



UNIVERSITY OF PIRAEUS - DEPARTMENT OF INFORMATICS

**MSc «Digital Culture, Smart Cities, IoT
and Advanced Digital Technologies»**

MSc Thesis

Thesis Title:	FinTech and Digital Transformation in Financial Services: A New Digital Financial World FinTech και Ψηφιακός Μετασχηματισμός στις Χρηματοοικονομικές Υπηρεσίες: Ένας Νέος Ψηφιακός Χρηματοοικονομικός Κόσμος
Student's name-surname:	Sofia Zoi
Father's name:	Apostolos
Student's ID No:	ΨΠΟΛ/18013
Supervisor:	Dimitrios Psychoyios, Associate Professor

November 2021

3-Member Examination Committee

Dimitrios Psychoyios
Associate Professor

Dimitrios Vergados
Professor

Angelos Michalas
Professor

University of Piraeus, Department of Computer Science (Informatics)

Sofia Zoi

© 2021 All rights reserved

“We are what we repeatedly do. Excellence, then, is not an act, but a habit.”
Aristotle

Acknowledgments

I would like to thank my supervisor, Professor Dimitrios Psychoyios, for showing me the confidence to engage in such an interesting research thesis, and for his guidance and support throughout the writing of this dissertation.

I would like to thank my parents - Apostolos Zois and Paraskevi Theodorou - for their love, support, and faith in me to succeed in my career and life. I am grateful to have them in my life.

Abstract

This dissertation deals with the impact of FinTech and the digital transformation in banking and other financial services. In our digital era and with significant demographic changes in the population, people are looking for convenience, efficiency, and speed in their financial transactions. They want to trade through platforms and mobile applications, and these activities include managing their economic life, monitoring their total expenses, applying for a loan, or optimizing their investment strategies. The FinTech industry is an emerging service industry that provides technological solutions, electronic services, and digital products. The FinTech industry is booming after the global financial crisis because the people lost their trust in the banking system. In the FinTech environment, apart from the companies, there are also the Neobanks and Challenger banks, breaking the monopoly of the traditional banks. For this reason, banking institutions are beginning to partner or acquire FinTech companies to integrate new technologies and platforms into their services. BigTech is also moving forward with new services and products in the financial sector.

All of them will have to comply with regulations and rules such as GDPR, PSD2, and Open Banking. The GDPR fundamentally shapes how FinTech companies and everyone else should manage data and approach data privacy. Every FinTech business and bank - whether based in Europe or not - must be aware of and comply with the GDPR as if the new rules are violated, companies will face the imminent threat of potentially significant fines of up to € 20 million or 4% of total global annual turnover. Finally, it is worth mentioning that the global health crisis, the coronavirus pandemic gave growth to FinTech. Even traditional banks rushed in to offer FinTech services as the bank's branches were closed. Technology plays a key role in our lives.

Keywords: Financial Technology, FinTech, Digital Transformation, New Innovative Technologies, Startup Companies, Unicorns, Customers, Blockchain, Digital Payments, Traditional Banks, Neobanks, Challenger Banks, BigTech, GAFA, Financial Regulation, GDPR, PSD2, Open Banking, Digital World, Financial Globalization, Coronavirus Pandemic, Covid-19, New Norm, Finance, Future

Table of Contents

Acknowledgments.....	5
Abstract.....	6
Table of Contents.....	7
Introduction.....	9
1. FinTech Industry.....	11
1.1. What is FinTech?.....	11
1.2. Other Definitions of FinTech.....	12
1.3. Products and Services of FinTech.....	14
1.4. Potential Benefits and Risks of FinTech.....	19
2. History and Evolution of FinTech.....	20
2.1. FinTech 1.0 (1866-1967).....	20
2.2. FinTech 2.0 (1967-2008).....	22
2.3. FinTech 3.0 (2008-Until Today).....	23
2.4. The Future of FinTech.....	25
3. FinTech, Neobanks, Challenger Banks, and Traditional Banks.....	26
3.1. What are Neobanks?.....	26
3.1.1. Advantages and Disadvantages of Neobanks.....	26
3.2. What are Challenger Banks?.....	28
3.2.1. Advantages and Disadvantages of Challenger Banks.....	28
3.3. What are the differences between Neobanks and Challenger Banks?.....	29
3.4. Neobanks-Challenger Banks and Traditional Banks.....	30
4. BigTech in Finance.....	31
4.1. What is BigTech?.....	31
4.2. Other names of BigTech.....	31
4.3. Financial Products of BigTech.....	32
4.4. FinTech-TechFin-BigTech.....	34
4.5. BigTech and Traditional Banks.....	35
5. Regulation-Legislation and FinTech.....	36
5.1. GDPR (General Data Protection Regulation).....	36
5.2. PSD2 (Revised Payment Services Directive).....	39
5.3. Open Banking.....	40
5.4. What are the differences between PSD2 and Open Banking?.....	41
5.5. GDPR and PSD2.....	42
6. FinTech and the impact of Coronavirus Pandemic (Covid-19).....	43

Conclusion.....45
References.....46

Introduction

The global economy is changing and acquiring the form of the new digital economy, in which technology plays a pivotal role. The impact of technology is crucial in both the global market and e-commerce and aims to offer innovative products and services in the financial sector and the banking sector, providing the financial markets with a leap in progress. Start-ups create innovative products to attract new customers.

The global financial crisis of 2008 resulted in a shift in the economy. The big banks and money managers shook the confidence of consumers. As free software and cloud computing made it easier than ever for a technology company to start, the FinTech industry has a crucial role in the economy. Newcomers were everywhere, mainly in California, New York, London, Shanghai, and Berlin. As soon as pioneers of FinTech showed that financial transactions could be as simple as buying on Amazon, the online market changed.

Following the 2008 financial crisis, financial regulators introduced new measures to ensure both the integrity and security of the financial system. A key component has been stricter communications compliance regulations, including several guidelines for improving communication and increasing transparency to mitigate future risk. Some global market data have changed forever due to FinTech payment innovations. Most people enjoy this change and believe that it has created a better economy for trade and transportation, especially in developing countries. FinTech has already improved e-commerce and helped make it more available worldwide. Negotiation is now much easier and more convenient than ever. FinTech continues to influence global e-commerce and payments.

Following the success of the e-commerce giants such as Amazon, eBay, Alibaba and tech giants such as GAFAM (Google, Apple, Facebook, Amazon, Microsoft), FinTech companies use digital channels to gain customers and data and sell better products. Following significant data breaches for consumers, such as the Cambridge Analytica scandal, FinTech companies provide the transparency and training required to gain the trust of their customers. They reduce intermediation supplies by removing manual friction, reducing transaction costs, and reaching out to sections of society that were not available on the stock market or in banks. As more data is made public, these new businesses use their ability to understand their customers, thus providing loans, insurance, payment services, and investment options in markets that have traditionally remained unused by established institutions.

FinTech companies offer innovative solutions and allow faster, cheaper, and more convenient financial services to customers. After the entry into force of the European Union GDPR Regulation for the Protection of Individuals against the Processing of Personal Data and the Free Circulation of such Data, FinTech companies should comply with the Regulation, as these companies, which provide payment services and other financial services, collect, control and process a wide range of personal data. FinTech companies must comply not only with the GDPR that imposes penalties for non-compliance but also with the new European Payment Services Directive PSD2 (Open Banking), which facilitates transactions, enhances and guarantees the rights of citizens. Finally, the Covid-19 pandemic caused economic disruption. The impact of the global coronavirus pandemic has disrupted the global economy, has accelerated the rise in digital payments, and has changed how people interact with financial services.

To sum up, the first chapter presents the definitions of FinTech. Also, it shows the products, the services, and the potential benefits and risks of FinTech. The second chapter describes the history and evolution of FinTech until our days and gives predictions for the future. The third chapter presents the banks of the future, Neobanks and Challenger banks. Also, it examines their relationship with traditional banks. The fourth chapter presents BigTech and its relationship with banks. The fifth chapter analyzes the legislation of FinTech as GDPR, PSD2, and Open Banking. Finally, the sixth chapter describes the impact of coronavirus in the FinTech industry.

1. FinTech Industry

Financial Technology is disrupting every sector of the financial industry. FinTech is changing the economic and financial landscape. The FinTech revolution represents the disruption from startups and technology companies to the financial industry and the digital transformation within traditional financial services firms. The use of digital technologies is the norm. FinTech will play a crucial role in making a cashless world a reality.

1.1 What is FinTech?

Financial Technology or FinTech for short describes a business that aims to provide financial services and products using software and advanced technologies. These companies¹ are exploiting new technologies to create innovative and better financial services and products for both consumers and businesses. They develop several applications, processes, products, or even different business models aimed at improving or disrupting traditional financial service providers, such as banks. This industry consists of start-ups, unicorn start-ups companies², technology companies, large financial institutions, or simply financial services providers.

Banks, insurance companies, and other traditional financial companies tend to harmonize in this area. What distinguishes a financial technology bank from a traditional bank is the central role that technology plays. However, many traditional banks resort to Financial Technology solutions, in some cases, even partner with financial technology companies - or even acquire them - to enhance their innovation capabilities. Big banks like HSBC, Citi, Barclays, JP Morgan Chase & Co., and Goldman Sachs are adopting these new digital technologies to better serve their customers and their better future. For example, in 2016, investment bank Goldman Sachs launched the Marcus³, a consumer loan platform.

FinTech brought about a digital revolution in finance. These are significant changes in asset management, business, and personal loans, raising capital, money transfers, and the way we invest. At its core, FinTech helps companies, business owners, and consumers better manage their financial operations, processes, and lives using specialized software and algorithms used in computers and more and more

¹ <https://www.cbinsights.com/research/report/fintech-250-startups-most-promising/>

² <https://www.investopedia.com/terms/u/unicorn.asp>

³ <https://www.marcus.com/us/en>

smartphones. This new service industry has created the development of technological solutions, electronic services, and digital products to make financial services and our daily transactions more accessible, friendly, and efficient. Finally, FinTech describes new technology that improves and automates the delivery and use of financial services.

1.2. Other Definitions of FinTech

Many big companies and organizations define the term FinTech⁴. Some of them are the following:

Bank of Greece (FinTech Innovation Hub) says that:

“FinTech stands for Financial Technology and describes technologically enabled financial innovations 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.”⁵

CFA Institute defines FinTech as:

“FinTech, or financial technology, refers to the technological innovation in the design and delivery of financial services and products. Technology in finance continues to evolve; advancements include the use of Big Data, artificial intelligence (AI), and machine learning to evaluate investment opportunities, optimize portfolios, and mitigate risks. Increasingly focused on customer outcomes, the desired outcome of FinTech is the ability to provide tailored, actionable advice to investors with greater ease of access and at a lower cost.”⁶

Ernst & Young (EY), a Big4 company gives another definition of FinTech as:

“organizations combining innovative business models and technology to enable, enhance and disrupt financial services”, emphasizing that FinTech is not only about

⁴ In the early 1990s, the term FinTech has origin from a project initiated by Citigroup, “Financial Services Technology Consortium”.

⁵ <https://www.bankofgreece.gr/en/main-tasks/supervision/fintech-innovation-hub>

⁶ <https://www.cfainstitute.org/en/research/fintech>

early-stage start-ups and new entrants, but also scale-ups, maturing firms, and even non-financial services firms.⁷

KPMG defines FinTech as:

“a portmanteau of finance and technology” which includes (1) “businesses who are using technology to operate outside of traditional financial services business models to change how financial services are offered” and (2) “that use technology to improve the competitive advantage of traditional financial services firms and the financial functions and behaviors of consumers and enterprises alike.”⁸

McKinsey & Company defines FinTech company as:

“start-ups and other companies that use technology to conduct the fundamental functions provided by financial services, impacting how consumers store, save, borrow, invest, move, pay, and protect money.”⁹

The World Economic Forum defines the term FinTech as:

“new entrants that promised to rapidly reshape how financial products were structured, provisioned, and consumed.”¹⁰

⁷ [https://www.ey.com/Publication/vwLUAssets/ey-fintech-adoption-index-2017/\\$FILE/ey-fintech-adoption-index-2017.pdf](https://www.ey.com/Publication/vwLUAssets/ey-fintech-adoption-index-2017/$FILE/ey-fintech-adoption-index-2017.pdf)

⁸ <https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/07/h1-2018-pulse-of-fintech.pdf>

⁹ <https://www.mckinsey.com/~media/mckinsey/industries/financial%20services/our%20insights/bracing%20for%20seven%20critical%20changes%20as%20fintech%20matures/fintechnicolor-the-new-picture-in-finance.ashx>

¹⁰ http://www3.weforum.org/docs/Beyond_Fintech_-_A_Pragmatic_Assessment_of_Disruptive_Potential_in_Financial_Services.pdf

1.3. Products and Services of FinTech

FinTech is a term that describes a wide range of financial technologies that exist outside the conventional banking ecosystem. FinTech typically includes insurance services, yet the international community focuses mainly on financial services when using the term FinTech. The technological and business trends provided by FinTech companies cover a wide range of financial services, such as payments (e-payments and mobile wallets), services investment management, lending services mainly through alternative forms of financing (P2P lending) and automated control services of financial transactions and customer communication (Robo-advisors). In more detail, some of the most important services and products are:

- **Electronic payments, electronic wallets, mobile payments, and mobile banking (e-payments, e-wallets, m-payments)**

Online electronic payments¹¹ are a large part of the FinTech industry. Electronic payment systems have revolutionized payments, making them convenient, easy, and highly accessible for all. FinTech companies are constantly improving their products and services to better serve consumers everywhere. Using sophisticated technology such as digital authentication, NFC, and QR code, they allow consumers to exchange money and make payments online or on mobile devices, without the need for a bank. Visa¹² and Mastercard¹³ started working with third-party merchants on a host of smart chip technologies for “contactless payment,” “touch-and-go,” and “pay-with-a-wave” transactions. Apple Pay, Google Pay, Facebook Pay, Amazon Pay, Samsung Pay, PayPal, Revolut, Robinhood, Square, Stripe, Coinbase, all work with Visa and Mastercard. Finance is an industry that is full of “frenemies,”.

Also, they are upgrading the security of online payments. For instance, they are developing blockchain-based systems to make electronic money transfers more secure and cost-effective, compared to banks. E-commerce payment platforms such as PayPal, Stripe, WePay, Transferwise, Coinbase have made international transactions extremely faster, cheaper, and more effective.

¹¹The digital euro would be an electronic form of money issued by the Eurosystem.
://www.ecb.europa.eu/paym/digital_euro/html/index.en.html

¹² <https://usa.visa.com/>

¹³ <https://www.mastercard.us/en-us.html>

- **E-Wallets**

An e-wallet or digital wallet is a bank on our smartphone. The immense growth of e-wallets is another indicator of the rise of FinTech financial services. Tech Giants like Alibaba with Alipay and GAFA (Google, Apple, Facebook, Amazon) use these innovative services for transactions such as Google Pay/Android Pay, Apple Pay, Facebook Pay, Amazon Pay.

Because of these successful FinTech products, many banks are now realizing its importance and are recognizing e-wallets as a collaborative measure to embrace technological advancements. In Greece, the most well-known greek FinTech company that has an e-wallet is Viva. Viva started as an online ticket booking service Viva.gr and was later licensed by the Eurosystem as a Viva Payments institution known as Viva Wallet¹⁴, which means that under the supervision of the Bank of Greece it can provide services e-banking across the European Economic Area. Now, Viva Wallet is a Neobank.¹⁵ Also, a British unicorn (private start-up company worth more than \$ 1 billion), Revolut¹⁶ is an example of a London-based FinTech company that offers e-wallet to consumers.

- **Mobile Payments**

Mobile Banking is a large part of the FinTech industry. Almost everyone has a smartphone and a mobile payment app or some form of mobile payments worldwide in 2021. Consumers have easy digital access to their bank accounts, especially on a mobile device.

Most major banks offer some kind of mobile banking feature, especially with the rise of Neobanks. Neobanks are essentially banks without any physical branch locations, serving customers with checking, savings, payment services, and loans on completely mobile and digital infrastructure. The increase in the use of smartphones has forced banks to come up with mobile applications that offer convenient FinTech banking services. Today, most banks have a mobile application that has a user-friendly

¹⁴ https://www.vivawallet.com/gr_el

¹⁵ Viva Wallet, a Greek startup, offers the Tap-On-Phone solution, which turns any Android device (smartphone, tablet, or enterprise device) into a card terminal, to accept both contactless and PIN payments without the need for separate hardware.
<https://techcrunch.com/2021/04/28/greeces-viva-wallet-raises-80m-for-its-neo-bank-targeting-small-business-merchants/>

¹⁶ <https://www.revolut.com/en-GR>

interface and recognizes biometrics such as the fingerprints of the user or Iris recognition.

- **Budgeting apps**

Mobile budgeting apps allow anyone to conveniently and effectively closely monitor their expenses, income, and other finances. Financial activities have become completely transparent for consumers, allowing them to manage their money in more responsible ways. Before, consumers had to create their budgets, gather checks, or navigate excel spreadsheets to keep track of their finances. Revolut, Monzo, Monese, Starling Bank, N26, Square, Venmo, and many others are some examples of FinTech companies that offer innovative ways of financial services.

- **Crowdfunding and crowdsourcing**

Crowdfunding platforms such as IndieGoGo (2008)¹⁷, Kickstarter (2009)¹⁸, GoFundme (2010)¹⁹ allow Internet and app users to increase the required capital through many smaller donations from ordinary people. Also, Crowdfunding platforms allow Internet and app users to send or receive money from others on the platform and have allowed individuals or businesses to pool funding from a variety of sources all in the same place. FinTech brought the innovative crowdfunding idea to the financial market, allowing ordinary people to fund campaigns and online projects by lending money or buying shares in the company. The Donation, Reward, Debt/Peer-to-Peer (P2P) Lending, and Equity are the four types of Crowdfunding.

- **Blockchain and Cryptocurrencies**

Blockchain²⁰ is a distributed database that maintains an ever-increasing list of so-called block records. Blockchain is a series of blocks linked together in a chain, with each block storing records of economic transactions. Data within a block is resistant to tampering and cannot be modified further. Every time Blockchain data changes, a new block is recorded, which is "chained" to the original data block. Blockchains are

¹⁷ <https://www.indiegogo.com/>

¹⁸ <https://www.kickstarter.com/>

¹⁹ <https://www.gofundme.com/>

²⁰ One blockchain application is the smart contract. Smart contracts are digital, self-executing contracts that can electronically facilitate, verify and implement agreements between buyers and sellers.

inherently transparent and detectable, making them suitable for recording events, medical records, and other file management, identity management, transaction processing, and data origin proof activities.

Blockchain technology, including Ethereum, is a distributed ledger technology (DLT) that maintains records on a network of computers but has no central ledger. Blockchain uses encryption technology to create cryptocurrencies, a promising new medium of exchange that is more secure and better than cash. Some significant benefits achieved by blockchain and cryptocurrencies include reduced costs, faster transactions, enhanced efficiency, better traceability, improved security, decentralization, and increased transparency.

Cryptocurrencies have transformed the digital payment industry over the years and have become one of the many payment methods in the digital world. Also, FinTech includes the development and use of digital cryptocurrencies such as Bitcoin (created in 2008 by Satoshi Nakamoto), Litecoin, Ripple, Ethereum. Bitcoin is an example of a cryptocurrency, a form of digital or virtual money. Entirely electronic, no physical banknotes or coins are involved. Cryptocurrency exchanges like Coinbase and Gemini connect users to buying or selling cryptocurrencies.

- **InsurTech (Insurance Technology)**

InsurTech uses technology to simplify and streamline the insurance industry. FinTech has even disrupted the insurance industry. InsurTech has changed the way consumers buy and use insurance. InsurTech includes everything from car insurance to home insurance and data protection.

- **RegTech (Regulatory Technology)**

RegTech helps businesses Financial services to comply with the rules of industry compliance, especially those that cover the protocols for combating fraud against the legitimacy of illegal activities, and the identification of the customer base, Know Your Customer (KYC).

- **Unbanked/Underbanked services**

These services seek to serve low-income individuals and those who are not served by traditional banks or dominant financial services companies.

- **Artificial Intelligence, Machine Learning, Chatbots, Cloud Computing, and Big Data**

New technologies such as Artificial Intelligence (AI) and Machine Learning (ML), Augmented Reality are part of the FinTech industry. "Learning" applications will not only learn the habits of users, which will often be hidden from themselves but will involve users in learning games to improve their automatic, unconscious expenses and savings decisions.

FinTech is also a strong adapter of automated customer service technology, using chatbots and AI²¹ interfaces to help customers and reduce staff costs. Finally, security and fraud recognition are provided with artificial intelligence.

- **Robo-Advising and Stock-Trading Apps**

Rodo advisors, such as Betterment, are automated economic design services, and thanks to high-tech algorithms, these services are available 24/7. Robot consultants use algorithms to automate investment advice to lower its cost and increase accessibility and provide digital financial advice based on mathematical rules or algorithms.

Stock-trading apps are another popular and highly innovative FinTech invention. In the past, investors must physically visit stock exchange establishments to buy and sell stocks. Today, stock trading solutions allow investors to easily trade stocks at the flick of a finger on their smartphones.

²¹ https://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf

1.4. Potential Benefits and Risks of FinTech

FinTech is the biggest disruptor of our time for financial institutions and has a great potential to change the social-economic lives of people across the globe. FinTech has potential benefits and risks. The benefits of FinTech are the following:

First of all, FinTech is characterized by speed and convenience. Financial products tend to be delivered online. Consumers have easy and fast access to them. Consumers benefit from a greater choice of products and services because they can be bought remotely, regardless of location. Technology allows FinTech companies to collect and store more information on customers so they may be able to offer consumers more personalized products or services. Last but not least, FinTech companies may not need to invest money in physical infrastructure like a branch network so may be able to offer cheaper deals to consumers.

Apart from the benefits, there are also risks. FinTech companies may be new to the financial industry and use different business models to traditional providers. This can make it harder to ascertain which ones are regulated, and what your rights are if something goes wrong. Financial products that are bought instantly online without ever meeting anyone face-to-face may make it easier for consumers to make quick, uninformed decisions. You bought financial products online may leave you more exposed to technology-based risks. For example, you could fall victim to cybercrime. While technology increases choice and access for most consumers, it can exclude those who do not know how to use the Internet or devices like computers, smartphones, and tablets.

2. History And Evolution of FinTech

In our days, FinTech is causing major disruptions to how we work with money in our lives, but those disruptions didn't come from anywhere. Finance and Information Technology have been connected for a long time.

According to a research paper²² by Douglas W. Arner, Janos Barberis, and Ross P. Buckley, there is a timeline of key inventions and events that have shaped FinTech in the 21st century. The evolution of FinTech has a long history and has been distinguished in three main eras:

- **FinTech 1.0 (1866-1967)**
- **FinTech 2.0 (1967-2008)**
- **FinTech 3.0 (2008-today)**

2.1. FinTech 1.0 (1866-1967)

The era, which dates from 1866 until 1967, is called FinTech 1.0. In this era, there were important FinTech inventions and the financial services industry remained analog.

In 1866, the first FinTech era starts, when the first transatlantic cable was successfully laid, connecting western North America to Europe and enabling communication between the major financial markets of London & New York possible. This telegraph cable²³ helped the evolution of interbank transactions and provided fundamental infrastructure for the period of intense financial globalization. Also, technologies such as the telegraph (communication) as well as railroads and steamships (advanced transportation) allowed for the first time the rapid transmission of financial information, transactions, and payments around the world.

In 1880 there was another FinTech invention when consumers and merchants began exchanging goods and services for credit using items known as charge plates and charge coins.²⁴

²² <https://ssrn.com/abstract=2676553>

²³ In the early 1900s, interbank payments were often done by the physical delivery of cash or gold.

²⁴ Charge plates were aluminum or white metal plates embossed with a customer's name and address on the front, and a paperboard insert on the back with the issuer's name and cardholder's signature. The "Charge-Plate" was a sort of pseudo-credit card, first developed in 1928. Charge coins bore the customer's identification number and an image associated with the vendor and were roughly the same size and shape as modern coins.

Until the 1970s, the system remained largely telegraphic and the Morse code-based system was used as a real-time settlement funds transfer system. However, as technology improved, the system shifted from telegraphy towards telex, and finally to computer operations and proprietary communications networks.

In 1918, the Banks established a telecommunications system to process funds transfers, connecting all 12 Reserve Banks, the Federal Reserve Board, and the United States Treasury by telegraph using Morse code. This system was known as the Federal Reserve Wire Network, Fedwire or the Federal Reserve Wire Network. Fedwire in the USA was the first electronic fund transfer system, which operated with the help of now-archaic technologies such as the telegraph and Morse code. The link created between financial institutions and public transport changed the way banks were able to communicate with their customers. The development of mainstream telephone and broadband communication allowed new ways to send and receive money.

In 1950, there was an important FinTech²⁵ product; the first universal credit card from Diners Club Inc. was introduced, and later from American Express in 1958. The Diner's Club card was the first-ever credit card and automated the process of extending credit, but also made actual payments much more efficient and cost-effective. The first credit card was created to ease the burden of carrying cash, and thus the foundation for the modern-day, non-cash payment system was born.

In 1966, the Interbank Card Association (now MasterCard) was established in the USA. Also, in 1966, the telegraph was replaced by the Telex network. The global Telex network was created. It was a switched network predating the modern Internet we all know today. It used telegraph lines to send text messages and was eventually killed off by the fax machine. In the 1960s, the Quotron system was the first electronic system that delivers stock market quotes to an electronic screen rather than on a printed ticker tape. The stockbrokers could get information on trades, displayed on a screen. In a business where time is money, every broker wanted whatever edge they could get.

²⁵ In 1919, the economist, John Maynard Keynes, wrote about the link between finance and technology in his book, *The Economic Consequences of the Peace*. John Maynard Keynes is one of the most influential economists of all time, with his theories carrying influence with the governments of today.

In 1967²⁶, a FinTech invention was launched. The first ATM²⁷ (Automated Teller Machine) was installed by Barclays Bank at its Enfield Town branch in North London. ATM allowed customers to receive cash without waiting to enter a bank branch. ATM signaled a major change in how people thought about financial services. Today, Automatic Teller Machines or ATMs²⁸ are computerized and can perform many more services than simply dishing out cash. They can take cash deposits, authorize loans, and more.

2.2. FinTech 2.0 (1967-2008)

During this era, which started in 1967 until the global financial crisis of 2008 (GFC), the development of digital technology for communications and transactions transformed the financial industry from analog to digital. This era is marked by the digitalization of traditional financial services and the digital transformation of the financial sector.

As mentioned, the first ATM in 1967 marks the end of FinTech 1.0 and the beginning of FinTech 2.0. In 1967, the first ATM and the first handheld calculator²⁹ were important FinTech inventions, which marked the beginning of the modern period of the new era. In this era, electronic payment systems advanced rapidly. There were important establishments like the following:

In 1968, the Inter-Bank Computer Bureau was established in the United Kingdom, forming the basis of today's Bankers' Automated Clearing Services (BACS) payment system.

In 1970, The US Clearing House Interbank Payments System (CHIPS) was established, which allowed the most active banks of the world to transmit and pay in US dollars.

In 1971, the establishment of NASDAQ transformed FinTech. NASDAQ is the first electronic stock market, that helped reduce the spread (the difference between the bidding price and asking price of the stock) and heralded the end of fixed securities commissions. NASDAQ helped modernize the initial public offering (IPO).

In 1973, the Society of Worldwide Interbank Financial Telecommunications (SWIFT) was established. SWIFT provides the communication protocol between

²⁶ In 1967, Texas Instruments first produced the portable computing device.

²⁷ The first ATM opened for business on June 27, 1967.

²⁸ With the rise of online banking and cashless payment systems, ATMs have not the glory of the past.

²⁹ The 45-ounce calculator featured a small keyboard with 18 keys and a visual output that displayed up to 12 decimal digits.

financial institutions thus facilitating a large volume of cross-border payments among them. NASDAQ, the first digital stock exchange, and SWIFT are established, marking the beginning of financial markets and communication protocols being used today. Also, they marked the beginning of how the financial markets operate today where there is almost no human interaction. A prime example of this is the Forex market—none of which is in the form of physical cash, rather being conducted in the digital book entries of major financial institutions. Of course, all this digitization had its downsides too marked by the Major market crash of 1987.

In the 1980s this era continued with the rise of bank mainframe computers and the growth of online banking, which major shift in how people perceived money and in the relationship between people and financial institutions. The internal processes of banks and the interactions with customers had become fully digitized. Many banks had over a million customers by the beginning of the 21st century.

In 1998, PayPal was launched and was one of the first FinTech technology companies to start transforming the way people manage their money through payments. Also, eBay was one of the first e-commerce promotion sites that allowed consumers to create a market and set prices for auction items. This era ended with the Global Financial Crisis in 2008.

2.3. FinTech 3.0 (2008- Until Today)

From 2008 until today is the era known as FinTech 3.0³⁰. With the Global Financial Crisis in 2008, the banking industry lost its good reputation. People developed a distrust of the traditional banking system. People started seeking more reliable ways to seek money, which would be different from traditional banking systems.

This era is marked by the emergence of new players, new start-ups (and unicorns), and existing technology companies that deliver financial products and services directly to businesses and consumers, alongside the already existing ones such as banks. In this era the important events and products are the following:

³⁰ FinTech 3.5 has been defined to account for the changes in consumer behavior and how they access the Internet in the developing world. The two countries with the highest FinTech usage are China and India.

The development of smartphones³¹ was an important FinTech invention because people access the web and therefore different financial services across the globe. Everyone connects from all over the world using the wifi. Computers are now commonly used but smartphones have become the primary device by which people access the Internet and use different financial services.

In 2009, the world is introduced to Bitcoin followed by other different cryptocurrencies. This is another event that has had a major impact on the financial world. Satoshi Nakamoto, the inventor of Bitcoin, designed it for use as a medium for daily transactions and a way to frustrate the traditional banking infrastructure after the 2008 financial collapse.

In 2011 Google has created its Google Wallet and Apple followed Apple pay in 2014. The introduction of Google wallet and later Apple pay accelerates the use of smartphones.

In this era, the emergence of important products and services were notable such as Cloud computing for data sharing, Robot advisors, and Crowdfunding platforms. Many FinTech companies, using cloud computing, offer innovative financial products and services and disrupt traditional business models. Technology has an important role in the finance industry and major disruptions are coming. Today, we are living the Fourth Industrial Revolution (Industry 4.0) in which the introduction of connected devices (IoT), data analytics, and artificial intelligence technologies automate processes further.

³¹ In 2007 was the launch of the iPhone.

2.4. The Future of FinTech

Our days, there is the phenomenon of digital transformation and revolution with a significant impact on the financial and banking industry. Every FinTech era has been driven by using technology to make banks easier to use for their customers, and as this technology evolves, so have how people and businesses can manage their money. Emerging and disruptive technological advances mark the 4th Industrial Revolution in areas such as Robotics, Artificial Intelligence (AI), Blockchain, the Internet of things (IoT), and Big Data strategies.

The future of FinTech (Industry 5.0) is Blockchain-based. Whether the use case is about money transfer, processing and payments infrastructure, wealth management, or consumer lending, there are multiple decentralized (or Blockchain-based) applications that are being developed. Blockchain and Open Banking will continue to drive the innovation of the future. The general trend for FinTech is certainly one that features more speed, more precision, and more automation. Also, Digital Transformation, technology, and customer experience are important pillars for the future of FinTech. The customer experience is at the center of business strategy. Personalization and automation of systems improve the customer experience.

Last but not least, banks will change their business model, adopting customer service innovation and converging on a mostly customer-centric approach. Banks will invest in FinTech startups largely to leverage new technology and ways of thinking to upgrade their existing operations and offerings. Also, BigTech will dominate the FinTech industry. FinTech is not only customer-centric but is emotionally engaging and provides services with purpose.

3. FinTech, Neobanks, Challenger Banks, and Traditional Banks

Innovation, technological disruption, and a wave of digital transformation have hit the banking and financial industry. FinTech companies, Neobanks, and Challenger banks gain greater market share, using technology to change the economics and business models of the industry. Neobanks and Challenger banks are the banks of the future?

The biggest financial institutions had a monopoly on the banking sector. However, in our era, human behavior is changing and banking is changing. Neobanks and Challenger banks have emerged in the banking industry.

3.1. What are Neobanks?

A Neobank is defined as a FinTech company that offers financial services to customers exclusively online. In contrast to the traditional banking model, a Neobank is an online-only banking platform that lacks branches. But they should not be confused with online banks. Online banks have a bank charter and provide a broader range of services to their customers, including loans.

Since they have no physical presence that requires paying rent or mortgages, they can charge much lower fees. Neobanks are known for being very easy to use and they have a great UI/UX on mobile or web. Also, Neobanks avoid banking legacy systems by using such technologies as artificial intelligence and machine learning. Last but not least, Neobanks do not hold a banking license.

Neobanks mostly appeal to the technologically savvy, typically young or unbanked populations who would benefit from low-entry financial solutions and offer flexibility and access to a wide range of services. These could include checking accounts, savings accounts, credit cards, mobile apps, payment cards, money transfers, loans, savings accounts, and analytics to improve spending behaviors, among many other financial services similar to traditional banking services.

3.1.1. Advantages and Disadvantages of Neobanks

Neobanks have advantages as well as some disadvantages over traditional banks.

The advantages of Neobanks are the following:

- Neobanks focus on providing services that can be accessed easily via mobile or online banking from anywhere at any time. Mobile apps are popular ways to access Neobank accounts.

- Neobanks have attractive interfaces and great customer experiences. They have good UI/UX. Neobanks are born from technology and innovation.
- Neobanks offer novel banking services that are similar to those of traditional banks, but with a personalized customer experience. Neobanks use and analyze data to predict future account activity. This can help with setting up a budget or planning for trends in your business.
- Another advantage is the low fees and competitive interest rates. With low costs due to the lack of physical branches, Neobanks can afford to charge fewer fees for their services. This is in contrast to traditional banks that are known for charging a wide range of fees. Because of lower overhead costs, Neobanks tend to offer higher interest rates to their customers.
- Neobanks are transparent and strive to provide real-time notifications and explanations of any charges and penalties incurred by the customer. Most Neobanks provide easy-to-deploy and operate APIs to integrate banking into the accounting and payment infrastructure.
- Security is always important when it comes to digital transactions. Neobank applications are built to ensure compliance with anti-money laundering laws, ensure customer privacy, and prevent malware attacks. Neobanks implement biometric verification, encryption technology, and other security measures to protect customer data.

The disadvantages of Neobanks are the following:

- If you are not tech-savvy and want to do your banking business in person or get in-person customer support, Neobanks is not the right choice. They do not have physical branches.
- Neobanks are not banks and do not have a bank charter. Neobanks are not actual banks.
- Neobanks typically have fewer services than traditional banks. Some only provide savings services but do not provide lending services. Traditional banks offer a variety of financial products and services, including loans, bank accounts, credit cards, and more.

3.2. What are Challenger Banks?

Challenger banks are tech companies that have a bank licenses. They also maintain a brick-and-mortar physical presence. They manage their activities like a bank, from asset-liability management to credit risks.

Challengers leverage software to digitize and streamline retail banking. They use digital channels, typically mobile, to offer customers a range of traditional banking services and digital features such as checking and savings accounts, loans, insurance, and credit cards.

3.2.1. Advantages and Disadvantages of Challenger Banks

The advantages of Challenger Banks are the following:

- Challengers are positioning themselves as something more than just a bank. The success of Challenger Banks is their approach to branding and marketing. They implement marketing strategies to build customer relationships and brand equity through marketing channels such as word-of-mouth, influencers, and social media. For example, Starling Bank and Challengers Banks brand themselves as digital-first, customer-centric, and data-driven.
- Their advertisements are cool and their designs are visually appealing. Also, their physical cards are art creations with bright colors and styles.
- Challenger bank accounts are quick to use and very easy to set up. Most challenger banks can have you signed up, approved, and doing business within a matter of minutes. Digital tools such as electronic ID and address verification and paperless on board to make a good customer experience. Challenger banks are known for the cutting-edge technology they bring to their consumers.
- Challenger banks offer services that the traditional bank does, paying psychical cash, making online payments, checking your balance, and of course linking with your accounting software. Additionally, these services would be cheaper than most traditional banks. Challenger banks have good currency exchange rates and helpful reminders.
- The fees involved with challenger banks are substantially lower than the fees of traditional banks and other institutions. Bank licenses allow these challenger banks to provide customers with a full range of financial services. Challenger banks can offer credit cards and loans as part of their membership services.

The disadvantages of Challenger Banks are the following:

- A challenger bank is a licensed banking entity; however, they only have very few physical locations to see a banker in person.
- You may not have the same level of protection as you would with a traditional bank.

3.3. What are the differences between Neobanks and Challenger Banks?

After the global financial crisis (2008), the government opened the market to Neobanks and Challenger banks. For some people, Neobanks and Challenger banks seem the same. But, it is not true. Every Challenger bank is a Neobank, but not all Neobanks are Challenger banks.

There are some significant differences between Neobanks and Challenger banks.

The most important difference between Neobanks and Challenger banks is their physical presence. Neobanks are exclusively online, cloud-based platforms that offer their services to their customers from web platforms and mobile applications. Challenger banks are mostly online and some have physical branches.

Another important distinction is the banking license. Neobanks do not have a banking license but Challenger banks have. So, only Challenger banks can offer a full range of financial services like issuing credit cards and loaning money. Neobanks can offer these services as well, but only if they are tied to a licensed institution.

Another difference between Neobanks and Challenger banks is the accounts, products, and services. Challenger banks offer both personal and business accounts. Moreover, Challenger banks streamline their products and services, so they can be more internet-friendly. Challenger banks are small institutions, which “challenged” the Big Four UK banks (Barclay’s, Lloyd’s, HSBC, and RBS). Their technology-based services and commitment to markets traditionally underserved by the Big Four quickly attracted legions of customers. While Neobanks do offer some personal accounts and services, they usually target small and medium-sized businesses (SMEs) and business startups. They present themselves not just as banks, but also as online financial technology firms, and typically appeal to more tech-savvy customers.

3.4. Neobanks-Challenger Banks and Traditional Banks

In the United Kingdom, there are the Big Five banks: HSBC, Barclays Bank, Lloyds Bank, The Royal Bank of Scotland, and the UK subsidiary of Santander. These traditional banks may bring to mind monolithic brick-and-mortars, malfunctioning ATMs, and mountains of paperwork. Traditional banks of course are established entities that offer the greatest security and trust of them all. Also, they charge higher fees (sometimes hidden fees) and tend to be conservative in their lending practices. However, many of these banks are seeking partnerships with Challenger banks and are now starting their digitalization. Many traditional banks are supporters and adopters of the technology, actively investing in, acquiring, or partnering with FinTech startups. As technology is becoming ever more central in the finance industry banks accelerate the collaboration with FinTech startups.

In contrast to traditional banks, Challenger Banks charge customers transparent low fees, provide faster services, and deliver a better user experience through always-available digital interfaces. Challengers prioritize an improved user experience, appealing to those who want to be able to bank from their phones instead of visiting a retail location. Challenger banks often provide highly mobile, tech-friendly solutions that help customers take control of their money with convenience and less expensive.

We live in an ever-changing world, where rapid advancements in technology are revolutionizing products and services. Neobanks and Challenger banks are here to stay. These FinTech companies are attempting to change the banking industry by making banking more convenient and accessible. They offer quick and convenient account opening, 24-hour banking support, and customer-friendly interfaces. These banks of the future will continue to leverage new technologies and deliver new and faster mobile services entirely tailored to the needs of their customers. However, this does not mean that a Neobank would be the right fit for everyone. Many people prefer going to a traditional bank or credit union branch and chatting with a banker instead of an online bank or navigating an app on your phone. For some, the convenience of technology is not convenient at all. So, traditional banks and Challenger banks will coexist in the financial world.

4. BigTech in Finance

4.1. What is BigTech?

BigTech is not one big monopoly. It is 4 or 5 companies all in different businesses. BigTech is the term used to describe the Tech Giants, the four or five major technology companies globally, namely Google, Apple, Facebook (Metaverse), and Amazon. Microsoft is occasionally added to the list. Due to their dominance in the technology market, BigTech companies also influence the economy and society. Due to their huge Internet presence and their market shares both in mobile phones and computers, they have at their disposal a great deal of consumer data to immerse themselves in the financial market. These companies are shaping the way our society is progressing.

The entry of BigTech into the payment market is a revolution creating a new norm in payments. BigTech promises easy, fast, inexpensive transactions from anywhere and anytime 24/7/365, providing a complete user experience. Google, Apple, Facebook, Amazon (GAFA) are the dominant players in the United States market.

4.2. Other names of BigTech

The term Big Tech is often referred to by the following names or acronyms:

1. GAFA or THE BIG FOUR

GAFA or The Big Four are the most powerful tech companies in the United States. Alphabet (GOOG), Amazon (AMZN), Facebook (FB), and Apple (AAPL) are commonly referred to as GAFA, which is the most popular term. Alphabet Inc., the parent company of Google, is often abbreviated using a "G" in these acronyms.

2. GAFAM or The Big Five

The Big Five refers to the five largest and most influential tech companies in the U.S., which are Google, Apple, Facebook, Amazon, and Microsoft. GAFAM is also a popular term.

3. The FAAAM stocks

Sometimes, the Big Five are referred to as the FAAAM stocks, where the letters are rearranged and Alphabet is abbreviated using an "A" instead of a "G."

4. FAAMG

FAAMG is an acronym for the stocks of American technology companies: Facebook, Amazon, Apple, Microsoft, and Google (Alphabet)

5. FAANG-FANGAM

When entertainment is included in the list, the Big Five are Facebook, Apple, Amazon, Netflix, and Google (FAANG). Also, FAANG refers to the stocks of five prominent American technology companies: Facebook (FB), Amazon (AMZN), Apple (AAPL), Netflix (NFLX), and Alphabet (GOOG). Another acronym is "FANGAM," which includes Microsoft.

6. BATX and other tech companies

Asian large Internet companies that dominate the Chinese market are known with the acronym BAT (Baidu, Alibaba, and Tencent) or BATX (Baidu, Alibaba, Tencent, and Xiaomi).

4.3. Financial Products of BigTech

In recent years, BigTech companies or GAFA are launching financial products aimed at taking market share from our larger Financial Institutions. The BigTech or GAFA have developed e-wallets such as Google Pay, Apple Pay, Facebook Pay, and Amazon Pay. More analytically, the products of GAFA are the following:

GOOGLE

In 2011, Google launched Google Wallet, allowing users to pay through Citi and MasterCard. Google Wallet turned the smartphone into a wallet and was a mobile payment technology that allowed users to shop in stores or send money to others. In 2015, the search giant announced Android Pay, which utilizes near field communication (NFC) technology for enabling transactions. In 2018, Google launched Google Pay allowing users to pay from desktop and phone.

APPLE

The entry of Apple into finance began with Apple Passbook launched in 2012. It allowed users to store boarding passes, movie tickets, coupons, and loyalty cards in one place. Passbook was later rebranded as Wallet in 2015. In 2014 Apple Pay put

privacy at the heart of design. Apple Pay leverages the NFC-based payments method to enable transactions.

Apple Pay³² is easy and works with the Apple devices you use every day. Apple Wallet is the platform where you store your credit or debit cards and use them with Apple Pay. Using Apple Pay with your iPhone or Apple Watch is quick and secure. It is a safe way to pay and make contactless, secure purchases in stores and on the web. It helps you avoid touching buttons or exchanging cash. Apple has introduced the Apple Card³³, a new type of credit card, in partnership with Goldman Sachs and MasterCard. The card is located on Apple devices and is used with the Apple Pay service.

FACEBOOK

Facebook has announced Facebook Pay, a service for sending money over the company's social networks and apps. Facebook Pay launched in November 2019 and is also available across Instagram, WhatsApp, Messenger, and Facebook.

Also, Facebook has announced the creation of the Calibra, a digital wallet service that will allow the user to hold units of the digital currency Libra, a stable coin of Facebook. The technology of transactions through Libra is available as a standalone application from 2020. Lately, Facebook rebrands Calibra Wallet to Novi Wallet³⁴. Novi Wallet³⁵ is a digital wallet to store and secure cryptocurrencies from fraud and theft. Novi can be used to send and receive Diems, the previous Libra. The Diem payment system will be accessible to anyone with an entry-level smartphone and data connectivity. Diem transactions are quick and easy. The Diem network is built on blockchain technology and designed with security in mind.

Digital wallets such as Apple Pay, Google Pay, PayPal, and many more surround us. But the Novi wallet is a digital wallet with crypto capabilities. When a new crypto wallet is created, it receives a unique address on the blockchain along with a set of encryption keys used to access that account and perform transactions.

Once the money arrives in a Novi wallet, it is automatically converted into Diem currency. For example, if you add \$100 USD to your Novi wallet, you will see 100 Diem USD in your wallet.

If you receive money through Novi, you can decide to store the Diems in your Novi wallet or withdraw them into your bank account. If you withdraw Diem into your bank

³² <https://www.apple.com/apple-pay/>

³³ <https://www.apple.com/apple-card/>

³⁴ <https://techcrunch.com/2020/05/26/facebook-rebrands-libra-wallet-service-calibra-to-novi/>

³⁵ <https://www.novi.com/>

account, they will automatically be converted to USD. The Novi wallet works like any other digital wallet that protects your digital tokens and is the most secure way to access and transfer crypto funds.

AMAZON

In 2007, Seattle tech giant launched Amazon Pay³⁶ to offer banking services (via JP Morgan). In 2018, Amazon launched the Amazon Go, a cashier-less store.

4.4. FinTech-TechFin-BigTech

There is an important difference between TechFin and BigTech. BigTech refers only to the GAF A companies, Google, Amazon, Facebook, and Apple. The term TechFin includes the GAF A companies in the United States and the BAT companies in China, Baidu, Alibaba, and Tencent.

TechFin and BigTech companies are technology companies that have grown and had completely changed the way we use technology in our daily lives. They were both born 100% tech. Technology, data, and customers characterize TechFin companies and also BigTech companies.

TechFin companies are leveraging their existing technologies, data, brands, customer bases, or other assets to provide better financial services than the existing traditional service providers. They have the potential to be truly disruptive. They offer consumers a global digital experience. Tech titans like Google, Facebook, Apple, and Amazon are offering banking and financial services products directly, at the tap of a button. BigTech firms leverage their enormous user base and can build on existing infrastructure to offer a wide variety of digital products and services to consumers.

These companies are innovating in areas like payments and money transfers, financial product comparisons, insurance, lending and borrowing, financial planning, and in a range of additional B2B areas like analytics, digital identity, and cybersecurity solutions. They have core businesses in areas like technology, online retail, or social media but have now realized the potential to build on their vast data resources, digital platforms, and experience in designing user-friendly services to disrupt the financial industry.

TechFin and BigTech companies use FinTech to offer financial products and services. FinTech is defined as financial innovation. FinTech generally refers to cutting-edge technology and Big Data to deliver financial solutions and services. FinTech

³⁶ <https://pay.amazon.com/>

companies are typically innovative startup companies that use technology to create apps, APIs, and analytics to disrupt the traditional financial sector. FinTech companies are ready to disrupt existing processes and financial services ecosystems with emerging technology. Also, FinTech companies look for technology to improve their service and customer experience. For example, a traditional bank that offers mobile banking services is FinTech. Nevertheless, most often, FinTech is about non-traditional financial institutions such as PayPal, Zelle, and Venmo in the United States, or online-only Starling Bank, Monzo, Monese and Revolut in the United Kingdom.

FinTech, TechFin, and BigTech collect and analyze massive data sets, learn from the insights to improve personalization and digital engagement in real-time, and offer innovative digital financial products and services to consumers. The entrance of these companies into financial services is potentially game-changing.

4.5. BigTech and Traditional Banks

The traditional banks are acting to compete with FinTech and BigTech in innovation, morphing into a digital bank that speeds all operations their clients need, with 24/7 availability through the network. Also, they increase cybersecurity measures to avoid fraud or cyberattacks. Another FinTech service that banks adopted is the digital signature. In this way, banks eliminate the paper and ensure user authenticity. Finally, banks analyze Big Data to know the needs of their customers and to offer them customized products. With all these changes, banks target to regain the reputation and the trust of people.

Banks will be in a partner ecosystem with FinTech to deliver personalized products and services. Banks will adopt digital banking in a major way. Digital banking refers to the digitization of banking services, thus eliminating the need for consumers to physically visit a bank branch. The FinTech revolution continues to disrupt, and traditional banks must keep up with the pace of technology to stay relevant and competitive.

BigTech companies can adopt FinTech innovations much more easily than banks as they already have a digital platform and a big database of customers. As a result, banks need to be in a symbiotic ecosystem with FinTech. However, at the same time, they must continue to manage the scale, security standards, and regulatory requirements of a traditional financial-services enterprise.

5. Regulation-Legislation and FinTech

FinTech companies must comply not only with the General Data Protection Regulation that imposes very strict penalties for non-compliance but also with the new European Payment Services Directive PSD2 (Open Banking), which facilitates transactions, enhances, and guarantees the rights of citizens.

5.1. GDPR (General Data Protection Regulation)

The protection of personal data and privacy is a fundamental human right. The new GDPR Regulation provides certain rights to natural persons (data subjects) and imposes specific obligations on those who hold and process personal data (controllers). In an economy that is increasingly evolving towards technologically converging solutions and paving the way for innovation and technology, the need to protect personal data and privacy is becoming increasingly pressing.

What is the GDPR?

The General Data Protection Regulation or GDPR is the new European Union Regulation that protects individuals against the processing of personal data. The GDPR was approved by the European Parliament on 14 April 2016, replacing the pre-existing legal framework, Directive 95/46/EC, and entered into force on 25 May 2018. It consists of 173 introductory points and 99 articles to make the framework stricter and thus strengthen the confidence of personal data subjects.

The GDPR will affect every company in Europe, which manages personal data of any kind. Any processing of personal data should be lawful and fair. This regulation also applies to FinTech companies, not only those located in the EU but also those located outside the EU, if they have European customers.

For the FinTech industry and the financial services sector in general, the GDPR presents a unique set of challenges, as financial services operators typically own and process large amounts of data of their clients as a core part of their business. FinTech companies will have to comply with the GDPR. Otherwise, they will be subject to severe fines for non-compliance (up to € 20 million).

Protective Rights

To become GDPR compliant, FinTech companies must first understand the individual rights granted by the legislation. They are as follows:

- Right to be informed of how your data is being processed
- Right to access this data
- Right to rectify incorrect data
- Right to erase data (the right of erasure, or the right to be forgotten)
- Right to restrict processing of personal data
- Right to data portability – this means that as a business you will need to put in place a system by which you can quickly and easily compile all the personal data you hold on an individual and make it securely accessible to them
- Right to object to your data being processed
- Rights relating to automated decision making, including processing

Data protected under General Data Protection Regulation (GDPR)

General Data Protection Regulation protects the personal data of individuals. Personal data is any information that refers to an individual who can be directly or indirectly identified.

According to the GDPR, the following types of data is addressed and protected:

- Personally identifiable information, including names, addresses, date of births, social security numbers
- Web-based data, including user location, IP address, cookies, and RFID tags
- Health and genetic data
- Biometric data
- Racial and/or ethnic data
- Political opinions
- Sexual orientation

Below there are some of the most important legal terms that GDPR defines:

Data processing: Any action performed on data, whether automated or manual. The examples cited in the text include collecting, recording, organizing, structuring, storing, using, and erasing anything.

Data subject: The person whose data is processed (customers or site visitors).

Data controller: The person who decides why and how personal data will be processed. An owner or employee in their organization handles data.

Data processor: A third party that processes personal data on behalf of a data controller. The GDPR has special rules for these individuals and organizations. They could include cloud servers or email service providers.

DPO: The GDPR requires that a FinTech company could hire a data protection officer (DPO). Data protection officers are responsible for overseeing a company's data protection strategy and its implementation to ensure compliance with GDPR requirements. DPOs are responsible for educating the company and its employees about compliance, training staff involved in data processing, and conducting regular security audits. DPOs also serve as the point of contact between the company and any Supervisory Authorities (SAs) that oversee activities related to data. Failing to adhere to the GDPR, penalties of up to €20 million, or 4% of global annual turnover, will be imposed.

5.2. PSD2 (Payment Services Directive 2)

In 2015 the European Union adopted a new directive on payment services (PSD2) to improve the existing rules and take new digital payment services into account. The revised Payment Services Directive was published in November 2015, entered into force on 13 January 2016, and applied on 13 January 2018.

PSD2³⁷ is an update from the original directive (PSD)³⁸ adopted in 2007. The PSD created a single market for payments and the foundation for a Single Euro Payments Area (SEPA). Many new entrants, especially in the FinTech area, are outside the scope of the PSD and, therefore, not regulated by the European Union. The PSD2 aims to improve security and fraud prevention, but at the same time encourage innovation, competition, and the creation of safer, more innovative payment services. In other words, PSD2 paves the way for a Digital Single Market. PSD2 creates a new ecosystem in the market and breaks the monopoly of customers' data held by the banks. It requires banks to open the data of their customers by exposing their Application Programming Interfaces (APIs). With its implementation, two new categories of Payment Institutions are created:

Account Information Service Providers (AISPs)

AISPs allow their users to access their bank account information from different banks, stored on an online platform or mobile application. With AISP you can read account information like legal name, IBAN, nationality, card validity data, account balance, and transaction history.

Payment Initiation Service Providers (PISPs)

PISPs can initiate a payment on behalf of their customers. They provide Payment Institutions with the ability to start transferring money on behalf of the user. So instead of using his bank to transfer money, the user can pay through the PISP Payment Institution, which in turn transmits the order to the bank. Among other things, there are consolidated rules for making electronic payments, strict security requirements, but also a ceiling on charges from the interbank use of electronic means of payment.

³⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2366>

³⁸ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007L0064>

The PSD2 Directive has the potential to significantly change and improve banking and financial services, to extend existing terms with a view to the digital age, and its main objective is to enhance competition across the range of payment services. The Second Directive (PSD2) goes further and paves the way for significant changes in the banking and payment markets. The PSD2 directive allows the visitor of banking services, the market, or ordinary consumers, to use similar services other than banks to manage their finances. Thus, the consumer can keep his money in his bank account, but on other platforms, to pay bills, transfer money, or control and analyze his transactions. In this way the competition increased, as other financial services companies are allowed to offer the corresponding services, with the relevant commission, breaking the banking monopoly.

5.3. Open Banking

Open Banking is the result of the PSD2 directive introduced by the European Banking Authority. In August 2016, the United Kingdom Competition and Markets Authority (CMA) forces the nine-biggest UK banks – HSBC, Barclays, RBS, Santander, Bank of Ireland, Allied Irish Bank, Danske Bank, Lloyds, and Nationwide – to open up their precious data, which could mean crucial changes for the way we use money. Banks had a monopoly on the financial world.

In this era, Open Banking forces banks and other account-holding institutions to allow access and control of customers personal and financial data (with the customer's permission) to third-party service providers (TPPs), through the use of application programming interfaces (APIs).³⁹ This is important because it can allow customers to have better control over their data and gives third parties the ability to create value-added services for customers and provide new, innovative products and services.

Open Banking changes the way payments are managed, not just in the UK and Europe but also around the world. Payments will become easier, more secure, and with an improved user experience. Open banking is becoming a major source of innovation that will reshape the banking industry.

³⁹ Open APIs refer to a publicly available interface that gives access to the sharing of data or functionality. Developers can create programs, tools, or apps tailored to the information provided by banks to offer products that are more relevant to customers.

5.4. What are the differences between PSD2 and Open Banking?

At the beginning of 2018, PSD2 and Open Banking announced to improve the transaction speeds and security challenges in finances. They promise to drive innovation and make it easier for customers, banks, and other third-party service providers to share data. Both of the directives are similar in their goal. However, there are some differences between them.

1. The adoption of Open Banking is only mandatory for the nine largest providers of current accounts in the United Kingdom. However, the EU's PSD2 is much more demanding and requires all the financial players in the Union to apply the same standards.
2. Open Banking uses a single Application Programming Interface (API) established and implemented by the nine banks. API makes a convenient platform for third-party financial providers to base their products/services on the existing bank accounts. On the other hand, PSD2 has no set parameters and is based on open APIs, which are defined by the market. This means that the individual financial entities will have to create their APIs.
3. The compliance period that the banks and other third-party players have to incorporate these directives. The UK financial firms had already incorporated the Open Banking solutions by the directive deadline. On the other hand, the EU-based financial players had 18 months to comply with the PSD2 directive.

In conclusion, PSD2 and Open Banking directives are aimed at making financial as well as data exchanges between customers and banks/third-party firms much easier and more convenient. Banks and TPPs adopt PSD2 and Open Banking APIs to enable customers to access products that adopt more digital operating models and give customers more control over their data.

5.5. GDPR and PSD2

The implementation of the revised Payment Services Directive (PSD2) and the General Data Protection Regulation (GDPR) was introduced in 2018 as parts of legislation focusing on consumer data. Designed to protect the rights of individuals with regards to the collection and use of their data, these regulations helped drive the growth of Open Banking and laid the foundation for Open Finance. PSD2 is reshaping its banking sector. At the same time, the introduction of the General Data Protection Regulation (GDPR) has had a huge impact on how companies must protect data.

PSD2 aims to create access to personal data. Through its access to accounts rule, PSD2 can gain entry to the financial data of consumers allowing third parties to enter the payments market and provide new account information and payment initiation services. These services are offered by account information services providers (AISPs) and payment initiation service providers (PISPs), respectively. PSD2 applies only to payment accounts, which means there is still no mandate with regards to other types of financial data—such as savings and investment accounts, pensions, or even mortgages.

GDPR provides consumers with the right to data portability, meaning they can share their data with another party. GDPR aims to protect personal data, making it easier for consumers to know where their data is being used and raise objections about its use.

The EU Payments Services Directive (PSD2), which brings in new laws aimed at improving consumer rights and enhancing online security. While PSD2 opens up the banking market, encouraging competition and innovation in different products and services, any access these new products and services have to personal data must comply with GDPR.

Non-compliance carries heavy fines and reputational damage. So far, most traditional banks have prioritized the protection of consumer data over major plans to innovate. But as more new players enter the open market, banks face a choice of compliance or take PSD2's opportunities to create a competitive advantage.

6. FinTech and the impact of Coronavirus Pandemic (Covid-19)

The Covid-19 pandemic⁴⁰, also known as the Coronavirus pandemic, is an ongoing global pandemic that has changed everything. The global pandemic has changed the way people manage their finances and has given rise to a wave of rapid product innovation from FinTech companies. Many of the trends will be fundamental and long-lasting.

On March 3rd, 2020, the World Health Organization issued an alert advising consumers to avoid physical cash payments and instead switch to contactless payments to limit the spread of coronavirus through hand-to-hand money exchanges in places like shops and restaurants. The contactless payments, the switch from bricks-and-mortar to digital channels, the rise in Artificial Intelligence advisors, and Chabot support are FinTech trends during the Coronavirus period. In April 2020, with Covid-19 spreading quickly and aggressively globally, the world economic outlook shifted monumentally.

Also, the adoption of online banking and mobile banking with real-time access to their cash positions was increased. Traditional banks were forced to temporarily close or reduce their services. Consumers have embraced digital and mobile banking options, and it seems inevitable that many of them will continue to use these services rather than revert to in-person banking. Mobile apps and online platforms have become a safe and convenient way to transfer money. Also, access to digital platforms like the cloud and predictive machine learning and analytics creates an innovative and efficient operation.

FinTech companies have played a pivotal role during the pandemic. They have provided solutions that were safe and convenient. The most important FinTech solution is that customers can remotely access financial services without the need to physically visit a bank, or handle physical cash. FinTech evolution has shifted client-banking preferences to a more convenient, easily accessible digital experience.

FinTech companies have caused disruption in traditional banks with the acceleration of technology. Consumers want efficiency, accessibility, and demand essential banking services in a physically safe manner. Tech titans like Google,

⁴⁰ The novel virus (coronavirus disease 2019, COVID-19, caused by severe acute respiratory syndrome coronavirus 2 -SARS-CoV-2) was first identified in the Chinese city of Wuhan in December 2019; a lockdown in Wuhan and other cities in surrounding Hubei failed to contain the outbreak, and it quickly spread to other parts of mainland China and around the world. The World Health Organization (WHO) declared a Public Health Emergency of International Concern on 30 January 2020, and a global pandemic on 11 March 2020, its first such designation since declaring H1N1 influenza a pandemic in 2009.

Facebook, Apple, and Amazon are offering banking and financial services products directly, at the tap of a button. The outbreak of COVID-19 has driven society online more than ever and reflected the importance of digital transformation strategies in financial services and other industries. It has shown that it is possible to do everything digitally and remotely.

COVID-19 has disrupted almost everything in our daily lives. It has changed the values and behaviors of customers, their experiences, and their expectations of brands. The pandemic is accelerating the adoption of FinTech, among consumers, businesses, and government entities. FinTech is seeing a world where digital transformation is not an option. COVID-19 has accelerated the rise in digital payments and the digital transformation in the new normal.

What has been a necessity during the lockdown will soon become a preference and a convenience. One year after the COVID-19 pandemic first left many of us working from home, celebrating holidays via Zoom, and spending more than ever before on e-commerce, media streaming, and food delivery. Managing finances from the comfort of your home and the convenience of ordering everyday goods online and via mobile devices will be the new norm. Opening Banking significantly reshapes the financial services landscape. The concept of a cashless society and the adoption of online banking and mobile banking with real-time access to their cash positions in the future seems to be more prevalent.

Conclusion

In conclusion, the FinTech industry can increase business efficiency by helping businesses grow faster and creating a better customer experience. Therefore, companies need to recognize the importance of automation, keeping up to date with the latest technology. It is also in the interest of all FinTech companies, despite the challenges, to take active steps to ensure a clear and effective data protection compliance program under the GDPR as potentially severe penalties of up to € 20 million or 4% of the total global annual turnover are at stake.

FinTech not just came to stay but is the new order of things when it comes to financing. Shortly more and more financial institutions will change in this direction. There will be solutions from software companies and startups and solutions that will evolve through institutions and service providers to mechanize traditional and time-consuming practices for the benefit of all of us.

These competitors will to the economic environment of the new digital age, adopting FinTech, to maintain or strengthen their presence in the global market. Also, the continuous evolution of technology and the recognition of the need to manage the amount of information (big data analytics) to improve the quality of life of the consumer-customer make financial technology a necessary tool. In this age of digitalization, banks and their employees will absorb FinTech innovations that play a crucial role in developing a more customer-centric approach.

References

Accenture, (2018). "STAR SHIFTING: RAPID, EVOLUTION, REQUIRED, Banks can grow by accelerating their move to digital".

Available at: https://www.accenture.com/_acnmedia/pdf-87/accenture-banking-rapid-evolution-required.pdf

BBVA, (2020). "Banks and fintech, agents of change in the post-COVID-19 innovation system".

Available at: <https://www.bbva.com/en/banks-and-fintech-agents-of-change-in-the-post-covid-19-innovation-system/>

Business Insider Intelligence, (2021). "Overview of the fintech industry: stats, trends, and companies in the ecosystem market research report".

Available at: <https://www.businessinsider.com/fintech-ecosystem-report>

Capgemini, (2019). "BigTech challenges to traditional banking are on the rise, Sankar Krishnan,".

Available at: <https://www.capgemini.com/2019/04/bigtech-challenges-to-traditional-banking-are-on-the-rise/>

Carney M., (2017). "The Promise of Fintech – Something New Under the Sun?", Bank of England

Available at: <https://www.bankofengland.co.uk/speech/2017/the-promise-of-Fintech-something- new-under-the-sun>

Deloitte, (2020). "The DNA of Digital Challenger Banks".

Available at: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-dna-of-digital-challenger-banks.pdf>

Douglas W. Arner, János Barberis, and Ross P. Buckley, (2015). "The Evolution of FinTech: A New Post-Crisis Paradigm?", University of Hong Kong Faculty of Law Research Paper No. 2015/047, UNSW Law Research Paper No. 2016-62.

Available at: <https://ssrn.com/abstract=2676553>

EY, (2019). "Global FinTech Adoption Index 2019: As FinTech becomes the norm, you need to stand out from the crowd".

Available at: https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/ey-global-fintech-adoption-index.pdf

Fintechmagazine, (2020). "The difference between a neobank and a challenger bank?".

Available at: <https://fintechmagazine.com/banking/difference-between-neobank-and-challenger-bank>

Forbes, (2018). "How Amazon Is Impacting Small Business Finance,".

Available at: <https://www.forbes.com/sites/rohitarora/2018/03/13/how-amazon-is-impacting-small-business-finance/#7746d8c64dad>

Goldman Sachs, (2020). "COVID-19's Impact on the Future of Fintech".

Available at: https://www.goldmansachs.com/insights/pages/from_briefings_03-june-2020.html

KPMG, (2019), "The Pulse of Fintech".

Available at: <https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/07/pulse-of-fintech-h1-2019.pdf>

KPMG, (2018). "The Pulse of Fintech 2018: Biannual global analysis of investment in fintech".

Available at: <https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/07/h1-2018-pulse-of-fintech.pdf>

McKinsey & Company, (2016). "FinTechnicolor: The New Picture in Finance".

Available at:

<https://www.mckinsey.com/~media/mckinsey/industries/financial%20services/our%20insights/bracing%20for%20seven%20critical%20changes%20as%20fintech%20matures/fintechnicolor-the-new-picture-in-finance.ashx>

N26, (2021). "What Are Challenger Banks?".

Available at: <https://n26.com/en-us/blog/challenger-banks>

Official Journal of the European Union, (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 (Text with EEA relevance)".

Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2366>

Official Journal of the European Union, (2016). "REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 on the protection of natural persons concerning the processing of personal data and the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)".

Available at: <https://eur-lex.europa.eu/eli/reg/2016/679/oj/eng>

René M. Stulz, (2019). "FinTech, BigTech, and the Future of Banks ", Ohio State University.

Available at:

<https://corpgov.law.harvard.edu/2019/11/20/fintech-bigtech-and-the-future-of-banks/>

Techcrunch, (2021). "Greece's Viva Wallet raises \$80M for its neobank targeting small business merchants".

Available at:

<https://techcrunch.com/2021/04/28/greeces-viva-wallet-raises-80m-for-its-neo-bank-targeting-small-business-merchants/>

Walden Stephanie, Strohm Mitch, (2021). "What Is A Neobank?".

Available at: <https://www.forbes.com/advisor/banking/what-is-a-neobank/>

WEF, World Economic Forum, (2015). "The Future of Fintech: A Paradigm Shift in Small Business Finance".

Available at:

http://www3.weforum.org/docs/IP/2015/FS/GAC15_The_Future_of_Fintech_Paradigm_Shift_Small_Business_Finance_report_2015.pdf

World Economic Forum. (2015). "The Future of Financial Services: How disruptive innovations are reshaping the way financial services are structured, provisioned and consumed,".

Available at:

http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf).

World Economic Forum. (2017). "Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services".

Available at:

https://www3.weforum.org/docs/Beyond_Fintech_A_Pragmatic_Assessment_of_Disruptive_Potential_in_Financial_Services.pdf)

World Economic Forum. (2018). "The New Physics of Financial Services Part of the Future of Financial Services series: Understanding how artificial intelligence is transforming the financial ecosystem".

Available at:

https://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf)

Zerucha, T. (2016). "The history of fintech. Bankless Times".

Available at: <http://www.banklesstimes.com/2016/06/27/the-history-of-fintech/>.