.Econ.* 48 (19) 1799-1815.

[43] Klein A. 2019. Is China’s new payment system the future? [online] The Brookings institution. Available from: <https://www.brookings.edu/research/is-chinas-new-payment-system-the-future/>

[44] Financial Times. Virus forces EU digital rethink. [online].2020. Available from: <https://www.ft.com/content/0c29e958-fdf0-409c-b622-6d6466ded094>

[45] European Commission. FinTech Action plan: For a more competitive and innovative European financial sector. 2018. [online] Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0109&from=EN>