الجمهوريــة الجزائريــة الديمقراطيــة الشعبيــة
République Algérienne Démocratique et Populaire
و البحث العلمي وزارة التعليم العالي
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique

Université MUSTAPHA Stambouli
Mascara

جامعة مصطفى اسطمبولي
معسكر

The Faculty of Economic Sciences, Commerce, and Management Sciences
Department of Economic Sciences

Handout directed to Second-year Master's students in Business Economics

In module

Financial Technology

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Academic Year: 2024/2025

Financial Technology (FinTech)

These lessons are directed towards students:

Level: Second year Master

Specialty: Business Economics

Branch: Economic Sciences

Field: Economics, Commercial Sciences and Management Sciences

According to the academic master's program curriculum, which is divided into the following content:

Chapter One: Conceptual Framework of Financial Technology (FinTech)

Chapter Two: Digital platforms

Chapter Three: Big Data

Chapter Four: Insurance Technology

Chapter Five: Cyber Security

Chapter Six: FinTech in Islamic Finance Industry

Chapter Seven: Risks and Regulatory Systems related to FinTech

Chapter Eight: Fintech Ecosystem

Chapter Nine : Successful global experiences in the field of financial technology industry

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Financial Technology (FinTech)

Introduction

The banking sector is undergoing significant changes driven by various influential factors, primarily technological advancements. These advancements have led to shifts in customer expectations and requirements, as well as changes in regulatory frameworks. The impact extends beyond merely integrating technology into payments and financial services; it also involves a transformation in general culture, the evolution of business models, new approaches to problem-solving, increased customer participation in decision-making, and the application of innovative ideas for effective leadership.

Financial Technology (FinTech) is widely recognized as one of the most significant innovations in the financial industry, experiencing rapid growth. This growth has been fueled by a decline in trust in traditional financial service providers, leading to a heightened demand for alternative financing options. FinTech's expansion is largely driven by various technological advancements, such as the widespread availability and affordability of infrastructure (e.g., the Internet, cellular technology, sensors), increasingly mature technology applications (e.g., platforms, Big Data analysis), and evolving business operations (e.g., the sharing economy) identified six emerging FinTech business models: payments, wealth management, crowdfunding, Peer-to-Peer (P2P) lending, capital markets, and insurance services[1].

In recent years, the fintech sector has revolutionized global and Arab financial systems. Fintech startups have successfully provided a diverse range of financial services, including payment services, digital currencies, money transfers, as well as lending, crowdfunding, wealth management, and

[1] Bhenu Artha, Ali Jufri. Fintech: A Literature Review. Jurnal Proaksi. Vol 7.N° 2. 2020. P 59

insurance services. This development is casting a shadow on the future of traditional financial services.

Financial technology (FinTech) is considered a revolution in the global economy, as it facilitates and accelerates daily financial transactions. FinTech has witnessed significant growth and widespread adoption across various countries around the world. A new generation of FinTech startups and digital solution providers has emerged, offering a wide range of financial services. These include digital payment solutions, money transfers, crowdfunding, and other digital products.

In this publication, we will try to analyze the most important concepts related to Finance, Technology and Innovation, and highlight the most important definitions and experiences that explain them. So the The question will be as follows:What are the different applications of financial technology? And how can they enhance Islamic finance?

The answer of these questions will be in the following chapters:

Chapter One: Conceptual Framework of Financial Technology (FinTech)

Chapter Two:Digital platforms

Chapter Three:Big Data

Chapter Four:Insurance Technology

Chapter Five:Cyber Security

Chapter Six:FinTech in Islamic Finance Industry

Chapter Seven:Risks and Regulatory Systems related to FinTech

Chapter Eight:Fintech Ecosystem

Chapter Nine :Successful global experiences in the field of financial technology industry

Chapter One: Conceptual Framework of Financial Technology (FinTech)

Fintech is reshaping the financial industry by introducing innovative solutions that challenge traditional banking models. Technologies such as open banking and P2P lending demonstrate how fintech enhances customer control, fosters competition, and creates more accessible financial services. The integration of fintech into various sectors, coupled with evolving regulatory frameworks, continues to drive efficiency, transparency, and inclusivity in the global financial ecosystem. As fintech evolves, it promises to offer even more personalized, secure, and diversified financial products, making finance more adaptable to the needs of both consumers and businesses.

1. Definition of Fintech

The term 'fintech' combines 'financial' and 'technology' to refer to innovations that improve or automate financial services and processes. This broad category encompasses a wide range of industries[2].

There are many definitions associated with financial technology, including the following:

The Financial Stability Board defines financial technology as “technological innovations in the financial sector that can create new business models, applications, processes, or products that have a significant and tangible impact on financial markets, institutions, and the delivery of financial services”[3].

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[2] Hajar Mohammad Alhosseiny, Fintech, concept, opportunities and challenges, and Egypt’s fintech landscape, journal of Organizational Culture Communications and Conflict, Volume 27, Special Issue 1, 2023, p3

[3] Dahbia Latrache & Soumia Harrag, The reality of financial technology in Arab countries and its importance in enhancing financial inclusion in small and medium enterprises, journal of advanced economic research, Vol 5, N°2.2020, p95

According to the Basel Committee on Banking Supervision, fintech is linked to three main sectors directly related to core banking services: credit, deposit and capital raising; payments, clearing, and settlement; and investment and wealth management[4].

Financial technology (FinTech) refers to the economic sector that encompasses most companies using the latest new information and communication technologies (NTIC) to deliver financial services more efficiently and at lower costs. In other words, the term FinTech refers to any non-financial institution that enters the financial and banking sector to offer its clients innovative technological solutions regarding financial services provided by banks and insurance companies. These companies aim to capture market share from the traditional players in the financial services sector.

Fintech refers also to any institution involved in offering innovative or cutting-edge technological solutions to its customers in the financial sector. These are typically startup companies aiming to capture market share from traditional financial service providers[5].

Researchers believe that financial technology represents a shift in accounting thinking and practice towards financial innovation based on technology through innovative services. Interest in fintech has increased during the COVID-19 pandemic as there has been a push to employ innovative technological solutions to enhance banking services[6].

2. Fintech Evolution

[4] The Union of Arab Banks, Financial Technology and Artificial Intelligence in the Financial and Banking Sector, 2018

[5] Amer Abdelwali AlMomani, Khalid Faris Alomari, Financial Technology (FinTech) and its Role in Supporting the Financial and Banking Services Sector, International journal of academic research in business and social sciences, Vol 11, N° 8, 2021, p 1795.

[6] Ibtihaj Ismail Yakoub, Faihae Abdellah Yaakoub, Zaineb Joumaa Matar, Financial technology as one of the recovery strategies of the Iraqi banking sector in the post-Covid-19 stage: An exploratory study, journal of accounting and financing studies, 2021, p 62

The history of modern financial business can be traced back to several key milestones:

Fig.1.Phases in FinTech Evolution

Source: Fangky Antoneus Sorongan, Mercurius Broto Legowo, Steph SubanidjaFinTech as The Emerging Technologies in Banking Industry: Past, Present, and Futur. International Journal of Progressive Sciences and Technologies.Vol 28.N°2. 2021. P 373

2.1. Fintech 1.0 (1866-1967)

where the transition from analog to digital took place in this era[7].The introduction of the Automated Teller Machine (ATM) marked the beginning of financial automation.

Generally, fintech historians often overlook a significant and transformative event from Fintech 1.0: the launch of Diner's Card in 1950. This card represented the first genuine effort to make payments cashless, initially focusing on restaurant payments. This was followed by the introduction of the credit card by American Express in 1958. The financial market took a major leap forward with the introduction of screen-based stock data by Quotron in 1960[8].

2.2. Fintech 2.0 (1967-2008)

[7] Fangky Antoneus Sorongan, Mercurius Broto Legowo, Steph Subanidja FinTech as The Emerging Technologies in Banking Industry: Past, Present, and Futur. International Journal of Progressive Sciences and Technologies.Vol 28.N°2. 2021. P 373

[8] Ibrahim A. Zeidy, The Role of Financial Technology (FINTECH) in Changing Financial Industry and Increasing Efficiency in the Economy, Comesa, 2023, P 2

Financial services sector was significantly transformed into a digital industry, driven by the rise of the internet around the year 2000.

2.3 Fintech 3.0 (2008-Present)

is the so-called democratization of electronic financial services[9].Since 2008, the financial crisis has spurred a wave of innovations in Fintech, fueled by changing market conditions[10].

The 2008 global financial crisis marked a turning point, making FinTech a new standard. This shift has presented challenges for regulators and market participants, particularly in balancing the potential benefits of innovation with the associated risks[11].

The fintech sector experienced significant growth following the financial crisis that hit the financial sector in 2008, which led to a decline in consumer confidence in traditional financial institutions. With the development of technologies, modern communication tools, the reduction in their costs, and the increasing percentage of the global population able to access and use the internet, an opportunity was created for the emergence and growth of fintech companies that integrate technology into the provision of financial services worldwide[12].

According to a report by Wamda and Payfort, the development of financial technology can be divided into two waves. The first wave includes payment solutions and lending solutions, while the second wave involves the integration of technology into international money transfers, insurance,

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[9] Fangky Antoneus Sorongan, Mercurius Broto Legowo, Steph Subanidja FinTech as The Emerging Technologies in Banking Industry: Past, Present, and Futur. International Journal of Progressive Sciences and Technologies.Vol 28.N°2. 2021. P 373

[10] DW Arner, J Barberis, RP Buckley, The evolution of Fintech: A new post-crisis paradigm, Heinonline, 2015

[11] Sofia Anyfantaki, The evolution of financial technology (Fintech), Economic Bulletin, 2016, P 47

[12]Lazhari Zouaouid, Hadjaj Nafissa, Financial Technology: The Revolution of Financial Payments...Reality and Prospects," Al-Ijtihad Journal of Legal and Economic Studies.Vol 7, N° 3.

wealth and investment management, followed by the emergence of a new phenomenon—blockchain technology[13].

FinTechs are also evolving; moving beyond trendy but occasionally impractical tech applications, more mature teams are entering the market with a focus on addressing customer needs, including issues that traditional banks have overlooked. As the ecosystem economy develops, the opportunity to integrate services across various technology platforms will drive the growth of "life tech," where devices and apps seamlessly interact to support users without clear boundaries between them[14].

The literature offers limited insight into how recent technological innovations have affected market power in the investment advice industry. FinTech firms are entering the market, providing direct services to investors and tools for implementing specific investment strategies. Meanwhile, established firms are also innovating, leveraging their large client bases and cost advantages from economies of scale. Innovations in investment advice and wealth management are broadening access to diverse investment strategies and may help reduce biases in recommendations from traditional advisers[15]

Fintech startups are adopting a range of sectors within the banking system, including payments and money transfers, insurance, and cryptocurrencies. Among these, the payments and wealth management sectors are the most widespread[16].

3. The Advantages of Fintech

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[13] The Union of Arab Banks, Financial Technology and Artificial Intelligence in the Financial and Banking Sector, 2018

[14] Sofe Blakstad, Robert Alle. FinTech Revolution (Universal inclusion in the new financial ecosystem). Library of Congress control. 2018. P 15

[15] Basel Committee on banking supervision. Literature review on financial technology and competition for banking services. 2024. P 5

[16] Boumoud Imane, Matraf Aouatif, Chaoui Chafia, Fintech innovations and their role in developing the performance of Arab Islamic banks. Journal of Economic Visions, Vol 10, N° 1, 2020

Advocates of fintech emphasize various ways in which it could positively impact society and individual consumers.

The technology provided by FinTech enhances job effectiveness and efficiency, offering numerous benefits to the community. Firstly, FinTech enables cheaper lending and better product offerings. Secondly, FinTech companies can significantly reduce labor and office space costs, leading to a more comfortable experience for consumers, as reflected in their reviews. Lastly, lenders can better screen potential borrowers by utilizing alternative information sources and employing big data techniques inherent in technology-driven lending practices[17].

3.1 Economic Opportunities

The fintech sector generates employment and attracts investment.[18].FinTech also provides access to financial services for individuals and businesses that may have been underserved by traditional banking systems, particularly in remote areas.

3.2 Innovation and flexibility

Digital transformation facilitates access to credit and financial services, which helps in the development of the sector and contributes to lifting people out of extreme poverty. Financial inclusion aims to provide opportunities for more people to start their own businesses and earn a stable income. The institutions working in this field not only provide financial opportunities but also educate people on how to manage credit and develop their own businesses. Reaching underserved populations requires innovative channels and digital products that can overcome the challenge of achieving both efficiency and sustainability.

3.3. Cost reduction

[17] SI Anggreini.

[18] Jamie Evans, Steve Browning, Fintech: a guide to financial technology, House of commons library, N° 9150, 2021, P 20

The increased use of mobile banking services in particular, and financial technology services in general, contributes to reducing the cost of money transfers and providing formal financial services to millions of people for the first time.

3.4. Financial inclusion

FinTech services and mobile payment solutions are effective means of integrating marginalized groups who are not engaged with the financial sector into the formal financial system, thereby achieving financial inclusion goals. Many FinTech companies have introduced products targeting these marginalized groups, offering alternative financing options and technological solutions to facilitate their access to financial services[19].

3.5.Better Risk Management

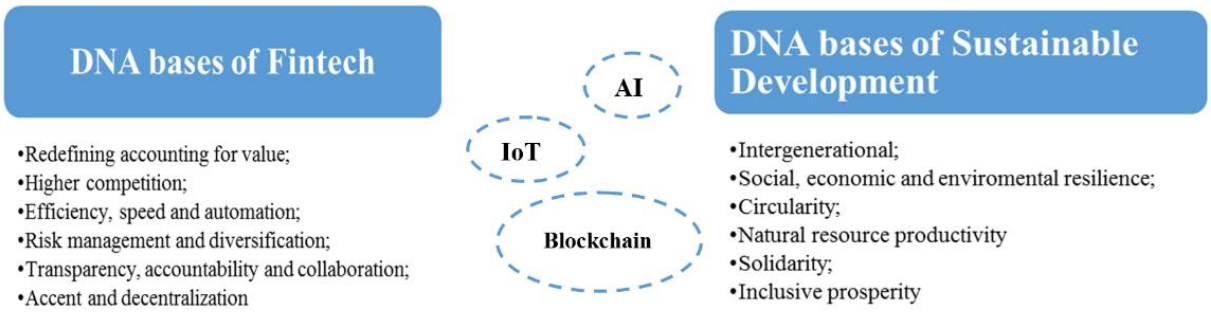
By leveraging big data and advanced analytics, fintech companies can more accurately assess risks and tailor financial products to individual needs, improving outcomes for both providers and consumers.

FinTech has significantly fostered innovation and heightened competition in the financial services industry. Traditional financial institutions have been forced to quickly adapt and innovate to keep up with FinTech startups, leading to widespread improvements across the industry. Many established banks have developed their own digital platforms, launched mobile banking apps, and formed partnerships with FinTech firms to offer more convenient and technologically advanced services. As a result, consumers now enjoy a wider range of financial products and services, often with better features and more competitive pricing. This ongoing push for innovation is set to further transform the industry in the coming years[20].

Fig.2.FinTech as a tool for sustainable development

[19]Central bank of Egypt. Finance concepts, Fintech. 2012. Issue 29

[20] Wentao Zhou. The Transformative Impact of FinTech on Financial Services: A Comprehensive Analysis. the Creative Commons Attribution-NonCommercial. 2024. P 88



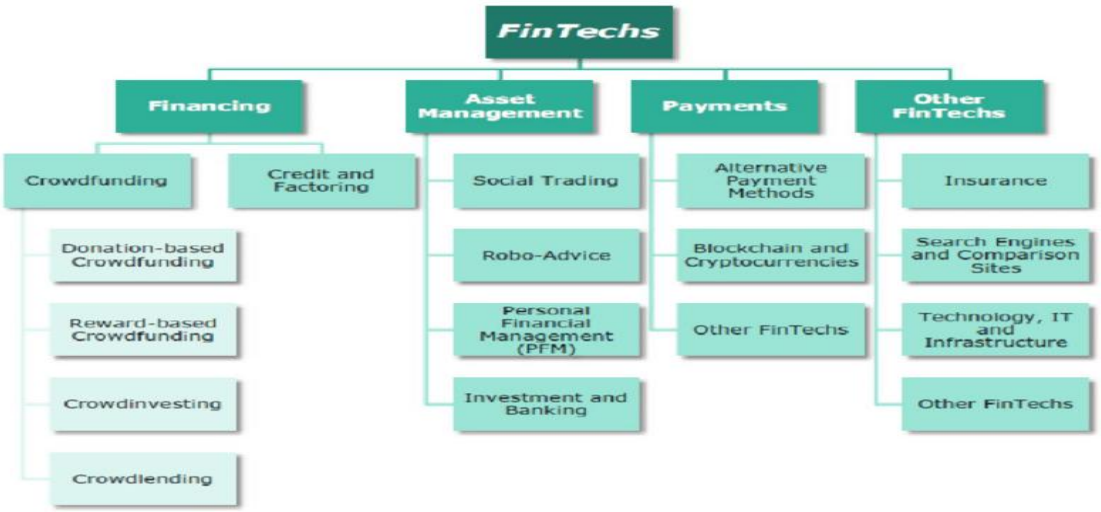
Source: N.G. Vovchenko, S.S. Galazova, A.A. Sopchenko, O.S. Dzhu. FinTech Ecosystem as an Instrument of Sustainable Development Provision.International Journal of Economics and Business Administration. Vol VII, Special Issue 2, 2019. P 148

4. FintechIndustry

Fintech mechanisms involve the creation and enhancement of services, products, or processes to increase value for customers, improve transparency, enhance accessibility, and reduce costs or fees[21].

There are numerous fields and applications of financial technology, including, for example: artificial intelligence, data analytics, crowdfunding, cryptocurrencies, payments, transfers and remittances, insurtech, smart contracts, regulatory technology, and blockchain technology.

Fig.3.Fintech Industry



[21] Mercurius Broto Legowo, Steph Subanidja, Fangky Antoneus Sorongan, Role of FinTech Mechanism to Technological Innovation: A Conceptual Framework, International Journal of Innovative Science and Research Technology, Volume 5, Issue 5, 2020, p 36

Source: Amer Abdelwali AlMomani, Khalid Faris Alomari, Financial Technology (FinTech) and its Role in Supporting the Financial and Banking Services Sector, International journal of academic research in business and social sciences, Vol 11, N° 8, 2021, p 1797

4.1 Mobile Banking

Through mobile banking apps, customers of banks and financial institutions can perform a wide range of transactions conveniently from their mobile devices. These apps allow users to manage their accounts from anywhere, providing features such as opening new accounts, checking balances, transferring funds, and paying bills[22].

Open banking has enabled the emergence of many non-banking players, open banking allows customers to share access to their financial data with third parties whose applications and features can offer customers a better banking experience, for example, account aggregators[23]

4.2 Digital Payments

The widespread adoption of smartphones, along with the rise of mobile payments and blockchain technology, has driven innovation throughout the financial system, especially in three key areas: peer-to-peer payments, retail payments made in stores, and the processing and settlement of credit and debit card transactions[24].

4.3. Blockchain

The first appearance of blockchain dates back to the introduction of the digital currency Bitcoin on October 31, 2008. The first use of Bitcoin occurred on January 3, 2009, with the creation of the first blockchain (the

[22] Hajar Mohammad Alhosseiny, Fintech, concept, opportunities and challenges, and Egypt's fintech landscape, journal of Organizational Culture Communications and Conflict, Volume 27, Special Issue 1, 2023. P 3

[23] Rym BOUCHELIT, Fatima BENOUZIANE. Digital Transformation of Banking Sector: Open Banking and Fintech. Economic Researcher Review. VOL 11,NO 02. 2023. P 99

[24] Kellsy Panno. An introduction to fintech: Key sectors and trends. S&P Global Market Intelligence. 2016. P 7

first block in the blockchain that issued the first 50 Bitcoins, where all subsequent blocks in Bitcoin trace back to this original transaction).
Blockchain is defined as a distributed database that continuously maintains an ever-growing record of data entries that are resistant to tampering or modification, even by the operators or data custodians within the nodes. The blockchain can be seen as a public ledger of all transactions that are executed, continuously growing as a new block is added to the previous ones[25].

4.4.Insurtech

The term "InsurTech" refers to an emerging industry that includes a range of new companies, especially tech-driven startups, that leverage technology to disrupt and transform the traditional insurance marketplace. InsurTech encompasses a growing array of apps, software, and startups that have reinvented what was once a stagnant and uninspiring industry.
As defined, InsurTech represents a set of innovative business models and platforms designed to enhance customer experience by applying cutting-edge technologies within the insurance sector[26].

4.5 Crowd Funding

Fundable defines crowdfunding as a method of raising capital by pooling resources from friends, family, customers, and individual investors. This approach relies on the collective efforts of a large group of people, primarily through online platforms and social media, to expand reach and visibility[27].
The idea of online crowdfunding platforms is based on collecting small amounts of money from a large number of people and presenting it to individuals and helping them launch their projects, especially people who

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[25] Madaoui Nadjia. Smart Contracts and Blockchain.Moufakir review for legal and political studies.Vol 4.N° 2. 2021.

[26]Signority. WHAT IS INSURTECH?AND WHY THE INSURANCE INDUSTRY SHOULD TAKE IMMEDIATE NOTICE. 2017. P 6-7

[27]S M Rashed JAHANGIR.PEER TO PEER (P2P) LENDING. 2019. P 4

have ideas and do not have money to implement their ideas and turn them into real investment projects[28].

4.6.Peer-to-Peer Lending

Peer-to-peer lending can be seen as a form of non-bank or shadow banking, where lending and borrowing occur without the involvement of traditional banks. Unlike conventional banking, peer-to-peer lending primarily operates online. Borrowers seek loans through peer-to-peer lending platforms, often in search of better terms than those offered by local banks, while investors use these platforms to lend money, typically aiming for higher returns than those available through traditional banking institutions[29].

4.7. Personal Finance Management

Fintech developments have made personal financial management simple for everyone. Consumers may successfully manage their funds and obtain insight into their spending habits.

4.8 Robo-Advisor

Robo-advisors are software programs that leverage algorithms to assist individuals in making informed financial decisions. Their popularity is growing within the financial industry, especially in portfolio management and stock markets, as they streamline the trading process, enhance accessibility, and enable trading anytime, anywhere[30].

4.9. Cryptocurrencies

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[28]Demdoum Zakaria, Merghni Walid, Bekkouche Latifa. The need for crowdfunding as a mechanism to support emerging institutions. Hawliyet of the university of Bachar in economic sciences. Vol 7.N° 3. 2021.

[29]S M Rashed JAHANGIR.PEER TO PEER (P2P) LENDING. 2019. P 8

[30] Hajar Mohammad Alhosseiny, Fintech, concept, opportunities and challenges, and Egypt's fintech landscape, journal of Organizational Culture Communications and Conflict, Volume 27, Special Issue 1, 2023. P 4

The rise of cryptocurrencies presents a fundamental challenge to traditional financial functions. By utilizing a peer-to-peer mechanism, cryptocurrencies effectively remove the need for intermediaries, such as financial institutions. For instance, transactions in the cryptocurrency world do not require a bank account or credit card; instead, a cryptocurrency "wallet" functions similarly to a bank vault. With just a smartphone and internet access, cryptocurrencies hold the potential to revolutionize financial inclusion, especially for the over two billion people who are currently unbanked[31].

5. Impacts of FinTech Application on the Financial System

The financial sector has seen numerous significant innovations and technological advances, including contactless payments, digital wallets, and cryptocurrencies. Today, however, much of the innovation originates not from traditional banks but from smaller fintech companies. Despite their differences, there is substantial potential for both fintechs and banks to benefit from collaborating with each other[32].

The innovation in the financial industry has resulted in reduced costs, increased efficiency, faster processes, enhanced innovation, greater flexibility, and improvements in business operations[33].

The significant advancement of emerging fintech companies and their impact on transforming various sectors has enhanced collaboration with financial institutions globally. This progress highlights the true adoption of financial technology and demonstrates how to leverage digital trends to support the sector's growth. The banking sector and fintech startups are encouraging decision-makers to offer additional incentives to stimulate business growth

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[31] Wolfgang Karl Härdle, Campbell R. Harvey, Raphael C. G. Reule. Understanding Cryptocurrencies. International Research Training Group 1792. 2018. P 2

[32] Sofia Anyfantaki, The evolution of financial technology (Fintech), Economic Bulletin, 2016, P 55

[33] Zakia Siddiqui, Claudio Andres Rivera, Fintech and Fintech ecosystem:A review of literature, Risk Governance and Control: Financial Markets & Institutions / Volume 12, Issue 1, 2022, p 64

and to provide essential information for the development of the field, as well as to disseminate knowledge about the impact of this technology[34].

FinTech companies have significantly transformed customer expectations, raising them to a higher level than ever before. These companies focus on several key criteria to create higher added value for the end customer. These criteria include specializing in providing distinctive products and services in specific areas, offering processes that revolve around customer expectations and needs, ensuring cost-effectiveness, and reducing the time required to complete transactions[35].

5.1. Linking Fintech and Financial Inclusion

Fintech has the potential to overcome the barriers to financial inclusion, including geographical limitations, high costs, inadequate infrastructure, and restricted access to traditional banking services. By harnessing technology and data, Fintech offers innovative solutions that are more affordable, convenient, and customized to meet the needs of underserved populations. Through alternative channels like mobile phones, digital platforms, and agent networks, Fintech expands financial access to previously excluded individuals and businesses. It also supports the creation of new business models, risk assessment tools, and credit scoring mechanisms that make lending to individuals with limited credit histories possible[36].

5.2. The futur of Fintech

The future of FinTech is closely intertwined with the advancement of emerging technologies like quantum computing and the Internet of Things

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[34] Amer Abdelwali AlMomani, Khalid Faris Alomari, Financial Technology (FinTech) and its Role in Supporting the Financial and Banking Services Sector, International journal of academic research in business and social sciences, Vol 11, N° 8, 2021, p 1797

[35] Central bank of Egypt. Finance concepts, Fintech. 2012. Issue 29

[36] Muneera Quresh, Muhammad Ismail, Madiha Khan, Mohsin Asad Gill, Rabia kishwer. THE IMPACT OF FINTECH ON FINANCIAL INCLUSION: OPPORTUNITIES, CHALLENGES, AND FUTURE PERSPECTIVES. PalArch's jornal of Archaelogy.20 (2). 2023. P 1214

(IoT). These innovations promise to bring about a new wave of transformation in the financial services sector. Quantum computing, with its unprecedented computational capabilities, could dramatically enhance financial modeling, risk analysis, and cryptography, enabling the processing of massive datasets and performing complex calculations that were once unimaginable. This could lead to more optimized financial operations and decision-making processes[37].

[37] Wentao Zhou. The Transformative Impact of FinTech on Financial Services: A Comprehensive Analysis. the Creative Commons Attribution-NonCommercial. 2024. P 89

Chapter Two: Digital platforms

The Digital Platform Business Model has significantly disrupted various industries and services, leading to optimized efficiencies, faster information sharing, and more dynamic business processes. This phenomenon has forced businesses to rethink and redesign their strategies. Additionally, it has facilitated economies of scale for many smaller companies through the development of Business Ecosystems centered around Digital Platforms. This evolution has reshaped how businesses operate, collaborate, and grow in a more interconnected and digitally driven environment.

1. Digital Platforms

1.1 Definition

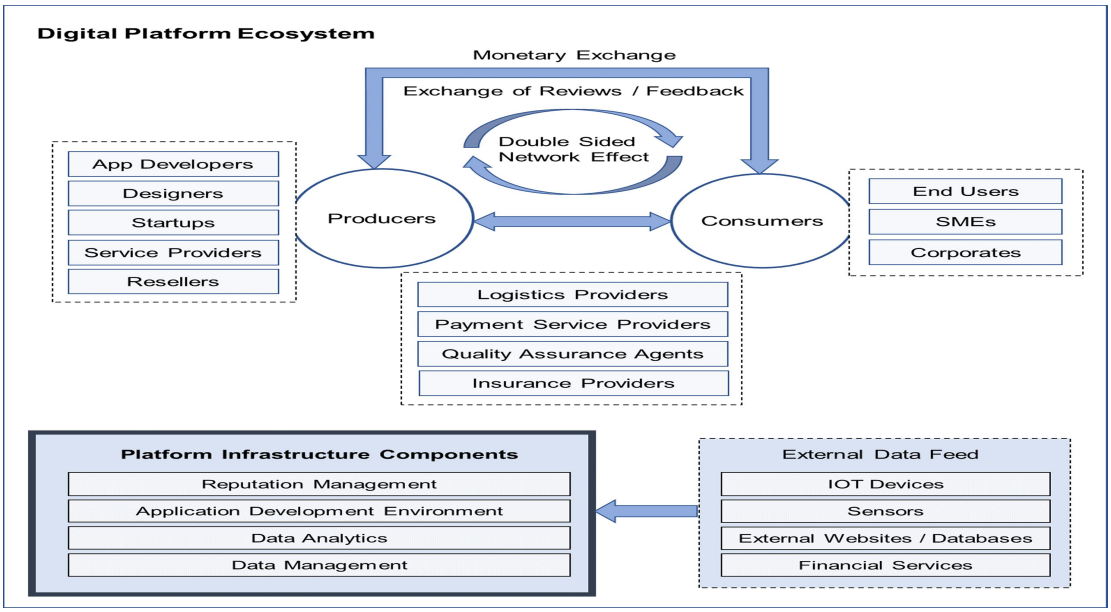
The term "platform" carries a deep history and various interpretations. It combines the words "plat," which means flat or level, and "forme," referring to shape or arrangement of parts. Together, these words suggest a flat, potentially elevated surface where something can be placed or arranged[38]. Digital platforms have been conceptualized in various ways. One view defines them as purely technical artifacts, where the platform serves as an extensible codebase, and the ecosystem consists of third-party modules that complement this core codebase. Alternatively, digital platforms can also be seen as sociotechnical assemblages that incorporate both technical components, such as software and hardware, and the associated organizational processes and standards. Building on this, Ghazawneh and Henfridsson (2015) describe digital platforms as "software-based external platforms consisting of the extensible codebase of a software-based system

[38] Knut H. Rolland. Digital Platforms: perspectives, concepts, and cases. Institutt forinformatikk. 2018.

that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate"[39].

Researchers with an economic focus often emphasize the competitive advantages and new business opportunities that digital platforms introduce. Gawer (2014) described platforms as a form of market, particularly a two-sided market, a concept further elaborated by Rochet & Tirole (2003) as multi-sided markets or multi-sided platforms. Economists tend to view digital platforms as facilitators that connect different actors within a network, often linking various types of consumers and enabling transactions that were previously impossible. A key aspect of this perspective is the exploration of network effects—an independent variable that influences the network without being directly affected by it[40].

Fig.4.Digital platforms Ecosystem



Source: Aneesh Zutshi, Belma Rizvanović& Tahereh Nodehi. The Emergence of Digital Platforms: A Conceptual Platform Architecture and impact on Industrial. Engineering Computers & Industrial Engineering 136. 2019. P 3

[39] Mark de Reuver, Carsten Sørensen, Rahul C. Basole. The digital platform: a research agenda. Journal of Information Technology. 2017

[40] Niklas Lögdal, Philip Calissendorff. Digital platforms challenges and opportunities: Evidence from a traditional market sector. UMEA University. 2018. P 5

1.2 Crowd funding Platforms

The idea of online crowdfunding platforms is based on collecting small amounts of money from a large number of people and presenting it to individuals and helping them launch their projects, especially people who have ideas but do not have the money to implement their ideas and turn them into real investment projects[41]. In order for crowdfunding platforms to be activated in a way that serves the economy and the small and medium enterprises sector, a clear regulatory framework is needed. Regardless of the types of crowdfunding platforms, whether based on loans, donations, or shares, there are three participating parties, the first of which is the crowdfunding platform itself, the second is the companies wishing to invest and participate, and the third is the group interested in providing funds.
The conditions for applying crowdfunding platforms include the following:
- Determining what must be disclosed, by companies about their business, the platform about its role, operations, fees, and method of managing conflicts of interest, and investors about themselves and the extent of their knowledge and understanding of risks.
- Publishing all useful information about the project, product or service, which was promoted by the program launcher, and this is done electronically, because all operations are done through the Internet, and investors are located in different geographical areas.
- Some platforms put in place special mechanisms, such as electronic voting, which allows building a fixed and motivating opinion from the public about the success of the project in financing through the Internet platform.

[41] Demdoum Zakaria, Merghni Walid, Bekkouche Latifa. The need for crowdfunding as a mechanism to support emerging institutions. Hawliyet of the university of Bachar in economic sciences. Vol 7.N° 3. 2021. P 440

- A comprehensive explanation of the status of the invested funds, methods of investing them, and the obstacles they faced in the event that crowdfunding platforms fail to carry out their work[42]

1.3 Opportunities and challenges

Digital finance has given a new form to the banking industry. It is a financial service provided through mobile phones, personal computers, the Internet, or cards linked to a reliable digital payment system. It has the ability to provide an affordable, convenient, and secure banking service, in addition to greater control over customers' personal finances, making quick financial decisions, and the ability to make and receive payments[43].

Digital platforms have reshaped numerous markets, including online marketplaces, mobility services, social networks, and operating systems. They have revolutionized how consumers search for information, communicate, shop, travel, and even date. Additionally, these platforms have transformed business practices, influencing how products are distributed, human capital is sourced, and data is collected and stored. Governments and politics have also felt the impact of digital platforms. In the process, these platforms have generated significant economic surplus for both consumers and businesses, offering benefits such as increased consumer choice, improved efficiency, and enhanced societal participation[44].

In the evolving business models of the digital economy, two key forces are increasingly shaping value creation: platformization and the monetization of the rapidly expanding digital data landscape. Digital platforms are becoming central to the economy, with digital data serving as a crucial resource for

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[42] Faysal Chiad. Islamic Crowdfunding: Alternative Financing Opportunities in the Arab World. Journal of Management and Development for Research and Studies..Vol 8.N° 1. 2019. P P 245-246

[43]abitha Durai & G. Stella. Digital Finance And Its Impact On Financial Inclusion. conference paper. 2019

[44] Sebastian René Hermes. Digital Platforms: Sources of Power, Impacts on Consumers and Organizations, and European Platform Competition. Master of sciences. Technische Universität München. 2020. P 2

generating value. The interaction between these platforms and data significantly influences value generation and its subsequent distribution. While the digital economy is still in its early stages in many developing countries, the evidence of its impact on value creation and distribution remains limited. To fully understand the potential for value creation and distribution, it is essential to identify how companies create value and eliminate barriers that hinder this process. By doing so, businesses can better assess opportunities for modernization, value management, and the mechanisms of value reception[45].

2.Open Banking

2.1.Open API's in banking

APIs (Application Programming Interfaces) serve as bridges between different software applications, enabling them to communicate and share data in a structured way. They offer scalable, secure, and standardized mechanisms for data exchange, which can be reused across various settings, reducing development costs. By facilitating seamless data sharing, APIs can enhance collaboration within organizations, making information more accessible and interconnected, thus boosting productivity and streamlining business processes.

Externally, APIs can help businesses reach new audiences by exposing valuable assets—such as data, services, or products—to external users, including partners and third-party developers. This external API integration can open up opportunities for cross-selling and upselling by enabling others to build upon or incorporate the company's offerings into their own systems and services[46].

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[45] Ganna IEFIMOVA, Oleksiy PASHCHENKO. DIGITAL PLATFORMS IN THE GLOBAL ECONOMY. 2022. P 123

[46]Markos Zachariadis & Pinar Ozcan. OPEN BANKING: HOW PLATFORMS AND THE API ECONOMY CHANGE
COMPETITION IN FINANCIAL SERVICES.2022. P 60

Open banking is indeed a transformative approach in the financial industry. It allows customers to securely share their financial data with third-party fintech companies or other financial institutions, provided they give explicit consent. By facilitating this data exchange, open banking encourages the development of innovative financial products and services tailored to individual needs.

Open banking represents a significant paradigm shift in the financial industry, moving away from the traditional closed banking model towards a more open and interconnected ecosystem. This shift emphasizes data portability and interoperability, allowing customers to authorize third-party providers to access their financial data. With this access, fintech companies and other financial institutions can develop new and innovative services tailored to individual preferences and needs[47].

For consumers, this can mean a more personalized banking experience, with access to a wider range of services such as budgeting tools, investment advice, and more competitive financial products. For financial institutions and fintech companies, open banking can drive innovation, enabling them to develop solutions that better meet the evolving demands of customers.

2.2. Adoption of Open Banking

We see open banking's short history as having evolved in three waves:

- **First wave:** Shaped by technological limitations, limited bank connectivity, and scant intermediary participation, with use cases restricted to aggregation of payment information across multiple bank relationships and payment initiation services with minor innovations.

[47] Vikas Kumar Jaiswal. The Impact of Open Banking on Financial Services: Advantages, Challenges, and Regulatory Considerations. International journal of novel research and development.Vol 8.Issue 7. 2023. P 20

- **Second wave**: In some cases, encouraged by regulation, the number of participating large banks and intermediaries expanded. New use cases emerged, but solutions were limited to financial services.
- **Third wave**: The emergence of open finance, extending the principles of open banking to investment-based products, including savings accounts, mortgages, and insurance.

Participation by non-financial industries and consideration of regulatory enhancement to cater to new use cases, for example relating to crypto currencies or the buy-now-pay-later[48]

Open innovation in the banking sector, as described in the literature, can be categorized into two main strategies: inbound and outbound. These strategies align with the broader concepts of open innovation, where organizations leverage external knowledge and resources to enhance their innovation efforts[49]:

- **Inbound Open Innovation**: This strategy involves banks using external knowledge, technology, and ideas to improve their internal processes and offerings. For example, banks may collaborate with fintech companies, integrate third-party APIs, or adopt new technologies developed outside their organization to enhance customer experiences or operational efficiency.
- **Outbound Open Innovation**: This strategy focuses on leveraging a bank's internal technological capabilities and sharing them with external partners. By doing so, banks can create new revenue streams, enhance their market presence, and contribute to the broader financial ecosystem. Examples include offering white-label banking

[48]Boston Consulting Group.The Power of Open Banking Exploring the Next Wave of Use Cases. 2023

[49] Valeria Stefanelli, , Francesco Manta, , Pierluigi Toma. Digital financial services and open banking innovation: are banks becoming invisible. 2022. P 5

solutions, APIs, or technology platforms to third-party developers and companies.

With the emergence of open banking and regulations like the Payment Services Directive 2 (PSD2) in Europe, banks are increasingly forced to adopt these open innovation strategies. PSD2 mandates that banks open their payment services and customer data (with consent) to third parties, which has catalyzed partnerships and collaborations with fintech companies and other players in the digital financial ecosystem. This shift encourages banks to innovate and stay competitive by embracing new technologies, improving customer services, and finding new ways to deliver value in a rapidly evolving landscape.

Among the most important features and benefits of relying on open banking in financial and banking transactions, we mention the following[50]:

- Promote direct innovation processes
- Increase competitiveness
- Promoting financial inclusion
- Achieving efficiency in the banking sector

2.3. Open banking regulation

Open banking fundamentally shifts data ownership from banks to consumers, empowering them to take control over their financial information. This enables consumers to decide which third parties they wish to share their data with, fostering greater transparency and flexibility in managing their financial lives.

As of October 2021, open banking initiatives have gained traction worldwide, with at least 80 countries showing some level of government-led effort in this domain. However, most of these countries are still in the early stages of development, with only 32 having fully implemented open banking policies.

[50] Aymen Bouzana, Wafaa Hamdouche. Financial technology platforms as a mechanism to promote open banking -APIs as a Model-Moudabbir Journal. 2022. P P 156-157

The specifics of these regulations differ significantly across countries. In some places, data sharing is mandated by law, while in others, governments simply recommend or facilitate the process by providing technical standards or infrastructure.

The scope of customer financial data covered under open banking also varies. In some regions, it is limited to transaction data, while in others, it extends to include savings accounts, lending, and investment records. The European Union (EU) and the United Kingdom (UK) are leading the way in this movement. Both have fully implemented open banking policies and are considering extending these regulations further. In the EU, under the revised Payment Services Directive 2 (PSD2), all institutions offering payment accounts must provide third-party access to customer transaction information, provided the customer consents. This access is facilitated through dedicated APIs, ensuring secure data sharing with both banks and non-banks.

This regulatory framework not only promotes innovation but also enhances competition by enabling new entrants to offer financial services and products that are more tailored to consumer needs. However, the varying approaches across different countries also highlight the challenges in achieving global standardization and ensuring consumer protection[51].

3. Finance Peer To Peer

peer-to-peer business models can be described as so-called hybrid business models those that combine different institutional logics in a novel, unprecedented way. Yet another feature of hybrid business models is that they enable combination of for-profit and for-community (for-common good) motives. Indeed, each of the described cases had a social component, but also a profit-making logic behind it. Peer-to-peer business models have a

[51] Rachel J. Nam. Open Banking and Customer Data Sharing: Implications for FinTech Borrowers. 2022. P 8

potential to contribute to the better world, the world were people give back to the community and contribute to common good, share experiences and create joint memories[52].

3.1. P2P lending's business models

The literature provides a detailed analysis of peer-to-peer (P2P) lending, highlighting its various business models and how it compares to traditional banking.

Verstein (2008) P2P Lending Models: Verstein categorizes P2P lending into two main models:

- **P2P Exchanges**: These platforms function like e-commerce sites, matching borrowers with lenders directly, facilitating loan agreements without intermediaries.
- **Loan Facilitators**: These platforms assist in establishing the lending relationship between the two parties, often providing additional services like credit assessments and payment processing.

Ashta and Assadi (2009)P2P Lending Categories: They further divided P2P lending into four categories:

- **Small Loans**: Typically for personal or microloans, providing credit to individuals or small businesses.
- **Social Investing**: Platforms that allow investors to fund socially responsible projects.
- **Commercial Lending**: Focuses on loans for business purposes, catering to enterprises needing capital.
- **Social Lending**: Emphasizes lending for community-driven projects, often with a focus on social impact rather than profit.

Milne and Parboteeah (2016)Comparison with Traditional Banking: They compared P2P lending with conventional banking, highlighting P2P lending's

[52] Olga Novikov. Peer-to-Peer Business Model: Navigating between Social and Economic Pressures. International Journal of Trade, Economics and Finance. 2022. Vol. 13. No. 2. P 54

ability to attract both borrowers and lenders due to its flexibility, lower costs, and ability to serve underbanked populations. They also noted that P2P platforms often offer higher returns for lenders and more accessible credit for borrowers compared to traditional banks[53].

Peer to peer lending platform has been emerging since 2015. The first P2P website was established in U.K, named Zopa. There are several platforms of P2P scattered around the world such as Lending Club and Prosper[54].

3.2. Benefits of P2P lending

P2P finance platforms are uniquely positioned to enhance community development efforts through their innovative and transparent models. Here's why they are particularly well-suited for this purpose:

- **Transparency:** P2P platforms inherently rely on transparency, which is crucial for building trust and attracting investors. This transparency enables clear evaluation of community development loans on a case-by-case basis, allowing investors to make informed decisions.
- **Additional Capital:** If regulations permit, a P2P market for third-party issued loans could provide community lenders with a vital source of additional capital. This could significantly boost funding for local development projects.
- **Low-Cost Evaluation:** Investors can assess community development loans at relatively low costs, making it easier to participate in financing projects like affordable housing, playground construction, or street beautification.
- **Empowering Individual Investors:** P2P platforms offer a way for individuals to invest directly in their communities or causes they care

[53] Hang Yin. P2P lending's business models, risks and regulation. International Journal of Industrial and Business Management. 2017. P 2

[54] Monica Rosavina, Raden Aswin Rahadi. PEER-TO-PEER (P2P) LENDING PLATFORM ADOPTIONFOR SMALL MEDIUM ENTERPRISES (SMEs): APRELIMINARY STUDY. International Journal of Accounting, Finance and Business.Vol 3.N° 10. 2018. P 6

about. This provides an alternative to charitable donations and allows for grassroots involvement in neighborhood redevelopment.

- **Support for Community Projects:** By bridging finance and social networking, P2P platforms facilitate funding for various community projects that might otherwise struggle to find financial support from traditional sources.
- **Efficiency for Institutional Investors:** Institutional investors, such as those regulated under the Community Reinvestment Act (CRA), could benefit from P2P platforms as a more cost-effective way to invest in community development assets. P2P platforms can offer a more targeted and efficient alternative to traditional mutual funds or ad hoc investing strategies[55].

3.3.Key Risks of Peer to Peer (P2P) Lending

3.3.1 **Financial Risks** :Financial risks refer to the potential for loss a company may face due to fluctuations in financial market prices or rates. These risks are inherent in any business engaged in the financial markets, including peer-to-peer lending (P2PL)

- **Credit Risks (Counterparty Risks):**The risks associated with counterparties not fulfilling their part of an agreement. One example could be the investors' risk of not getting their money back from borrowers.
- **Liquidity Risks:** The risks of money being tied up in the platform and cannot be reached by the customers. An example could be that the platform has not got enough money available when many investors want to withdraw their funds at the same time.

[55] Ian Galloway. Peer-to-Peer Lending and Community Development Finance.Community Investments. 2010. P 19

3.3.2 **Operational Risks:** These risks can be defined as the potential for loss resulting from inadequacies or failures in internal processes, people, systems, or due to external events.

- **Business Risks:** The risks associated with fundamental changes in the business the company is engaging in. An increasing institutional involvement in the P2PL market could create such risks.
- **Agency Risks:**Misalignment of interests between different stakeholders in a P2P lending platform can create significant risks and complications. This misalignment often arises due to differing goals, expectations, and incentives among borrowers, investors, and the platform itself
- **Moral Hazard:** The risks associated with information asymmetry between borrowers and the ones assessing the risks of borrowers, leading to immoral behavior after the transaction. For example, there are moral hazard risks from the P2PL companies since their revenues do not depend on whether the loans are paid back or not.
- **Reputational Risks:**A poor reputation among customers can have significant risks and consequences for a company, particularly in the financial services industry
- **Process Risks:**The risks of inadequate planning and implementation of fundamental processes within the company, in this case the process of screening potential borrowers.
- **Technology Risks:**Failed or malfunctioning technological systems pose significant risks to P2P lending platforms and their stakeholders
- **Economic Risks:** Changing rates of interest in the financial market could for example affect borrowers' and investors' incentives to borrow and invest on P2PL platforms.

- **Legal Risks:** These risks are particularly relevant in the context of ensuring compliance with laws and regulations, such as anti-money laundering (AML) requirements.
- **External Market Risks:** The risks of increasing competition, both from similar platforms within the P2PL market and from commercial banks outside the P2PL market[56].

[56]S M Rashed JAHANGIR.PEER TO PEER (P2P) LENDING.2019. P 18-20

Big Data has revolutionized the financial industry by transforming how financial institutions collect, analyze, and utilize data. In finance, Big Data refers to the enormous volumes of data generated from a myriad of sources, including transaction records, market data, social media, customer interactions, and more. This data is characterized by its high velocity, volume, and variety, presenting both opportunities and challenges for financial institutions.

1.Big Data

Big Data is reshaping the financial sector by providing powerful tools for analysis and decision-making. It enables financial institutions to navigate complex market dynamics, enhance customer experiences, and maintain competitive advantage in a rapidly evolving industry.

1.1.Definition

First, before addressing the main topic, which is big data, we must understand:

What is data? And what is the difference between it and information and knowledge?

Data can be defined as a set of letters, words, numbers, symbols, or images related to a topic. Data in itself has no meaning or for example, employee data and images. Value, which is the raw image of the information. As for information, it is the data that has been analyzed and processed, so that it has meaning and value, and can be used in making decisions, such as obtaining the total Number of employees, their average age, average years of experience, ... etc. And knowledge is the process of analyzing different information and linking it together and having a clear Importance to it and mixing it with experience[57].

[57] Mahmoud Abdessalam. Big Data Technology.Arab Monetary Fund.AbuDhabi. 2021. P 5

The International Organization for Standardization (ISO) defines big data as: "A set or sets of data that have characteristics such as volume, velocity, variety, variability, accuracy, etc., that cannot be processed efficiently using current and traditional technology to achieve their intended benefit."[58]

Big Data encompasses the vast amounts of digital information produced from a variety of sources. This data comes from traditional software and information exchange as well as from modern sensors embedded in diverse environments. Applications of Big Data include:

- **Healthcare:** Hospitals and medical devices generate data related to patient health, treatments, and outcomes.
- **Logistics and Transportation:** Sensors in metro stations, cars, and traffic systems provide data on traffic flow, public transportation usage, and vehicle performance.
- **Retail:** Market sensors and point-of-sale systems capture customer transactions, inventory levels, and purchasing patterns.
- **Smart Devices and manufacturing:** Everyday electronics, such as home appliances and wearable technology, contribute data on usage patterns and user preferences[59].
- **Financial services and Insurance:**

  - The increased ability to analyze and process big data is dramatically impacting the financial services, banking, and insurance landscape.
  - In addition to using big data for swift detection of fraudulent transactions, lowering risks, and supercharging marketing efforts, few companies are taking the applications to the next levels.
- **Energy:**

[58] Abdarahman Mohamed Selimane Rashwan. The role of the analysis of large data Big Data in the rationalization of financial and administrative decisions in the Palestinian universities – a field study. Journal of Economic and Financial Studies.Vol 11.N° 1. 2018. P 27

[59] Anuj Mediratta. BIG DATA: TERMS, DEFINITIONS, AND APPLICATIONS. EMC Proven Professional Knowledge Sharing. 2015. P 3

- To combat the rising costs of oil extraction and exploration difficulties because of economic and political turmoil, the energy industry is turning toward data driven solutions to increase profitability.
- Big data is optimizing every process while cutting down energy waste from drilling to exploring new reserves, production, and distribution.

- **Government**:
  - Cities worldwide are undergoing large scale transformations to become “smart”, through the use of data collected from various Internet of Things (IoT) sensors.
  - Governments are leveraging this big data to ensure good governance via the efficient management of resources and assets, which increases urban mobility, improves solid waste management, and facilitates better delivery of public utility services[60].

The integration and analysis of this Big Data can offer valuable insights, drive innovation, and improve decision-making across various industries.

1.2. Characteristics of Big Data

The characteristics of Big Data are often described by the "5 V's" as shown in the figure 5:

- **Volume**: This is the size of the data extracted from a source, which determines the value and size of the data in order to be classified as big data. By the year 2018, cyberspace will contain approximately 40.000 megabytes of data ready for analysis and information extraction.
- **Variety**: This is the extracted data, which helps users, whether researchers or analysts, to choose the appropriate data for their research field. It includes structured and unstructured data such as: images, clips, audio and video recordings, text messages, call logs,

[60] R, Ashok Kumar. Introduction of big data analytics. BMS college of engeneering. 2023. P 13-15

and map data. It requires time and effort to prepare it in a form suitable for processing and analysis.

- **Velocity:** This means the speed of producing and extracting data to cover the demand for it, as speed is a crucial element in making a decision based on this data, which is the time we take from the moment this data arrives until the moment we make a decision based on it[61].
- **Veracity:**Inherent unpredictability of some data requires analysis of big data to gain reliable prediction
- **Value:** The extent to which big data generates economically worthy insights and or benefits through extraction and transformation

Fig. 5.Characteristics of Big Data

Source: Ashok Kumar. INTRODUCTION TOBIG DATA ANALYTICS. BMS college of engeneering. P 7

1.3 Types of Big Data in finance

In financial economics, Big Data plays a crucial role in decision-making, risk management, and strategic planning. The types of Big Data in this field can be categorized based on their sources, structure, and usage.

[61] Abdarahman Mohamed Selimane Rashwan. The role of the analysis of large data Big Data in the rationalization of financial and administrative decisions in the Palestinian universities – a field study. Journal of Economic and Financial Studies. Vol 11. N° 1. 2018. P 28

Big Data is generally categorized into three different varieties. They are as shown below:

- ***Structured Data:*** owns a dedicated data model, It also has a well defined structure, it follows a consistent order and it is designed in such a way that it can be easily accessed and used by a person or a computer Structured data is usually stored in well defined columns and also Databases
- ***Semi Structured Data:*** can be considered as another form of Structured Data It inherits a few properties of Structured Data, but the major part of this kind of datafails to have a definite structure and also, it does not obey the formal structure ofdata models such as an RDBMS
- ***Unstructured Data:*** is completely a different type of which neither has a structure nor obeys to follow the formal structural rules of data models It does not even have a consistent format and it found to be varying all the time But, rarely it may have information related to data and time[62]

1.4.The role of Big Data in Financial sector

Currently, use of Big Data, to distinguish the providers of financial services based on advanced analytics is in continuousincrease. Along with the advantages like improvement in customer services, operational efficiency, and effectiveness, managing.

Big data also helps in cost reduction with advanced technology.

Ability to process Big Data brings in multiple benefits, such as[63]:

- Businesses can utilize outside intelligence while taking decisions.

- Access to social data from search engines and sites like facebook, twitter are enabling organizations to fine tune their business strategies.

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[62] R, Ashok Kumar. Introduction of big data analytics. BMS college of engeneering. 2023. P 5

[63]Rajni Bhalla. Introduction to Big Data.Lovely Professional University. 2023. P 3-4

- Improved customer service (Traditional customer feedback systems are getting replaced by new systems designed with Big Data technologies.
- Improved customer service (In these new systems, Big Data and natural language processing technologies are being used to read and evaluate consumer responses.
- Early identification of risk to the product/services, if any.
- Better operational efficiency

The data available from the financial sector like online banking transaction, mobile apps data, asset management, management of trading online, online lending etc. helps the financial sector in improving performance and taking the right decisions based on the trends and customer demand. Services like online banking transactions, mobile apps, asset management, management of trading, and online lending provide millions of pieces daily. Covering the domain of banking transactions several authors have addressed and explained various relationships that they have developed based on data analysis gathered through online sources. Dissemination of data and the volume of data shows efficiency of financial markets. Furthermore, the role social media plays in financial market performance cannot be ignored because in developing countries financial markets are highly rumours based rather than depending on the fundamentals. Data is huge that is generated through online transactions which require efficient management and can be utilized for optimization of operations. Through optimization techniques return on investment and return on equity can be increased. Big Data in finance isequally important as in the field of marketing or human resource. The stock markets anywhere in the world follow technicalanalysis as compared to fundamental analysis. Thus, the importance of Big Data in the field of finance cannot be underestimated[64].

[64] Enas Al-Iozia, Amjed Alfityanib, Ayman Abdalmajeed Alsmadic*, Amer Moh'd Al_Hazimehd and

Customer satisfaction is the main indicator of the success of any bank. Also, detecting fraud and forgery is very important to protect customers. Hence, big data analysis provides the ultimate solution to increase customer satisfaction, by analyzing customer data to know their needs. For example, a bank will direct a customer to take a car loan if he does not have one. Big data analysis also helps banks detect fraud and forgery.

1.5. Big Data Management

Big Data management refers to the process of acquiring, storing, organizing, and maintaining large volumes of data. Effective management ensures that data is accessible, secure, and valuable for analysis. It encompasses a broad spectrum of activities, including data integration, data quality management, metadata management, and data security.

The transfer from the management of a traditional volume of data to the management of big data requires a change within the company. There are five areas of interest[65]:

- **Leadership**:Big data require the need for human guidance on the road to change and success. Evaluating information and extracting knowledge that can lead to successive business decisions is a science in itself, requiring visionary leadership.
- **Talent Management**:The complexity and management of big data has to do both with the technology and the processes, and with scientific and professional personnel, the key persons whose job it is to implement, integrate, and keep operational such systems.
- **Technology**:Indeed, big data management technology has seen remarkable advancements in recent years, offering a wide range of

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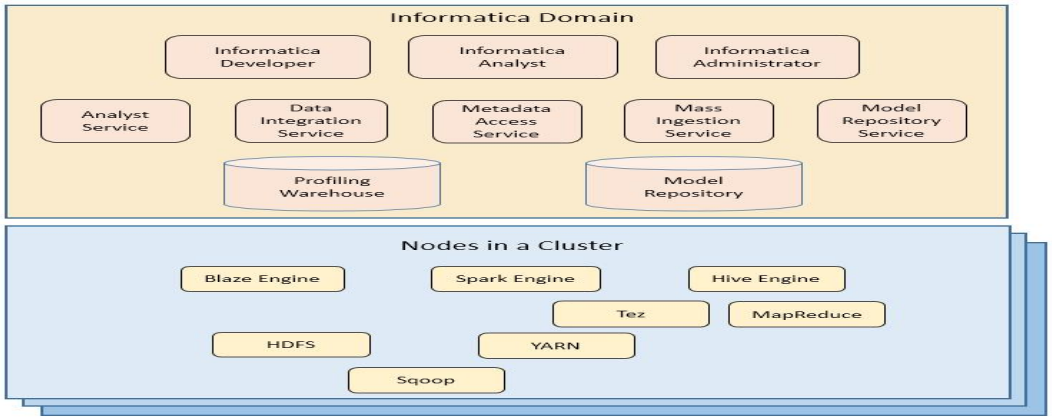
Jassim Ahmad Al-Gasawnehe. The role of big data in financial sector: A review paper. International Journal of Data and Network Science. 2022. P 6-7

[65]Panagiotis Kostakis and Antonios Kargas. Big-Data Management: A Driver for Digital Transformation?.Information.12, 411. 2021. P 3-4

tools and solutions for both professional and scientific purposes. Open-source tools, such as Hadoop, have made big data management more accessible to a broad community, enabling organizations of all sizes to leverage the power of big data.

- ***Decision Making:*** Information is created and transferred within the organization through data processing. That is why it is important for people who manage and process data to work with people who are responsible for understanding the company's problems, finding solutions and making decisions.
- ***Company Culture:*** Big data may lead a company nowhere, but transformingbig data into valuable information and decision-making knowledge means a series ofinternal changes to organizational culture. Being sensitive to external environmentalinformation (big data transformed into information) requires significant changes interms of company culture.

Fig.6. Components of Big Data Management



Source: https://docs.informatica.com/

2. Artificial intelligence in Finance:

Artificial intelligence (AI) is transforming the financial industry, bringing new opportunities and challenges. AI's ability to process vast amounts of data, recognize patterns, and make decisions is enhancing various aspects of

finance, from trading and investment to customer service and risk management.

AI programs allow computers to perform tasks that are typically associated with human intelligence, such as understanding natural language, recognizing patterns and problem-solving. Machine learning is an application that allows computers to learn from and make decisions based on data without direct instruction. According to the global consulting firm Gartner, machine learning is the technology financial organizations are leaning on the most to drive innovation. However, AI isn't a new concept in finance. Its use dates back to simple algorithms and models for trading and risk management in the 1980s and 1990s. Big data and advancements in computational power simply expanded their adoption and capabilities. Today, AI and ML are used for a diverse range of applications[66].

Today, AI (Artificial Intelligence) and ML (Machine Learning) are used in the financial industry to improve customer experience, increase the efficiency and accuracy of operational workflows, and improve performance by supporting multiple aspects of the investment process

For example, in an AI system that aims at credit adjudication, there are models that transform historical characteristics of a person (transactions, purchasing preferences, risk tolerance, debt level, etc.) into a score that is used further in the system to determine the risk associated with that individual and potentially make a decision on granting credit and its parameters. Scoring systems are also used in the insurance industry for pricing purposes[67].

Key Applications of AI in Finance are: Algorithmic Trading, Fraud detection & Prevention, Risk Management, Customer Service & Personalization, Portfolio

[66]Raymond A. Mason School of Buisiness.William & Mary. The Future of Finance: AI, Machine Learning and Predictive Analytics. 2024

[67]Financial Markets Authority. AI in Finance: Recommendations for responsible use. 2021. P 18 & 22

Management, Credit Underwriting, Sentiment Analysis, Compliance & Regulation.

3. Smart Contracts

Smart contracts" are a critical component of many platforms and applications being built using blockchain or distributed ledger technology. It is a term used to describe computer code that automatically executes all or parts of an agreement and is stored on a blockchain-based platform[68]

The purpose of smart contracts is to facilitate transactions between actors who do not know each other and to ensure that each contracting party fulfills its obligations and avoids any fraud. This reduces payment delays and the risk of error, but it also avoids potential friction over contract terms and mutual obligations. But the safe and intelligent nature of these protocols does not leave room for hesitation or interpretation, as contracts must be implemented on specific and acceptable terms without the possibility of bypassing the system[69]

3.1 Advantages of Smart Contracts

- **Speed, efficiency, and accuracy:** Once the conditions are met, the contract is executed immediately, since smart contracts are digital and automated, there is no paperwork to be processed, and no time is spent resolving errors that often result from manually making documents.
- **Trust and Transparency:** Since there is no meaning of a third party and because records are encrypted for transactions that are shared through participants, there is no need to ask about whether the information has been changed for personal benefit.

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[68] Skadden, Arps, Slate, Meagher & Flom LLP and Affiliates .An Introduction to Smart Contracts and Their Potential and Inherent Limitations. 2017. P 2

[69]Zainab Ali Kamal 1 and Rana F. Ghani. Data retrieval based on the smart contract within the blockchain. Periodicals of Engineering and Natural Sciences.Vol 9.N° 4. 2021. P 493-494

Susan G. Cohen & Yael V. Hochberg.Accelerating Startups: The Seed Accelerator Phenomenon. SSRN Journal, 2014, P 493

- **Security:** Transactions are encrypted, making them difficult to hack. Since each record is connected to the previous and subsequent records in a distributed ledger, it is difficult for hackers to alter the entire chain to change a single record.
- **Conservation:** Smart contracts eliminate the need for intermediaries to handle transactions, so time delays and fees associated with transactions do not exist[70]

4.Seed Accelerators

What do accelerators do? Broadly speaking, they help ventures define and build their initial products, identify promising customer segments, and secure resources, including capital and employees. More specifically, accelerator programs are limited-duration programs—lasting roughly three months—that help cohorts of ventures with the new venture process. They usually provide a small amount of seed capital, plus working space. They also offer a plethora of networking, educational and mentorship opportunities, with both peer ventures and mentors, who might be successful entrepreneurs, program graduates, venture capitalists, angel investors, or even corporate executives. Finally, most programs end with a grand event, usually a "demo day" where ventures pitch to a large audience of qualified investors[71]

Dempwolf et al. (2014) describe foursubtypes of accelerators: innovation, social, university and corporate. . Innovation accelarators are the best-known form of SAs. Examples include Techstars and YCombinator.

Social accelerators have been gaining increasing acceptance since the launch of social entrepreneurship programmes such as the Global Social Venture Competition. Some universities back entrepreneurship programmes

[70]Zainab Ali Kamal 1 and Rana F. Ghani. Data retrieval based on the smart contract within the blockchain. Periodicals of Engineering and Natural Sciences.Vol 9.N° 4. 2021. P 493-494

[71]Susan G. Cohen & Yael V. Hochberg. Accelerating Startups: The Seed Accelerator Phenomenon. SSRN Journal, 2014, P 4

linked to hosting entrepreneurs at their own accelerator facilities . Finally, corporate accelerators have emerged since 2014 to provide corporations with their own innovation ecosystems in pursuit of the goal acquiring client start-up[72]

5. Predictive Analysis

Predictive analytics is a type of data analysis that uses statistics, data science, machine learning, and other techniques to predict what will happen in the future. The term “predictive analytics” is made up of two words that are not difficult to understand. Indeed, it consists of making a prediction based on data analysis. More precisely, predictive analytics is based on historical information or behavioral analysis to draw conclusions about future events.

This is a subcategory of data science that marketing companies use to identify trends in order to meet customer needs. In other words, this type of data analysis includes descriptive and diagnostic analysis to arrive at prescriptive analysis.

Predictive analytics uses several techniques, including data mining, statistical modeling, mathematical analysis, but also machine learning which is a category of AI. However, it can do without the latter and still obtain satisfactory results[73].

5.1 Predictive Analytics in Finance

Financial organizations use different types of mathematical models to increase their profits and minimize their risks. Machine learning algorithms excel at analyzing vast datasets to identify patterns and predict future outcomes.

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[72]Lydia Canovas-Saiz, Isidre March-Chorda and Rosa Maria Yague-Perales. New evidence on accelerator performance based on funding and location. pean Journal of Management and Business Economics Vol. 29 No. 3, 2020. P 219

[73] https://www.actuia.com/

- **Data Collection and Processing:** Predictive models rely on diverse data types, including historical financial data, market data, customer transaction records, social media activity and economic indicators. The quality and integrity of this data directly impact the model's effectiveness. Clean, accurate and comprehensive datasets deliver reliable outcomes, while poor-quality data can lead to misleading insights and poor decisions.
- **Forecasting and Trend Analysis:** Financial forecasting methods analyze past data to identify patterns and trends as the basis for predicting future market movements and financial performance.

  Decision Support Systems: Financial companies use predictive analytics models to make better decisions. A decision support system (DSS) integrates predictive models for strategic planning and risk management. In traditional banking, a DSS predicts loan defaults so banks can adjust their lending strategies to minimize their risk. In investment management, predictive analytics help portfolio managers optimize their asset allocation based on forecasted market conditions[74].

Chapter Four: Insurance Technology

Insurtech, or insurance technology, has indeed been a transformative force within the insurance industry. By leveraging modern technologies such as artificial intelligence (AI), blockchain, big data, and the Internet of Things (IoT), insurtech has enabled significant advancements across various aspects of insurance operations.

Companies that rely on technological insurance have made the process of purchasing insurance policies easier, starting from individual insurance to

[74]Raymond A. Mason School of Buisiness.William & Mary. The Future of Finance: AI, Machine Learning and Predictive Analytics. 2024

corporate insurance. Technology insurance has made it easier for customers to search for the appropriate type of insurance, compare different policies, and purchase the policy online without the need to visit the company to complete the insurance process or report a claim or accident.

1.Insurtech and Insurtech Companies

1.1 Definition of Insurtech

The OECD defines the Insurtech that it as “a term used to describe new technologies with the potential to bring innovation to the insurance sector and influence regulatory practices in the insurance market”. It is also defined as “a set of emerging technologies that are changing the insurance industry model, with the aim of improving efficiency and enhancing customer satisfaction, relying on digital organizations and digital companies with a strong focus, excellent technical capabilities and a human culture that is well suited to innovation and innovation.”[75]

New technologies affecting the insurance industry include cloud computing, telematics, the Internet of Things (IoT), mobile phones, blockchain technology, artificial intelligence and predictive modelling[76]

Insurance companies have recently been leaning towards investing in technological insurance in order to facilitate the insurance process, reduce costs, and work on improving the service provided to customers, whether by creating their own technological system or by contracting with technology companies to provide the necessary technological technical support.

For example, in the event of a claim and as it is shown in the figure below:

1-By phone, report the initial notice of loss

[75] Meriem Sid, Sawsen Zirek. InsurTech a new path for the insurance sector. Virtual International Colloque on: Big Data and the Digital Economy as a Mechanism for Achieving Economic Takeoff in Developing Countries “Opportunities, Challenges and Prospects”. El ouedi University. 2022. P 3

[76]Martin Eling · Davide Nuessle · Julian Staubli.The impact of artificial intelligence along the insurance value chain and on the insurability of risks.The Geneva Papers on Risk and Insurance. 2022. P 210-211

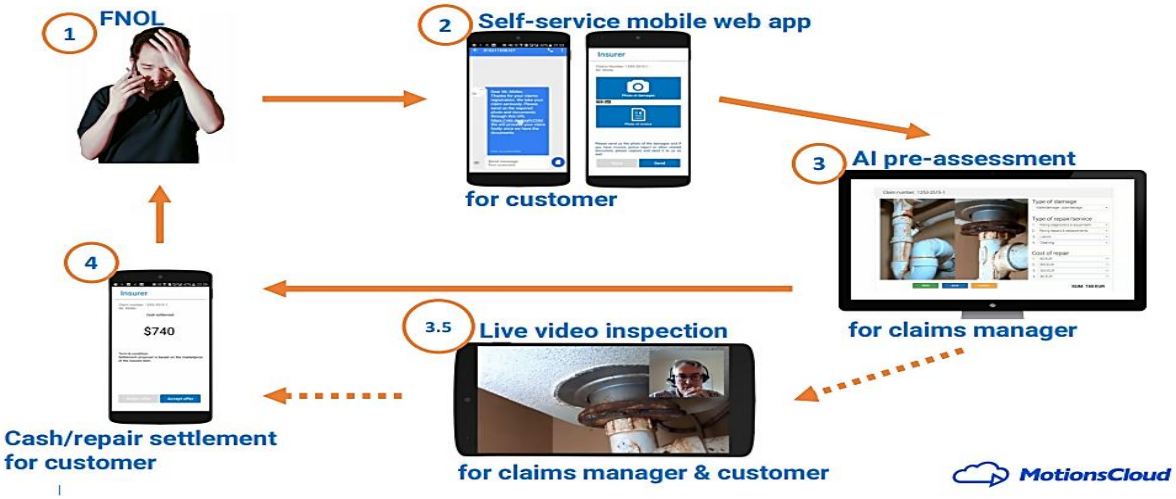
2-Through the insurance company's phone application, enter the necessary data

3-The application conducts an initial assessment of the claim and presents it to the compensation manager

4-Complete the accident assessment process through a video call so that the assessment is realistic by the company

5-Through the application, the necessary compensation is settled.

Fig. 7.Insurtech claim



Source: https://www.ifegypt.org/

1.2. Definition of Insurtech Companies

Insurtech companies are: “companies operating in the insurance sector, relying on new technologies to introduce innovations that lead to the emergence of new economic models, operations and products”. These companies are often small, newly established start-ups, arising from an entrepreneurial and creative idea that combines insurance and advanced technology, and using their skills and expertise in the field of digital technologies to acquire market shares in the branches targeted by traditional insurance companies until now. The emergence of this type of companies has been to reshape the insurance industry and introduce profound transformations, and make improvements that have the potential to modify the behavior of all market players: customers, brokers, insurance companies,

reinsurers, and enrich the services provided to insurance policyholders at a lower cost[77].

Insurtech companies provide more effective solutions in the casualty insurance branch. The investments being made and implemented in this vital branch are more important due to the strong presence of telemetry as in vehicle insurance, health insurance, housing insurance (home automation), while the life insurance branch remains less important and less attractive to Insurtech investments.

In order to conquer the insurance services market and increase demand for their products, emerging insurance technology companies focus on several aspects that can be mentioned as follows[78]:

–Improving and consolidating the relationship with the customer by individualizing the customer relationship thanks to communication tools

–Reducing costs, and the resulting decrease in the value of premiums

– Exploiting data circulating on the Internet, especially those resulting from connected objects and big data, autonomous vehicles, home automation

– Claims management, underwriting and management of insurance contracts via the Internet

– Personalization of insurance offers, the role of artificial intelligence and the introduction of new services.

2.Technologies affecting the insurance industry

The use cases show that most applications in the insurance industry, ranging from the analysis of images of customers through the use of algorithms for the estimation of contractual terms for life insurance policies to the optimisation of fraud detection, aim to realise artificial narrow intelligence

[77] Cheragua Sabrina. Insurance Technology: A New Direction for a Technologically Transformed and Advanced Insurance Industry– Case Study of the American Company "Lemonade". Journal of Economic Issue Studies.Vol 12.N° 2. 2021. P P 20–21

[78]KPMG, the pulse of Fintech, Global analysis of investment in Fintech, report, Q4. 2016. P 04

(weak AI) as they solve very specific tasks. In light of today's insurance markets, insurance companies are thus more interested in applications of artificial narrow intelligence than in mimicking human intelligence (strong AI). The impact of more human-like artificial general intelligence on the insurance industry remains unknown as the technology is not yet fully understood and developed. For now, insurance companies should focus on the implementation of artificial narrow intelligence while monitoring the technological developments of artificial general intelligence. Most applications focus on specific areas of the value chain and are used for customer and operations efficacy: scenarios where the computational advantage, speed and accuracy of artificial intelligence are mainly levered. Using artificial intelligence to generate new insights or to reveal previously unknown results is more difficult to realise from a technological point of view. Today's most prominent use cases in this category are telematics-enabled usage-based insurance contracts in the health, motor and property and casualty segment.28 Start-ups such as Oscar29 use machine learning algorithms[79]

The application of insurtech runs right across the value chain, enabling new types of product and services, new forms of distribution, new information for underwriting, and better ways to onboard and service business, particularly around claims. Insurtech solutions are driving analysable data into parts of the value chain that have not historically had that data. This opens up opportunities for actuaries to get involved in these new areas outside the traditional fields of pricing, reserving and capita[80]

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[79]Martin Eling · Davide Nuessle · Julian Staubli.The impact of artificial intelligence along the insurance value chain and on the insurability of risks.The Geneva Papers on Risk and Insurance. 2022. P 214

[80]Institute & Faculty of Actuaries. Insurtech – Applications in General Insurance. 2021. P 6

Insurtech companies leverage emerging technologies to reduce costs and provide insurance coverage that better suits customers. Their business model is characterized by customer focus, personalization of products, total automation of processes, and data-driven decision-making. The model also relies on mobile technology and applications to reach broad coverage, where premiums are paid automatically via a mobile insurance platform. Insurtech companies typically focus their activity on untapped parts of the insurance market and individual products, whether new or modified existing products such as teleinsurance[81]

2.1.Impact of technology on the insurance value chain

The value chain is the chain through which products pass in order, and at each step the product gains additional value, which begins with the design of the product (document), followed by its marketing, then underwriting and pricing, then settlement of compensation, and finally customer service.

- **Product design:** Technology insurance affects the insurance industry, especially the methods of obtaining data and analysis, which helps in the process of designing the document in a way that suits the customer's needs and creating new insurance coverage.
- **Marketing:** Using technology to reach target customers faster, for example through their phones or social media sites.
- **Underwriting and pricing:** Technology provides new data and advanced analysis, which helps to better understand risks and how to reduce them and use that data in pricing to make pricing more accurate.

[81] Cheragua Sabrina. Insurance Technology: A New Direction for a Technologically Transformed and Advanced Insurance Industry – Case Study of the American Company "Lemonade". Journal of Economic Issue Studies.Vol 12.N° 2. 2021. P 22

- **Compensation settlement:** Technology contributes to the ease of reporting in the event of an accident and speeds up the compensation settlement process.
- **Customer service:** Many interactions between customers and the insurance company have become digital (electronic) via social platforms on the Internet and phones to facilitate the communication process between the customer and the company and save time[82].

2.2 Insurtech Applications

Insurance startups are using a range of technologies to create a business solution that many traditional insurance companies cannot match. According to McKinsey, there are technologies in insurance, such as:Micro insurance, Block chain, Peer to peer, Robo Advisor, Analysis, Internet of things (IoT), Private insurance, Big Data & Machine learning.

- **Internet and Smartphones (Digital Platform):**It allows its users to purchase insurance documents through their mobile phones, in addition to the possibility of declaring the accident and sending photos via the self, as technology saves time for customers and insurance institutions to carry out insurance procedures, as well as store differences in order to deliver insurance services to all remote and rural areas. The digital platform also provides the opportunity for customers to pay insurance premiums in a safe, easy and smooth manner, through their mobile phones, where the QR code is scanned to enjoy a safe cashless payment through mobile phones
- **Internet of Things (IoT):** Oxford Dictionary (where IoT was added in August 2013) defines it as: A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data[83].

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[82] https://www.ifegypt.org/

[83] Dan-Radu BERTE. Define IoT..Proceedings of the 12th International Conference on Business

We can define the Iot from the above definition that it works to create a connected world that enables data collection via smart sensors: drones, smart cars and homes, remote controls….etc.

- **Data Analytics and Big Data**:Which was defined by the McKinsey Global Institute as: "A set of data that exceeds the capacity of traditional databases to capture, store, manage, and analyze that data. In this context, the term big data was applied in the field of information technology to a set of very large and complex data packages that are difficult to deal with by traditional database management systems."[84]
  - **Artificial Intelligence& Machine Learning**:Intelligence displayed by machines is used when computer programs are developed to perform cognitive functions and solve problems. Robotic advice is a model of automated advice that has the ability to provide advice in a more efficient and less costly manner[85].However, Machine learning is the modern science of finding patterns in your data in an automated way using advanced methods and algorithms.
- **Block chain**:It is a massive database that includes a series of blocks interconnected with each other through a digital signature. These blocks will record the transaction between the contracting parties that used the electronic network for contracting purposes. Information will be transmitted between these blocks, and each block will act as a

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Excellence De Gruyter Open. 2018. P 2

[84]Allali Sara, Guettafi Salima, The role of Islamic financial technology in the development of the Takaful insurance sector: prospects for Takaful insurance and insurance technology in Algeria. National Conference in Modern Trends in Islamic Financial Innovations and Their Role in Promoting Financial Inclusion in Algeria. 2022. P 8

[85] Marija Koprivica , INSURTECH: CHALLENGES AND OPPORTUNITIES FOR THEINSURANCE SECTOR, Conference Proceedings: 2nd International Scientific ConferenceITEMA 2018, P 622

digital ledger, where information can be securely stored and preserved, allowing the completion of the transaction process[86].

- **Smart Contracts** : With smartphones, autonomous cars and smart glasses, smart contracts in insurance companies play a role in revealing, for example, in the case of smart cars, who caused the accident and the condition of the driver, and thus insurance companies can impose different prices based on the place and conditions under which subscribers use their car[87].
- **Peer to Peer**:A mix of traditional mutual insurance and modern technological solutions[88]
- **Cloud Computing**: Cloud computing provides access to computing resources (servers, storage, applications, services, etc.) over a networkin a convenient, pay-as-you-go model.[89].

2.3.Reasons for Technology Impacting Insurance Industry:

The insurance industry is being transformed by technological advancements in several key ways:

- **Data Collection and Analysis**: With the rise of big data and advanced analytics, insurers now have the capability to collect and analyze vast amounts of data. This enables them to better assess risks, understand customer behaviors and preferences, and make more informed decisions.

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[86] Meriem Sid, Sawsen Zirek. InsurTech a new path for the insurance sector. Virtual International Colloque on: Big Data and the Digital Economy as a Mechanism for Achieving Economic Takeoff in Developing Countries “Opportunities, Challenges and Prospects”. El ouedi University. 2022. P 5

[87] Kerouani Meriem, Habbache Fares. The role of insurance technology in supporting operational innovation in insurance companies.Journal of Management and Development for Research and Studies.Vol 8.N° 1. 2019. P 64

[88] Cheragua Sabrina. Insurance Technology: A New Direction for a Technologically Transformed and Advanced Insurance Industry – Case Study of the American Company "Lemonade". Journal of Economic Issue Studies. Vol 12. N° 2. 2021. P 22

[89]KPMG, the pulse of Fintech, Global analysis of investment in Fintech, report, Q4. 2016. P 20

- **Automation:** Automation is streamlining many insurance processes, from underwriting to claims management. This reduces operational costs, enhances efficiency, and improves the overall customer experience by speeding up processes.
- **Enhanced Customer Experience:** Technological advancements allow insurers to deliver a more personalized and responsive experience to customers. This includes providing digital self-service options, such as online claims submissions and policy management, making interactions more convenient for policyholders.
- **Risk Management and Mitigation:** Technology is improving insurers' ability to assess and mitigate risks, especially in areas like cybersecurity and natural disasters. Data analytics, for example, help identify potential risks and develop targeted risk management strategies.
- **Rise of Insurtech:** Insurtech companies are disrupting the traditional insurance model by offering innovative products and services. Utilizing technologies such as blockchain and artificial intelligence, these companies provide more efficient and cost-effective insurance solutions[90].

2.3. Challenges

While image analysis and processing technology in general is reasonably well developed, its application to the insurance industry is relatively immature. As such, there are some challenges in developing specific solutions:

- Generic models will need to be adapted and trained to meet the specific requirements of the use case; this may require a large volume of data, and potentially a lot of human effort to label that data.

[90] COLINE MICHAEL SABU. Impact of technology on insurance industry.Journal of emerging technologies&innovative research.Vol 10. Issue2. 2023. P d28

-. Insurance is a highly regulated industry, and insurers have an obligation to treat customers fairly, so there is a need to demonstrate that the model and/or its deployment does not lead to biased or unfair decisions[91]

3.Some examples of partnerships between traditional insurance companies and insurance technology Start-ups

Many insurance companies are partnering with insurance technology companies to explore innovative areas such as self-driving cars, smart homes, insurance by usage, and others. Here are some of the partnership projects between the two parties:

- **Sureify:** The company has positioned itself as "the bridge between carriers and customers," and focuses on improved underwriting and customer engagement by providing insurance companies with more data about insurance policyholders via mobile devices and the Internet of Things.
- **Senteri:** Provides smart connected devices that provide insurance companies with dynamic updates on risks such as hazards in customers' homes. The Sentri mobile app allows customers to check which products installed on their property are eligible for insurance discount programs, such as security systems, smoke alarms, and automatic door locks.
- **Ping An:** Uses cloud technology to connect core customer databases, claims management platforms, and an artificial intelligence system to manage risks, with the aim of creating an intelligent system for processing insurance claims for car insurance, where the AI system processes 95% of these claims
- **All State:** The company created a chatbot called ABIE, which is present on its website and provides answers to business owners' questions. The advantage of this program is that it is available to

[91]Institute & Faculty of Actuaries. Insurtech – Applications in General Insurance. 2021. P 25

customers 24 hours a day, seven days a week, and machine learning will enable insurance companies to extract valuable data and information more efficiently[92].

Chapter Five: Cyber Security

As the global economy and everyday life become more interconnected through technology, the importance of safeguarding digital assets has never been greater. High-profile cyberattacks, such as the WannaCry ransomware and the SolarWinds breach, have highlighted the vulnerabilities in even the most secure systems, emphasizing the need for robust cybersecurity measures. Banks are a prime target for cybercriminals, both individuals and government entities, and no government entity has a greater interest in protecting the performance of financial institutions than a country's central bank. Furthermore, in exercising their supervisory and enforcement powers, central banks have a unique insight into whether regulated financial institutions, and sometimes even unregulated ones, have taken appropriate steps to be more resilient to cyberattacks. Because central banks are repositories of highly sensitive information about the financial system, they also have a strong interest in defending against the misappropriation of their private data.

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[92] Cheragua Sabrina. Insurance Technology: A New Direction for a Technologically Transformed and Advanced Insurance Industry – Case Study of the American Company "Lemonade". Journal of Economic Issue Studies.Vol 12.N° 2. 2021. P 26

1.Cybersecurity and Cybercrime

1.1. Definition of Cybersecurity

Cyber Intrusions and Attacks have increased dramatically over the last decade, exposing sensitive personal and business information, disrupting critical operations, and imposing high costs on the economy . Cyber Security is protecting our cyber space (critical infrastructure) from attack, damage, misuse and economic espionage.

Access control is a key component of cybersecurity. The danger of unauthorised access and data breaches is decreased by implementing appropriate access controls, which guarantee that only authorised users have access to particular resources. This entails defining user permissions and privileges in accordance with their roles and responsibilities and utilising robust authentication techniques, such as multi-factor authentication (MFA). Another essential element of cybersecurity principles is encryption. Data must be transformed into a coded format that can only be accessed with the right decryption key. Even if sensitive information falls into the wrong hands, encryption helps prevent it from being intercepted and viewed by unauthorised persons. Patch management and regular software updates are also crucial cybersecurity procedures[93].

1.2. Definition of Cybercrime

The term cyber crime is used to describe a unlawful activity in which computer or computing devices such as smartphones, tablets, Personal Digital Assistants(PDAs), etc. which are stand alone or a part of a network are used as a tool or/and target of criminal acitivity. It is often commited by the people of destructive and criminal mindset either for revenge, greed or adventure[94].

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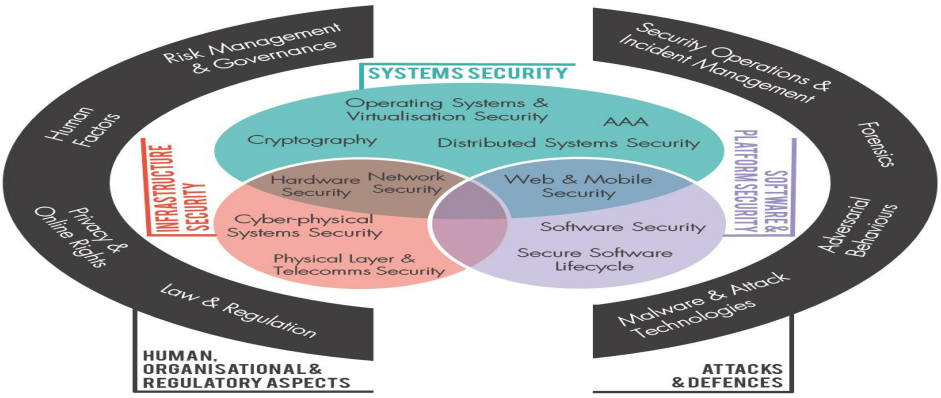
[93] Umakant Dinkar Butkar et al. Cyber Security for begginers. LAP LAMBERT Academic Publissing. 2023. P 9

[94] Jeetendra Pande, Introduction to Cyber Security (FCS). Uttarakhand Open University. 2017.PP 15-16

Cybercrime, involves illegal activities carried out using computers or the internet. These activities include hacking, identity theft, phishing, ransomware attacks, and other forms of malicious behavior that target individuals, organizations, or governments for financial gain, disruption, or other malicious intent.

Fig.8. The 19 Knowledge Areas (KAs) in the CyBOK Scope



Source: Awais Rashid et al. The Cyber Security Body of Knowledge.CyBOK. 2019.P 4

Cybercrime is growing as use of the Internet and business networks expand. Today, more than ever, businesses of all sizes rely on their networks, data and internet connectivity to conduct business. According to a McKinsey Global Institute report the Internet's economic impact has been greatest among "individual consumers and small, upstart entrepreneurs."

2. Trends of Cyber Security

Cyber Security assumes a critical role in the area of data technology. Safeguarding the data have become the greatest difficulty in the current day.

The cybersecurity the main thing that raids a chord is cybercrimes which are increasing tremendously step by step. Some main trends that are changing cybersecurity give as follows[95]:

2.1 Web servers & Mobile Networks

Currently, individuals need a more unusual accentuation on securing web servers as well as web applications. Web servers are mainly the pre-eminent stage for these cybercriminals to take the information. Thus, one should reliably utilize an additional secure program, mainly amid vital exchanges all together not to fall as a quarry for these defilements

2.2. Encryption

It is the method toward encoding messages so programmers cannot scrutinize it. In encryption, the message is encoded by encryption, changing it into a stirred-up figure content. It commonly completes with the use of an "encryption key," that demonstrates how the message is to encode. Encryption at the earliest reference point level secures information protection and its respectability.

2.3.ADP's and targeted attacks

Advanced Persistent Threat (APT) is a whole of the dimension of cybercrime ware. For quite a long time network security capacities. For example, IPS or web filtering have had a key influence in distinguishing such focused-on assaults. As attackers become bolder and utilize increasingly dubious methods, network security must incorporate with other security benefits to identify assaults.

3.Cybersecurity Techniques

[95]Rohit, KALAKUNTLA, Anvesh Babu, VANAMALA, Ranjith Reddy, KOLIPYAKA. Cyber Security. HOLISTICA Vol 10, Issue 2, 2019. P 117-118

There are many cybersecurity techniques available to combat cyber attacks. The most commonly used and effective methods to defend against these threats are as follows[96]:

3.1Authentification

It is a process of identifying an individual and ensuring that the individual is the same who he/she claims to be. A typical method for authentication over internet is via username and password. With the increase in the reported cases of cyber crime by identity theft over internet, the organizations have made some additional arrangements for authentication like One Time Password(OTP), as the name suggest it is a password which can be used one time only and is sent to the user as an SMS or an email at the mobile number/email address that he have specified during the registration process.

3.2. Encryption

It is a technique to convert the data in unreadable form before transmitting it over the internet. Only the person who have the access to the key and convert it in the readable form and read it. Formally encryption can be defined as a technique to lock the data by converting it to complex codes using mathematical algorithms. The code is so complex that it even the most powerful computer will take several years to break the code. This secure code can safely be transmitted over internet to the destination.

3.3. Digital Signatures

It is a technique for validation of data. Validation is a process of certifying the content of a document. The digital signatures not only validate the data but also used for authentication. The digital signature is created by encrypting the data with the private key of the sender.

3.4 Antivirus

There are verities of malicious programs like virus, worms, trojan horse, etc that are spread over internet to compromise the security of a computer either

[96] Jeetendra Pande, Introduction to Cyber Security (FCS). Uttarakhand Open University. 2017.P 26-32

to destroy data stored into the computer or gain financial benefits by sniffing passwords etc. To prevent these malicious codes to enter to your system, a special program called an anti-virus is used which is designed to protect the system against virus

3.5 Frewall

It is a hardware/software which acts as a shield between an organization‟s network and the internet and protects it from the threats like virus, malware, hackers, etc. It can be used to limit the persons who can have access to your network and send information to you.

3.6. Steganography

It is a technique of hiding secret messages in a document file, image file, and program or protocol etc. such that the embedded message is invisible and can be retrieved using special software. Only the sender and the receiver know about the existence of the secret message in the image. The advantage of this technique is that these files are not easily suspected.

4. Emerging Technologies and Cybersecurity

Among the most important technologies that help in cyber security we cite[97]:

4.1. IoT and Cybersecurity

The vast number and diversity of IoT devices present a significant cybersecurity challenge. Many of these devices have limited processing power and storage, making it difficult to implement robust security measures. Additionally, during the design and development phases, manufacturers often prioritize functionality and cost-efficiency over security, leading to vulnerabilities that cybercriminals can exploit.Addressing these issues requires a focus on enhancing the security of IoT devices from the ground up, including secure design practices, regular updates, and improved security protocols.

[97] Umakant Dinkar Butkar et al. Cyber Security for begginers. LAP LAMBERT Academic Publissing. 2023. P 229-232

4.2. AI & Machine learning (ML) in CS

AI and ML are used in a variety of ways in the field of cybersecurity to improve threat detection, incident response, and overall system security. Anomaly detection is one of the most important applications. The frequently changing attack methods are difficult for traditional signature-based procedures to identify. However, AI-driven systems are able toidentify patterns of typical behaviour inside a network and signal any variations as potentialdangers, even if those threats have never been seen before. Furthermore, powerful prediction models can be created thanks to AI and ML. These modelsestimate prospective vulnerabilities and dangers by examining past data on cyberoccurrences, enabling security professionals to take preventative action to reduce risks beforethey materialise into serious breaches.

4.3.Blockchain & CS

The impact of blockchain on cybersecurity is particularly noticeable in identity management and authentication. Traditional centralised systems are prone to security flaws that expose user data, resulting in identity theft and unauthorised access. Blockchain-based identity management systems, on the other hand, give people more privacy and control. Users may manage their personal information and permit only those individuals they trust access, lowering the chance of widespread data breaches.

Blockchain technology is not immune to cybersecurity issues, despite its advantages. Blockchains are resistant to some assaults because they are decentralised, however flaws in the way the blockchain protocol is implemented, in smart contracts, or in wallet software can still be taken advantage of environmental and practical concerns have also been brought up by the energy-intensive nature of some blockchain networks and scalability challenges.

4.4 Cloud-native security

In cybersecurity, "cloud-native security" refers to a collection of procedures and tactics intended to safeguard the infrastructure, information, and applications that run within cloud environments. Organisations have distinct security concerns that are different from those faced by conventional on-premises setups as they increasingly move their activities to the cloud. Cloud-native security tries to address these issues while maximising the advantages of cloud computing by taking into account the scalable and dynamic nature of cloud platforms

5.Types of Cyber Attacks on Businesses

More than ever, sensitive data, intellectual property and personal information of small and medium sized firms are targeted by an ever increasing and sophisticated community of cybercriminals. Small business is an increasingly attractive target for cybercrime. By hemselves, individual small businesses may not appear to present an overly attractive target. However, collectively small businesses are a very lucrative target set due to the collective economic impact of small business. In addition, small business attacks are increasing because they present cybercriminals with an easy way to gain access to customer credit card records and bank accounts, supplier networks and employee financial and personal data[98].

In today's rapidly advancing technological landscape, cyber-attacks are becoming increasingly prevalent, with some of the most significant ones being denial of service (DoS), distributed denial of service (DDoS), man-in-the-middle (MITM), ransomware, phishing, whaling (whale phishing), and Trojan horse attacks.

A **denial of service (DoS)** attack overwhelms a network or system by flooding it with numerous fake requests, effectively crippling the service and preventing users from carrying out routine and essential tasks. This type of

[98] America's Seed Fund. SBIR-STTR.THE IMPACT OF CYBERSECURITY ON SMALL BUSINESS.COURSE 10, TUTORIAL 1. P 2

attack results in lost time and financial resources as users work to restore the system's normal operations. **Distributed denial of service (DDoS)** attacks are similar to DoS attacks but involve multiple compromised host machines that are controlled by an unauthorized user, making the attack more widespread and difficult to mitigate.

A **man-in-the-middle (MITM)** attack involves an attacker intercepting communication between two parties, such as computers or networks, and eavesdropping on the exchanged data. The attacker can then modify the data before it reaches its intended recipient, compromising its integrity. To safeguard against this attack, strong encryption methods or virtual private networks (VPNs) should be employed.

One of the most common and alarming attacks today is **ransomware**. This attack occurs when a target's system is hijacked by malicious software, often downloaded from a website or email attachment. The attacker then demands a ransom in exchange for restoring access to the system, causing significant distress for the victim. To prevent this, installing a Next-Generation Firewall (NGFW) is recommended.

Phishing attacks involve sending deceptive emails that appear to be from legitimate sources, tricking the target into clicking a link or revealing sensitive information. This can lead to the installation of malware or theft of personal data. **Whale phishing (whaling)** is a more targeted form of phishing that focuses on high-profile individuals, such as executives or leaders within an organization.

Finally, **Trojan horse attacks** disguise malicious software as a legitimate program. When the user opens the seemingly harmless file or website, malware is unleashed, often creating a backdoor for hackers to infiltrate the

system. To avoid this, users should exercise caution when clicking on suspicious links and consider using NGFW for enhanced protection[99].

Chapter Six: FinTech in Islamic Finance Industry

Islamic finance, governed by the principles of Shariah law, prohibits activities involving interest (riba), excessive uncertainty (gharar), and investments in prohibited (haram) industries, such as alcohol or gambling. The industry has traditionally relied on ethical and socially responsible investment practices, emphasizing risk-sharing, asset-backed financing, and the avoidance of speculation.

The integration of fintech in Islamic finance has opened new avenues for growth and innovation. Through digital platforms, mobile banking, blockchain, and artificial intelligence, fintech is reshaping Islamic financial services, making them more accessible to a broader audience. For instance, fintech enables the development of Shariah-compliant digital banking solutions,

[99] Deepanshu Kaushik. The Impacts of Cybersecurity and AI on Businesses and Individuals.Journal of student research.Vol 12?Issue 4. 2023. P 6

peer-to-peer (P2P) lending platforms, and crowdfunding, which align with Islamic principles.

Moreover, fintech has the potential to address some of the long-standing challenges in Islamic finance, such as enhancing transparency, reducing operational costs, and improving the efficiency of compliance with Shariah law. By leveraging technologies like blockchain, Islamic financial institutions can ensure more transparent and secure transactions, while smart contracts can automate processes in accordance with Shariah principles.

1.Defintion of Islamic Fintech

Fintech is fundamentally the fusion of Islamic financial concepts with financial technology. Shariah law, which derives from the Qur'an and the Sunnah and attempts to ensure fairness, openness, and moral financial transactions, is the cornerstone of Islamic finance. It's crucial to outline the ideas that set Islamic finance apart from traditional finance in order to comprehend Islamic Fintech. The prohibition of Riba (interest), Gharar (uncertainty), and Maysir (gambling) are among the fundamental precepts. Islamic finance also prioritizes risk-sharing, asset-backing, and the ban on investment in sectors that are deemed Haram, such as those that involve alcohol, gambling, and pork Islamic Fintech aims to offer financial services that are innovative, effective, and compliant with Shariah principles through the use of contemporary technologies.

Shariah-compliant digital banking, peer-to-peer lending, crowdfunding, payments and money transfer services, and wealth management are a few ofthe services offered. Islamic Fintech is also a component of the larger Islamic economy, which also includes modest clothing, halal food, Islamic tourism, and Islamic media and entertainment. These industries frequently need certain financial services and goods that adhere to Islamic values. As

a result, Islamic Fintech can significantly contribute to the development of these industries[100]

Table .1Components and Principles of Islamic Fintech

Components	***Principles***	***Description***
Shariah Compliance	Riba (Interest)	Prohibition of fixed or floating payments orinterests
	Gharar (Uncertainty)	Prohibition of excessive uncertainty and ambiguity
	Maysir (Gambling)	Prohibition of gambling and speculation
Risk Sharing	Profit and Loss Sharing	Both parties must share profits and losses in transactions
Asset Backing	Tangible Assets	Financial transactions must have an underlying asset
Ethical Investments	Haram Screening	Avoidance of investments in alcohol, gambling, etc.

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 215

2. Islamic Fintech Applications

Based on the classification in the Islamic Finance News (IFN) Fintech Landscape 2018, the Islamic Fintech can be categorized into nine. These include blockchain and cryptocurrency, trading and investments, crowdfunding, remittances and forex, peer-to-peer finance, insurtech, digital banking, data and analytics, personal finance, and banking software.

Table 2. Comparison of Islamic Moral Economy and Conventional Economy

Aspect	***Islamic Moral Economy***	***Conventional Economy***
Basis of Transactions	Asset-backed, Profit and	Interset-Based

[100] Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. PP 214-215

	Loss Sharing	
Ethical Considerations	High (Shariah Compliance)	Generally Low
Risk Sharing	Emphasized	Not emphasized
Financial Inclusion	Strong Focus	Weak Focus
Social Welfare	Integral	Often secondary

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 217

2.1.Accounts and Payments

This is one the most common entry segments for many Islamic fintechs given that the aspect of Sharī'ah requirement is very minimal and mainly restricts payments for non-halal activities. Most of the notable developments here relate to offering interest free accounts (current account) with debit card from major card providers like Visa and Master cards and facilitating local and cross border transfer through a seamless and intuitive apps. Most players in this area are hybrid, which means they use traditional payments gateway butapply filtering for Islamic Fintech apps for Sharī'ah non-compliant merchants[101].

2.2.Crowdfunding and P2P Lending Platforms

In the dynamic and ever-changing field of Islamic fintech, crowdfunding and peer-to-peer (P2P) lending platforms emerge as effective mechanisms for investments and financial transactions. These platforms promote inclusiveness, transparency and socioeconomic empowerment by combining Islamic principles with contemporary financial technology. We can categorize crowdfunding in three types as Table 3.

Table 3. Types of Crowdfunding

Type	***Features***

[101]Arab Monetary Fund. Islamic Fintech in the Arab Region: Imperatives, Challenges and the Way Forward. 2021. P P 11-12

Donation-Based	Platforms where people can give money to campaigns without expectingany money back. This is in line with the Islamic concept ofcharity
Reward-Based	Backers get a good or service in exchange for their money, makingthe deal halal and moral
Equity-Based	Investors get shares in an enterprise or venture, which encouragesequity participation that is in line with the law of the Sharia.

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 219

EthisCrowd, a platform for financing Islamic real estate, serves as an illustration. It enables people to pool their money and participate in profitable social housing projects that also benefit society. Peer-to-peer lending and Islamic crowdfunding are financial intermediation approaches that match lenders and borrowers in a way that complies with Shariah. They are designed to adhere to Islamic finance's fundamental concepts of profit and loss sharing and asset-backed financing P2P lending can be put into three groups, as shown in Table 4.

Table 4. Types of P2P Lending and Their Principles

Type	***Features***
Qard Hassan	Loans with no interest that emphasise kindness and where the lender only wants the capital amount back.
Mudarabah	Profit-sharing agreements in which the gains are split in a way that has already been decided.
Musharakah	There are joint venture deals in which the profits and losses are shared.

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 220

Blossom Finance (2023) is an Islamic peer-to-peer (P2P) microfinance platform that aims to facilitate Sharia-compliant microfinancing options. The site is designed to promote ethical financing practices and contribute to economic growth[102].

2.3. Internet Banking

Customers of banks may conduct transactions via online banking, sometimes known as "i-Banking," viatheir PCs. The latest exchange rate data is available online, along with alternatives for bill payment andtransfer. Customers are not required to possess certain devices in order to take advantage of this facility because it can becarried out using any online-capable device. A further fintech service that banks provided was internet-based banking. Customerscan complete a variety of transactions that are provided by Islamic banking using online banking facilities on everydevice that is linked over the internet[103].

2.4. Takatech

The Islamic equivalent of traditional insurance, takaful is founded on the concepts of risk sharing and collaboration. Applications like automated underwriting, claim management systems, and customer support chatbots are examples of Insurtech in Takaful.

Takaful operates based on the concepts of mutual help and risk-sharing. In recent times, there has been a notable potential in the adoption of technology in the Takaful industry, commonly referred to as 'Insurtech.' Takaful is based on Islamic concepts that advocate for the practise of cooperative risk-sharing and the prohibition of uncertainty (gharar) and gambling (maysir). Participants make financial contributions to a collective

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[102] Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. PP 219-220

[103] Ibrahim Radwan Alnsoura. The effect of financial technology on Islamic banks performance in Jordan: Panel data analysis. International Journal of Data and Network Science 2023. P 1518

fund that is utilised to compensate for any losses experienced by any member of the group.

We can state takaful's model in four models as Table 5.

Table 5. Takaful Models

Models	***Description***
Mudarabah (Profit-Sharing Model)	The participants and owners have reached a consensus to jointly distribute both financial gains and losses.
Wakalah (Agency Model)	In a pure agency contract, the operator receives compensation in the form of a fee.
Wakalah – Waqf Model	Taking the wakalah plan for funding and adding an endowment fund (waqf) to hold takaful donations. Extra money isn't given back to the players; it's kept for future use or to help good causes
Hybrid (Wakalah & Mudarabah)	Contains parts of both the Wakalah and Mudarabah types. For underwriting and running costs, a wakalah fee is charged, and investments are handled on a mudarabah basis.

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 221

The incorporation of technology into the Takaful industry has facilitated the development of inventive solutions, including the use of digital platforms for policy management, the implementation of blockchain technology for claim processing, and the adoption of artificial intelligence-driven risk assessment tools. These advancements have contributed to enhanced operational efficiency and improved user comfort[104].

[104] Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. PP 220-221

2.5 Wealth Management and Robo-Advisory Services

A robo-advisory service involves using digital platform to profile the customer risk and reward appetite, select the right Sharī'ah- Compliant equity to trade in. It is one of the simple and high impact Fintech types for individuals who do not have the expertise of online equity trading. This area has a very good acceptance from the Islamic consumers, as such conventional Robo Advisors have also started offering such product. Notably, the biggest valued Islamic Fintech to date is Wahed Invest - a Robo advisor Fintech platform operating across three jurisdictions US, UK and Malaysia. In the Arab world, Sarwa in the UAE, a conventional Robo advisor platform started offering Sharī'ah-compliant products recently[105].

2.5.Islamic Cryptocurrencies and Blockchain Technology

The inherent characteristics of cryptocurrencies, such as decentralisation and digitization, can fit with the principles of Islamic finance, hence facilitating financial inclusion. In light of the inherent volatility observed in cryptocurrencies, the adoption of stable coins, which are supported by actual assets such as gold or fiat currency, could potentially present a more congruent solution with the principles of Islamic finance. Islamic Fintech has incorporated blockchain and cryptocurrency technology. For instance, Stellar is a cryptocurrency platform that may be used by Islamic financial institutions because it has received certification as Shariah-compliant. We can see some other Islamic cryptocurrencies in Table 6.

Table. 6. Examples of Islamic Cryptocurrencies

Name	***Description***	***Unique Function/Application***

[105]Arab Monetary Fund. Islamic Fintech in the Arab Region: Imperatives, Challenges and the Way Forward. 2021. P 12

HB Token (Halal-Chain)	Built on the Ethereum platform and geared towards the supply chain of the Halal food business	Ensures the authenticity and traceability of Halal foods.
ADAB Solutions	Only Shariah-compliant initiatives are listed on the First Islamic Crypto Exchange (FICE).	A Shariah-compliant cryptocurrency trading facility
Noorcoin	Halal-centric cryptocurrency based on Islamic principles	Integrates blockchain technology for Halal sector transparency and traceability.

Source: Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 225

Additionally, blockchain technology is being investigated for uses in Islamicfinance. Integrating Blockchain into Islamic fintech has transformativepotential, as it aligns perfectly with the emphasis on transparency, trustworthiness,and equity in Islamic finance principles. Its immutable record-keeping canstreamline the zakat collection and distribution processes, thereby nurturingdonor confidence. Moreover, the technology facilitates the automation of Shariah-compliant contracts, efficient cross-border remittances, and the tokenizationof tangible assets, which is essential for fields such as Islamic real estateinvestments and sukuk[106]

3. The Impact of Fintech on the Islamic Financial Sector

Fintech has enabled Islamic financial institutions to automate routine operations, such as accounting and customer service, and to streamline their processes. Fintech has also enabled Islamic financial institutions to offer digital banking services and mobile banking services, reducing the need for customers to go to physical branches.

[106] Gökmen KILIC. Yavuz TÜRKAN. The Emergence of Islamic Fintech and Its Applications.International Journal of Islamic Economics and Finance Studies.Vol 9.Issue 2. 2023. P 225

Furthermore, fintech has enabled Islamic financial institutions to provide digital payments and digital currencies. This has allowed Islamic financial institutions to meet the needs of their customers who do not have access to traditional banking services[107]

3.1 The importance of using Fintech applications in Islamic financial industry

With the growing importance of Islamic finance globally, the Islamic fintech industry has emerged strongly since 2010, reflecting the growth of the broader global fintech ecosystem, with development focusing on Shariah-compliant business and finance.

The introduction of fintech has certainly given Islamic banks an opportunity to catch up with their conventional counterparts. Islamic banks have higher fixed costs, making it difficult to maintain their service costs at a competitive level with conventional banks.

There are several promising government-led Islamic fintech initiatives such as the Dubai International Financial Centre's $100 million Fintech Fund to support Islamic fintech[108]. In order to keep pace with technological financial developments, the establishment of the first Islamic FinTech Union was announced on December 13, 2017, during the activities of the 24th session of the World Islamic Banking Conference, by the three largest Islamic banks (Al Baraka Banking Group, Kuwait Finance House-Bahrain, and Bahrain Development Bank, and this union was known as Alco Bahrain. This union aims to achieve the following:

- Finding innovative banking solutions that are compatible with the provisions of Islamic Sharia

[107] Mona Hasan. The impact of financial technology (fintech) on the financial and banking services sector and its applications in the Islamic financial industry.Electronic Journal. 2023. P 10

[108] Benaichouba Rafika, Sadkaoui Soraya. Islamic Financial Technology, Opportunities and Challenges, Journal of Strategy and Development. 2021

- Innovating and implementing low-cost and rapid financial technology solutions, as it enjoys complete strategic, operational, and financial independence to innovate financial solutions that suit the digital economic system
- Reducing the cost of innovation for banks while accelerating their ability to market, which has a direct impact on improving the profitability and growth of banks
- Restoring the growth of global Islamic banking by enhancing financial inclusion, creating new job opportunities, and directing new investments to critical economic sectors and even beyond borders [109]

Islamic finance is a fast-developing business, and fintech has been highlighted as a crucial trend that will alter the sector. Banks may increase efficiency, customer satisfaction, and cost-cutting by incorporating fintech solutions into their Islamic banking processes. With this connection, Islamic banks will be able to provide new services such as peer-to-peer lending, crowdfunding, and robo-advisory services. Blockchain technology is also expected to play an important role in improving Islamic banking transparency and security. Another area where fintech might improve Islamic finance is the incorporation of AI and machine learning algorithms in fraud detection and risk management. Finally, the transformation of Islamic banking via fintech is projected to result in a more innovative and competitive industry that can better meet the demands of clients. A thorough investigation of the links between the various clusters is required for the industry's future growth[110].

3.1.1 The Importance of AI in Islamic Financial industry

[109] Babas Mounira, Fali Nabila. Islamic Banking Industry Facing FinTech Challenges: A Case Study of Malaysia and GCC Countries. International Journal of Entrepreneurial Finance. Vol 1. N° 2. 2020

[110] Hanan Qudah et al. Islamic Finance in the Era of Financial Technology: A Bibliometric Review of Future Trends. International journal of financial studies. 2023. P 16

The importance of applying artificial intelligence in Islamic finance is evident through data analysis, algorithmic trading, stock selection, and Robo in the Islamic investment system. The process of text analysis (Text Maining) and stock selection (Stock Pick) is one of the most important techniques for extracting information from the huge amount of big data. After converting the information into a data format, the data mining method will help investors analyze market data and price levels and perform forecasting activities. Algorithmic trading (AT) as part of artificial intelligence is the tool used in Islamic investment to reduce the cost and minimize potential errors that may occur during the trading process by investors. This is due to the ability of artificial intelligence to place an investment for investors in a more accurate and effective process compared to trades placed by humans, which are sometimes subject to errors due to the wrong decision-making process[111]
The potential application areas of AI used in Islamic finance can be divided into five categories: Front Office (including credit scoring, Takaful insurance and chatbots), Middle Office (including AML, CTF, KYC, fraud detection and sentiment analysis), Back Office (including capital optimization, market impact analysis, risk management model and asset and wealth management), RegTech and Control Technology [112]
The use of digital technology in Islamic banking is predicted to determine the industry's future as the digital era brings significant expansion to the sector. Islamic banks can leverage digital technology to provide more efficient and streamlined services to consumers, such as online account management and e-payment options. Another potential development that might increase transparency and security is the implementation of blockchain technology in Islamic banking. Furthermore, big data analytics and artificial intelligence can

[111] Haneffa Muchlis Gazali et al. Application of Artificial Intelligence (AI) in Islamic Investments Journal of Islamic Finance, Vol 9, N° 2. 2020

[112]Nida Khan.AI Applications in the Islamic Finance Industry. 2019

improve risk management procedures and customer profiling. The growth of fintech firms in the Islamic finance industry is projected to create new prospects for innovation[113].

4. Challenges

The Islamic financial industry is one of the fastest-growing sectors in the global economy. Despite this impressive growth, the industry is facing some unique challenges that have impeded its development. We mention among them[114]:

4.1 Regulatory Challenges

One of the primary challenges facing the Islamic financial industry is the lack of a unified regulatory framework. Unlike the traditional banking sector, which is regulated by a single body, the Islamic financial sector is subject to a patchwork of regulations issued by various religious authorities. This makes it very difficult for Islamic financial institutions to operate across borders and could be a major impediment to growth

4.2 Technological Technologies

In order to keep up with the rapidly evolving financial landscape, Islamic financial institutions need to invest heavily in technology. They must adopt cutting-edge solutions such as cloud computing, artificial intelligence and distributed ledger technology to remain competitive. However, many Islamic financial institutions lack the resources or expertise to implement such solutions

4.3. Financial Challenges

The Islamic financial industry also faces financial challenges. The lack of understanding and acceptance of Islamic finance among the general public

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[113] Hanan Qudah et al. Islamic Finance in the Era of Financial Technology: A Bibliometric Review of Future Trends. International journal of financial studies. 2023. P 17

[114] Mona Hasan. The impact of financial technology (fintech) on the financial and banking services sector and its applications in the Islamic financial industry.Electronic Journal. 2023. P 11-13

has resulted in a lack of investment in the sector. Furthermore, Islamic financial institutions often have to pay a premium for their financing due to the lack of liquidity in the market.

4.4. Access to Data and Technology

Another challenge faced by fintech companies in the IFI is the lack of access to data and the right technology. The Islamic Financial Industry is a niche sector, so it is challenging to find the right data and technology to build innovative solutions. Additionally, the data available may not be of good quality and may not be suitable for building sophisticated algorithms

4.5. Lack of Awareness

There is a lack of awareness of the Islamic Financial Industry among the general public. This means that there is a lack of understanding of the different products and services offered by fintech companies in the market, leading to a lack of demand for these products and services. Additionally, the lack of awareness leads to difficulty attracting investors and venture capital for fintechs.

Fig. 9. Challenges facing Islamic Fintech in the Arab Region

Source: Arab Monetary Fund. Islamic Fintech in the Arab Region: Imperatives, Challenges and the Way Forward. 2021. P 24

Chapter Seven: Risks and Regulatory Systems related to FinTech

The rise of FinTech raises questions to financial authorities, such as whether to expand the regulatory and supervisory perimeter; whether new types of digital financial services fit existing regulations; how to identify, monitor and mitigate the risks of FinTech innovations and FinTech firms. There are also questions as to whether FinTech could lead to disintermediation and affect financial stability or change how central banks operate. Finally, FinTech makes extensive use of a wide range of digital data managed through computer networks often connected to the Internet, so the question arises as to whether cybersecurity and data protection risks are well understood, managed and mitigated. Financial authorities are looking into how to keep their financial systems stable while harnessing the benefits of FinTech, and existing supervisory policies, procedures and resources may no longer be adequate to address a fast changing landscape.

1. Regulatory Technology (RegTech)

1.1 Definition

Regulatory Technology (RegTech), defined as a sub-set of FinTech, has been growing strongly in the last couple of years and has attracted numerous start-ups as well as giants like IBM and global consultancy firms. As in other areas of FinTech, there is not yet an agreed upon definition of RegTech and its typology. The Institute of International Finance (IIF) defines RegTech as "the use of technologies to solve regulatory and compliance requirements more effectively and efficiently". Similar definitions can be found, but all seem relatively limited in the face of the promise that RegTech holds to overhaul not only regulatory compliance and risk management by regulated financial institutions, but also the nature of regulation and supervision. RegTech focuses on technology-based solutions to attenuate or solve regulatory and supervisory challenges, including the challenges posed by the expansion of FinTech. It leverages digital data and computer networks to substitute old-style processes, organizational and IT structures, analytical tools and improve the decision-making process. The technologies used in RegTech are the same ones used in broader FinTech . As in other areas of FinTech, a key element is the 3 V's of data, including new types and sources of greater volumes of data that may have not been "usable" up to now.(e.g., e-mails, PDF files, voice recordings, Internet traffic, social media, etc.). A combination oftechnologies and innovative processes are deployed to modernize data gathering and data analytics, withthe purpose to generate more refined and/or timely intelligence to feed the regulatory compliance and riskmanagement functions at financial institutions, or to benefit the regulatory and supervisory processes atfinancial and supervisory authorities. RegTech can be divided into two sub-segments: RegTech for financial institutions and RegTech for supervisors and regulators, or SupTech. [115]

1.2 Benefits

[115]TorontoCentre. FinTech, RegTech and SupTech: What They Mean for Financial Supervision. 2017. P 8

1.2.1 Increased revenue for insurers : Automation solutions can increase competitiveness while increasing customer satisfaction and retention, through faster onboarding and completion of KYC and AML requirements.

1.2.2 Reduced costs : Processes can be streamlined to reduce the number of people that need to check false positives and lowers overall compliance costs.

1.2.3. Efficiency gains :Automation of compliance protocols and reporting allows more time for firms to focus on their strategic goals. Compliance officers are also able to focus on more substantial activities, such as investigating cases.

1.2.4. Reduced risk: When firms can comply with AML, KYC, and the myriad of other requirements more easily, they are less likely to suffer reputational damage, penalties and fines from compliance missteps.

1.2.5.Supporting innovation :Industry participants are developing and adopting RegTech to meet regulatory compliance requirements. Innovative technologies will support firms to develop advanced data analytics capabilities (scenario analytics, trend and horizon scanning), which regulators consider as important tools to improve the quality of risk management

1.3 Challenges

1.4.1. Understand the firm's readiness position: Important to understand the firm's market position or expertise, determine the strategy, road map and senior level "buy-in" as well as identify the relevant compliance and reporting elements that can benefit from automation.

1.4.2. Existing regulatory compliance: Need to clarify compliance risks, complexities and resulting requirements in order to implement RegTech. The design and delivery of an integrated framework is fundamental, including standardised taxonomy for risk mapping and monitoring.

1.4.3. Upcoming regulatory data and reporting requirements: Supervisors need to have a clear understanding of the existing and emerging regulations that impact the business.

1.4.4. Skilled resources: Imperative to have skilled personnel to deliver services and manage change

1.4.5.Lack of a common position amongst regulators: Lack of a clear position from the regulators on solutions and standards due to different data protection regimes. Regional variations, as well as inter-regulatory conflicts can lead to uncertainty and inefficiency.

1.4.6. Technological change: Adopting RegTech solutions involves high costs and need to be carefully considered. The choices of the approach or solutions for the implementation may vary by each player. Standards and solutions used in the past can become obsolete[116].

2. Supervisory Technology (SupTech)

2.1 Definition

Supervisory technology is the use of innovative digital technology by supervisory bodies such as central banks to support their role in the supervisory process. This concept has been expanded and linked to artificial intelligence and big data. In addition to being the use of innovative technology by monetary and financial authorities, the term "innovative technology" refers to the application of Big Data or Artificial Intelligence (AI) used by financial authorities, while "financial authorities" refers to both supervisory and non-supervisory authorities of the financial system. This is what the new definition of the scope of users of supervisory technology includes, as it also includes non-supervisory financial authorities such as financial intelligence units (the Financial Intelligence Analysis Unit CTRF of

[116]A2ii – IAIS Consultation Call. RegTech and SupTech: Implications for Supervision. 2019. PP 5-6

the Ministry of Finance in Algeria) as well as the types of technology used (big data or artificial intelligence…etc[117].

2.2 The Role of Artificial Intelligence and Big Data in Supervisory Technology (SupTech)

2.2.1 The increasing use of Big Data: It has become imperative for supervisory authorities to have full control over data, especially with the emergence of big data that has witnessed widespread use in the world. According to a survey conducted by the Irwin Fisher Committee on Central Banking Statistics, it is expected that most central banks will increasingly use big data sources for macroeconomic analysis and financial stability purposes, Especially in the following areas:

- Economic prediction: such as economic indicators such as inflation, prices, unemployment, gross domestic product, industrial production, retail sales and tourism activity.
- Business cycle analysis and real-time forecasting techniques.
- Financial stability analysis such as model building and risk indicators.

2.2.2.The Role of Artificial Intelligence and Machine Learning in Supervisory Technology: The use of AI and machine learning in the field of financial services achieves significant benefits for financial stability through:

- Developing competencies in providing financial services and improving the efficiency of monitoring regulatory and systemic risks.

In addition, developing more effective and efficient information processing regarding credit risks and less costly interaction with customers will contribute to enhancing the efficiency of the financial system.

- Improving risk management, detecting fraud, and improving compliance with regulatory requirements, at a lower cost.

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[117] Adlani Joel, Djaalali Walid, ZineYounes. The role of central banks in achieving financial stability through Supervisory Technology (SupTech).Journal of Administrative and Financial Sciences, Vol 6.N°2. 2022. PP 294-295

- In the field of portfolio management, more efficient processing of information from AI and machine learning applications helps to enhance the efficiency and flexibility of financial markets, reducing early price imbalances and reducing intensive trading.
- Increasing supervisory effectiveness and conducting better analysis of systemic risks in financial markets)[118].

2.3 Benefits

2.3.1 Exceptions-based supervision : Automated checks on institutions' data and other information automatically collected and analysed for the identification of "exceptions" or "outliers" to pre-determined parameters

2.3.2Automated implementation of supervisory measures :Sending an automatically created direction for capital increases based on automated data analysis, and decision-making.

2.3.3 Algorithmic regulation and supervision : Can be used for oversight of high-frequency trading, algorithm-based credit scoring, robo-advisors or any service or product that automates decision-making.

2.3.4. Efficiency: Can reduce compliance costs for the regulated entity and enhance risk management to improve marketplace stability and effectiveness. Regtech can minimise different interpretations of rules and enhance timeline management.

2.3.5. Supporting innovation: Many regulators' mandates include the promotion of innovation. Through the identification of appropriate technologies, supervisors may help firms better manage regulatory requirements.

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[118] Adlani Joel, Djaalali Walid, ZineYounes. The role of central banks in achieving financial stability through Supervisory Technology (SupTech).Journal of Administrative and Financial Sciences, Vol 6.N°2. 2022. PP 302-303

2.3.6 Real-time supervision :Supervisors can monitor data as it is created in the regulated institutions' operational systems

2.4 Challenges

2.4.1 Data quality issues: Complexity in analysing or validating Big Data collected from non-traditional sources of information such as social media data.

2.4.2. Legal risk: Supervisors need to be aware of existing data protection laws in their jurisdictions given the continuous data collection and availability of more data from alternative sources

2.4.3. Operational risk: More data means that firms and supervisors have become a greater target for hacking and might require stringent cybersecurity measures in place to detect any forms of breaching.

2.4.4. Reputational risk: Improper validation of data by SupTech applications e.g. failure of algorithms may lead to misinterpretation and possible wrongful supervisory actions. This may affect the reputation of both the firm and the supervisor.

2.4.5 Resource issues: Supervisors may face budget constraints lack of skilled personnel to deploy SupTech applications. If such data remains unused, insurers might raise issues of regulatory burden[119].

3. FinTech Risks to the Financial System

Technology risks refer to the risks arising from the use of information technology and the Internet. These risks arise from failures or breaches in information technology systems, applications, platforms or infrastructure, which may result in financial loss, disruption of services or financial operations or damage to the reputation of a financial institution.

Regulators and supervisors have identifed risks arising from three main fntech-related drivers, namely the increasing reliance of fnancial services

[119]A2ii – IAIS Consultation Call. RegTech and SupTech: Implications for Supervision. 2019. PP 4-5

frms on technology, the increasing interconnectedness within the fnancial sector, and the prospect of greater concentration and herd-like behaviour.

3.1. Financial Risks

Financial risks in the fintech industry depend on the size and scale of the fintech operation. These can be broadly defined as credit or liquidity risks that may result in bankruptcy or business closure. Regulatory and policy environments are also adapting tiered approaches to address financial risks, which can be based on the size and volume of the fintech player. These approaches include developing an understanding of new fintech players, products and services, and learning from the experiences in other jurisdictions. Financial services regulatory authorities need to regulate firms that accept and manage money for others, especially in the payment industry, and these firms should follow international standards in safeguarding customer funds (escrow and trust account rules). In addition, minimum capital requirements for fintechs need crafting, depending on the markets, but should be sufficient to cover potential risks

3.2. Operational Risks

Generally, operational risk is defined as “the risk that deficiencies in information systems or internal processes, human error, management failures, or disruptions from external events will result in the reduction, deterioration, or breakdown of services.” A wide range of operational risks can occur during business operations. Fintech also has potential operational risks[120].

3.3. Technological Risks

Because of the highly technological dependence in the business operations and internal systems and controls, the new developed technological risks on the operational perspectives may arise in the innovation of FinTech. The

[120] Yonghwi Kwon, John Owens, Jae-Deuk Lee. Managing Fintech Risks: Policy and Regulatory Implications.ADB Briefs. 2023. P 5

technological risks include FinTech model design risk, program flaw risk, hardware failure, network connection failure, data theft and leaking risk, hacking risk and systems failure. Such potential technological risks will substantially threat the normal operation of FinTech business and internal control systems, and in order to prevent such risks, much more cost will be spent to maintain the function and security of relevant programs and systems. Among the various technological risks, data security and technological dependence have become top concerns for the FinTech industry. As businesses increase their reliance on technology and continue to holding vast amount of sensible data, it becomes increasingly important as well as difficult to ensure that substitutive systems are in place when technology failure occurs and reinforced system is safe enough to prevent the sensible financial transaction data and consumers' private data from leaking and missing.

3.4. Systemic Risks

According to the scale of services and products emerged with the development of FinTech, it is hard to say that FinTech is impacting the stability of the financial market and posing systemic risks to current financial system. The traditional financial institutions, such as commercial banks, securities and insurance companies, are still taking substantial part of the current financial market, as well as the financial services and products provided by them. The development of FinTech today is generating more efficient and convenient service and diverse funding choices for financial consumers and small businesses, rather than displacing the incumbent financial services and industries. However, with regard to the functions of services and business models in the area of FinTech, such as payment services, peer-to-peer lending, crowdfunding, and other innovative trading platforms, the core functions of traditional financial institutions will be potentially carried out by the new entrants with further development. And as

the economies of scale and scope of business models of FinTech grows, systemic risks will evolve[121].

3.5. Risks to Consumer

Although fntech should bring many benefts to consumers, there is also scope for consumers to be disadvantaged.

- Lack of consumer understanding
- Mis-selling of products and services
- Financial exclusion
- Data privacy, security and protection
- Reduced competition[122]

3.6. Cybersecurity Risks

FinTech companies are particularly vulnerable to cyber threats due to their reliance on digital platforms and the internet. Cyberattacks, data breaches, and hacking incidents can lead to significant financial losses and damage to customer trust.

3.7.Legal Risks

According to the Basel consultative document, legal risks is a subset of Operational risk.3 Although there is no standard definition legal risks can be explained as the cost to ensure the compliance with relevant laws and enforceability of contractual documents. From the perspective of FinTech companies, the innovation on their business operation and financial service brings a 'gap' between the practice and application of current laws. In order to fulfill the gap and avoid legal compliant risks brought by it, the FinTech companies have the responsibility to review the financial regulation and licensing requirement on their products, services, as well as the process of business, including the legality of fund raising (registration, financial

[121]Hangmin Li. Research on the risks and regulation of financial technology.Advances in Economics, Business and Management Research, volume 33. 2017. P 939

[122] KPMG, Regulation and supervision of Fintech,.2019. P 5

promotion and advertising, scale cap, etc.), investor credit and qualification, information disclosure and consumer protection, to ensure that the companies and their services or products comply with relevant general regulatory laws[123].

Chapter Eight: Fintech Ecosystem

The FinTech ecosystem is a dynamic and interconnected network that encompasses various stakeholders, technologies, and regulatory frameworks, all working together to drive innovation in financial services. At its core, the FinTech ecosystem is centered around the development and deployment of digital technologies that enhance or disrupt traditional financial practices, including banking, payments, lending, insurance, and investment.

This ecosystem includes a wide range of participants, such as FinTech startups, established financial institutions, technology providers, investors, regulators, and customers. Each of these entities plays a critical role in shaping the evolution of FinTech by contributing to the development of new products and services, providing the necessary infrastructure, and ensuring compliance with regulatory standards.

Key technologies such as blockchain, artificial intelligence, big data, and cloud computing are the backbone of the FinTech ecosystem, enabling more efficient, secure, and user-friendly financial solutions. These innovations are driving significant changes in how financial services are delivered, making them more accessible, personalized, and cost-effective for consumers and businesses alike.

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[123]Hangmin Li. Research on the risks and regulation of financial technology.Advances in Economics, Business and Management Research, volume 33. 2017. P 940

1.Definition of FinTech Ecosystem

Fintech ecosystems are complex networks of interacting FinTech start-ups and scale-ups,financial institutions, regulators, governments, investors, and talent institutions who share an interestin advancing the financial services industry through technological innovation. Today circa 30FinTech ecosystems of heterogeneous origins and dynamics exist worldwide. The growth and success of FinTech ecosystems hinge on several key factors, many of which are linked to the overall vitality of the region's entrepreneurial environment. First and foremost, the presence of strong founding teams and a robust talent pool is crucial. Successful ecosystems benefit from policies that foster talent development, minimize brain drain, and attract international expertise. In the context of FinTech, this means not only having skilled computer programmers and data scientists but also financial engineers and experts in financial services marketing.

Secondly, the availability of diverse forms of capital is essential for ecosystem dynamism. A well-functioning FinTech ecosystem relies on a continuous flow of financing that supports companies at various stages of their growth journey—from early seed funding to later-stage growth capital and eventual exit opportunities. This ensures that ventures can scale and succeed over time.

Lastly, the development of a FinTech ecosystem is driven by strong demand for innovative financial services. This demand, both from local and international markets, creates a "pull" effect that encourages the creation and adoption of new financial technologies. An ecosystem with a robust customer base that is eager for new solutions provides fertile ground for FinTech ventures to thrive[124].

2. Elements of a FinTech Ecosystem

[124]Said Business School.University of Oxford. Building FinTech Ecosystems:Emerging Trends & Policy Implications.2019.

We can identify five elements of the fintech ecosystem:

2.1. Fintech startups

FinTech startups are new technology-based companies that offer innovative solutions in the financial industry. These companies are responsible for the innovation leaps in the areas of payment, wealth management, loans, crowdfunding, insurance, and capital markets, so they are should be considered the central piece of the ecosystem. Fintech startups' businesses have many elements that directly impact the consumer in the financial value chain. FinTech startups use digital channels as a point of contact and each of them vary the forms of payment, settlement, quality of service, security and rights. Besides focusing on low-cost operations, FinTech startups also prioritize meeting niche market needs by offering more customized services to their clients in comparison to traditional financial institutions. However, although FinTech startups adopt a customer-centered strategy, such strategy does not remove uncertainties about long-term profits and success rates. The major categories of financial services that can be provided by FinTech startups are asset management, account management, investments and saving, crowdfunding, crowdinvesting, financial planning, insurance, P2P (peer to peer) loans, financing and money transfer. The possible financial solutions offered by a FinTech startup are defined more generically, and are divided into payment services, insurance, customer interaction, financing, and loans[125].

2. 2.New Technologies and Tools

In the emergence of the FinTech ecosystem, new technologies, new economic approaches and new tools come to the fore. In particular, the development of mobile and wearable technologies and the emergence of business models that facilitate their adaptation to the financial field through

[125] Paola Corrêa D'Albuquerque e Castro. Understanding Finéà&Tech ecosystem evolution through service innovation and socio-technical system perspective. U. Porto. 2019. PP 14-15

changing socio-economic approaches (such as Behavioral Finance and Sharing Economy) have had an important role in the emergence and development of the ecosystem. Today, many softwares such as machine learning, artificial intelligence, chatbot, robot consultants and blockchain increase the variety of products and services offered in the field of financial technology

2.3. Government

Perhaps the most important player in the ecosystem is the government. It is the government that constitutes the bodies providing the financial infrastructure, the structure that determines the rules of the game and determines the conditions of competition by enacting regulations. The most important role of the government arises in the stage of climate formation. Policy-making and the understanding of the FinTech concept by the relevant institutions of the state can make it a window of opportunity. As discussed earlier, FinTech area is one of the largest investment areas in the world. Therefore, prioritizing this issue in a country's development plan and creating policies and strategies accordingly, create new opportunities for countries to directly attract foreign capital. Today, many developed and developing countries have taken FinTech as one of their priority areas among their development policies, and have managed to attract startups and investors to their countries by creating an appropriate investment climate with their approaches and regulations[126]

2.4. Financial customers

One of FinTech startups' key feature is the ability to identifycustomer needs. FinTech startups focus on offering services that meet the needsof market niches by delivering high quality and personalized services. Thisapproach is extremely important to acquire of new clients, since customers evaluatethe

[126] Selim Yacizi. THE ANALYSIS OF FINTECH ECOSYSTEM IN TURKEY.Journal of Business, Economics and Finance.Vol 8.Issue 4. 2019. P 190

benefits and risks of the services of a FinTech before using them. Customersatisfaction is of paramount importance for FinTech startups because word-of-mouthrecommendations can be crucial for business success in such a highly competitiveindustry. Moreover, high standard and value-added services attract customerswho have been served by TFIs, since those institutions do not offer services thatmeet the specific customers' needs.

2.5. Traditional financial institutions

Traditional financial institutions (TFIs) are essential for FinTech ecosystems. After the first impact of FinTechs emergence in the financial sector, TFIs have been reviewing their business models and developing new strategies to innovate, particularly by using technology. Although at the beginning TFIs faced FinTech startups as a threat, recently they have started to work in collaboration with those new companies, through acquisitions and the creation of in-house incubators seeking to create new services with lower operational costs and more competitive prices. According to Diemers, the relationship of TFIs with FinTech startups may stimulate innovation within the former and further strengthen their competitive position[127].

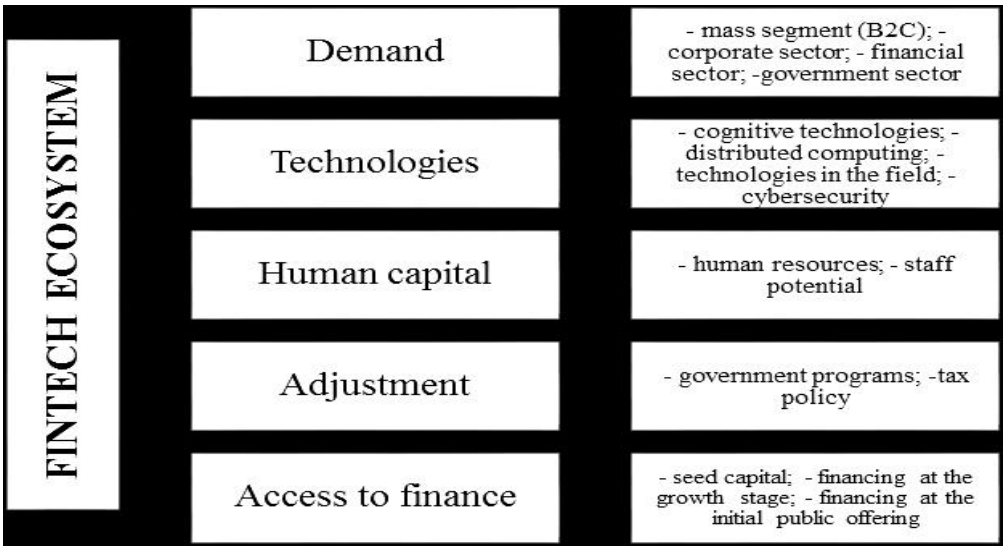
These elements symbiotically contribute to the innovation, stimulate economy, facilitate collaboration and competition in the financial industry, and ultimately benefit consumers in the financial industry

At the center of the ecosystem are fintech startups. These companies are mostly entrepreneurial and have driven major innovations in the areas of payment, wealth management, lending, crowdfunding, capital market, and insurances by incurring lower operating costs, targeting more niche markets,

[127] Paola Castro, José Pedro Rodrigues, Jorge Grenha Teixeira. Understanding FinTech ecosystem evolution through service innovation and socio-technical system perspective. 2020. P 5

and providing more personalized services than traditional financial firms. They are driving the phenomenon of unbundling financial services, which has been highly disruptive for banks. The ability to unbundle services is one of the major drivers of growth in the fintech sector, as traditional financial institutions are disadvantaged in this situation. Consumers, rather than relying on a single financial institution for their needs, are beginning to pick and choose services they would like from a variety of fintech companies. A consumer may manage his/her loan via SoFi, while using PayPal to manage payments, Rocket Mortgage for his/her mortgage, and Robinhood for stock management. Venture capitalists and private equities are conducive to the creation of fintech startups and the level of investments increased significantly overtime as well[128].

Fig.10.The FinTech ecosystem key elements



Source:N.G. Vovchenko, S.S. Galazova, A.A. Sopchenko, O.S. Dzhu. FinTech Ecosystem as an Instrument of Sustainable Development Provision.International Journal of Economics and Business Administration.Vol VII, Special Issue 2, 2019. P 151

3.Disruptive innovation ecosystems

[128]In Lee.Yong Jae Shin. Fintech: Ecosystem, business models, investment decisions, and challenges. Business Horizons. 2017. PP 2-3

The intersection of disruptive innovation and ecosystems is worthy of further investigation since disruptive innovations can normally be expected to possess greater potential to disturb the configuration of an existing ecosystem than non-disruptive innovations.

A disruptive innovative ecosystem is an economic community of interdependent actors that – without hierarchical governance – coevolve around an innovation which does not exclusively improve performance along the dimensions that customers historically valued, but along at least one hitherto neglected dimension. These actors (organizations and individuals) display complementarities in the production and/or consumption of products and/or services related to this innovation.

Established disruptive innovation theory emphasizes the potential of disruptive innovations to grow into a position of dominance in the market that they had previously disrupted. When the disruptive innovation is not developed by a 'standalone' company but is embedded in an ecosystem, this effect is likely to be strengthened. Complementary innovations developed by other members of the ecosystem can substantially increase the disruptive innovation's appeal to customers. Moreover, a disruptive innovation backed by a multi-company system may be able to grow faster than a disruptive innovation backed by a single firm because the greater number of supporting players can be a source of additional legitimacy. This 'legitimacy-by-numbers' effect can increase the innovation's acceptance among society, policy-makers and regulatory bodies, as well as capital investors who tend to 'trust' an innovation more when its fate does not depend on a single economic actor[129].

4. Challenges Facing the FinTech Ecosystem

[129]Palmié, Maximilian; Wincent, Joakim; Parida, Vinit; Caglar, Umur. The evolution of the financial technology ecosystem : an introduction and agenda for future research on disruptive innovations in ecosystems. 2020. PP 8-9

There are four challenges which face Fintech industry which are:

4.1 Access to regulator

Fintech firms may often not be in the direct regulatory purview of authorities, and may therefore have less formalised and less frequent meetings with regulators.The first possible structural challenge, then, is access to regulators.This is an important challenge to resolve.Our laws and regulations have historically been crafted for financial servicesintermediaries, long in the domain. The legal and compliance frameworks may be hardto interpret for fintech firms who may be tech-savvy start-ups with limited complianceknow-how or competencies.Access to regulators, and know-how of which authorities to connect with for particulartypes of queries, is important. Our regulatory architecture can be complex, with multiple financial services authorities, ranging from prudential and conduct-focused,through credit-related, to financial intelligence-related regulators. Access to thisnetwork is important in order to reduce any potential barriers to entry from a legal,regulatory and compliance perspective. This is why we have seen a rapid emergenceof innovation centres, hubs and guidance units across the globe: in recognition of theimportance of increasing access to regulators, by fintech firms in particular

4.2.Access to rule-making

Rule-making in financial services can be complex. The 'rules of the game' can be embedded in legislation and regulations, and through related instruments such as directives, position papers and standards. A good example of this complexity can be seen in the regulation of payment systems. Often, primary regulations set the conditions or criteria based on which stakeholders can have access to clearing and settlement systems. Such primary regulations position the overarching principles and objectives of providing legal certainty, deepening financial inclusion, and ensuring the general safety and efficiency of payment systems. However, at a 'lower

level', rules related to how payment schemes operate are equally important in setting specific conditions or criteria related to a payment system. As an example: direct credit systems will define clearing time-frames, and debit systems will define charge-back rules or conditions. These types of rules are often called the 'rule books' in jurisdictions like Canada and the United Kingdom (UK). There are 'rule books' publically available for schemes such as the Single European Payments Area (SEPA) Credits in Europe or, in the UK, the Faster Payments Scheme.

4.3.Access to resources

Two significant resource challenges facing fintechs are access to capital and access to skills sets. Unlike incumbents who generally have reasonable access to finance, fintech firms and specifically fintech SMMEs may experience significant additional challenges accessing finance. While consumer credit is likely well-served in South Africa, SMMEs continue to struggle to access critical funding to sustain themselves and even grow. This is despite the significant contribution that these businesses make to gross domestic product (GDP) and employment. The inability of SMMEs to raise funds is caused by a number of demand- and supplyside factors, such as the lack of financial records and the inability of lenders to tailor their loan terms to match the business needs. According to a 2019 report by one of the large banks in South Africa, few fintechs manage to secure start-up capital, with the general sentiment indicating that funding seems to be readily, but not openly, available. More broadly speaking, SMMEs also operate in a mostly informal, invisible and cash-based economy. Addressing this challenge is related to the broader need to digitise these businesses and ensure that they are included in the digital economy. Turning our attention to the importance of access to skills: although much emphasis is placed on the technologies in the fintech domain, it is the people, the skills and the talent

that create the innovation and propel the change. This is evidenced across the fintech value chain: from the data scientists who unearth customer behaviour patterns, needs and 'pain points', through the software developers and engineers who develop the solutions, to the business heads who craft growth strategies based on an emerging technology.

4.4.Access to refined financial services data

Finally, we turn to the importance of data, specifically refined and granular data.It has become cliché to say that 'data is the new oil of the economy'. As the digital economy continues to be embedded through the use of mobile devices, the use of social media platforms, and generally increasing activities over the Internet and online commercial platforms, we will increasingly create and leave behind 'digital bread crumbs' of unprecedented volumes. Never before have we seen such volumes of data. And for the first time in human history, we also now have evolving tools and techniques at our disposal through cloud-computing, AI and machine-learning methods to handle such volumes of data.

However, in this new digital economy, the availability of, and access to, data related to, for example, transactional payments or specific customer behaviour, has become a key competitive driver. Access to both structured and especially unstructured data can provide significant competitive advantages to those who own it. Fintechs in particular are exploring the use of Big Data to produce new services such as product comparisons and tailored solutions based on consumer-specific data. While Big Data presents new opportunities, the scope of available data, and how to govern access to that data, poses new challenges for the financial services industry and regulatory authorities around the world. As a result of the above, access to refined data is a key issue that regulatory authorities have to deal with.

Examples of addressing it through Open Banking and Open Finance efforts are increasing in many jurisdictions[130].

Chapter Nine : Successful global experiences in the field of FinTech industry

The FinTech industry has rapidly emerged as a transformative force in the global financial landscape, reshaping how financial services are delivered and accessed. Across the world, various regions have successfully harnessed the power of FinTech, leading to innovative financial solutions that enhance efficiency, accessibility, and inclusion. These global success stories offer valuable insights into the key factors that contribute to the growth of the FinTech industry, including supportive regulatory environments, strong digital infrastructures, access to capital, and a vibrant entrepreneurial culture.

Countries like the United States, the United Kingdom, Singapore, and China have established themselves as leaders in the FinTech industry by creating ecosystems that foster innovation and growth. In the U.S., Silicon Valley's tech-driven environment has been instrumental in the rise of numerous FinTech startups, while London's status as a global financial hub has made it a key player in FinTech innovation. Singapore, with its proactive regulatory approach and government support, has become a FinTech hub in Asia,

[130] South African Reserve Bank. Challenges facing fintechs and opportunities to respond. 2020. P 3-7

attracting international investments and talent. Meanwhile, China has seen the explosive growth of mobile payments and digital banking, driven by companies like Alipay and WeChat Pay.

These successful global experiences in FinTech demonstrate the importance of collaboration between governments, financial institutions, and technology companies. They also highlight the need for a balance between innovation and regulation to ensure that the benefits of FinTech can be realized without compromising financial stability or consumer protection.

1. Experience of Singapore

Singapore has emerged as a regional leader infostering Fintech innovation through a multifaceted approach adopted by its government since 2016. To create an environment conducive to experimentation with new financial technologies, the government has introduced several strategic initiatives. At the core of this effort is the establishment of a dedicated Fintech office in October 2016. This one-stop service agency brings together multiple government entities, including the Monetary Authority of Singapore (MAS), the Economic Development Board (EDB), the Infocomm Media Development Authority, and Enterprise Singapore. This centralized platform serves to advise newly formed Fintech companies on government-backed capital support programs and helps them navigate the evolving legal and regulatory landscape related to Fintech in the banking and financial sectors.

Complementing this institutional support, in August 2016, MAS launched the Fintech Innovation Lab - a shared space that enables the Fintech community to collaborate, interact, and jointly develop new products and solutions. Two months later, MAS further reinforced its proinnovation stance by publishing guidelines that offered more flexible mechanisms for Fintech companies to test financial products without excessive legal risks. These

concerted efforts have helped position Singapore as a hub for Fintech growth, although the government acknowledges that the city-state still lags behind some global peers in fully harnessing the opportunities presented by financial technologies. The investment landscape in Singapore's Fintech sector reflects this momentum. In 2022, total investments reached a five-year high of $4.1 billion, comprising 250 M&A, private equity, and venture capital transactions.This marked a 22% increase from the 2021 figure of $3.4 billion and a 75% surge compared to the $2.3 billion recorded in 2020. While falling short of the pre-pandemic peak of $5.62 billion in 2019, the 2022 investment amount still represents the second-highest on record for the Singaporean Fintech ecosystem. Globally, the key areas attracting Fintech investments in 2022 included payments, cryptocurrencies, and Regulatory Technology (RegTech). Singapore's Fintech investment landscape mirrored this trend, with the top three sectors being cryptocurrencies, payments, and asset management technology[131].

2. Experience of the United Arab of Emirates

The government launched the UAE Blockchain Strategy 2021 in April 2018, which aimed to benefit from blockchain technology to enable nearly 50% of government transactions by 2021. The Smart Dubai Office also announced that Dubai is moving towards blockchain technology in 2020. The Abu Dhabi Global Markets Financial Services Authority has also begun to organize and issue guidelines regulating crypto assets in order to establish rules that contribute to the secure operation of financial technology related to digital currencies. The British University in the Emirates has used the blockchain network in the process of issuing certificates. It is worth noting that the UAE now represents 46% of all emerging companies in the Middle East and

[131]Phung Thi Thu Ha, Le Thu Hoai. INTERNATIONAL EXPERIENCE IN FINANCIAL TECHNOLOGY (FINTECH) DEVELOPMENT AND LESSONS LEARNED FOR VIETNAM. IJARW.Vol. 5 Issue. 10. 2024. P 165

North Africa. It was also announced later that there will be cooperation between the Smart Dubai Office and Dubai Future to identify and evaluate modern innovations that contribute to providing greater security, efficiency and promising economic opportunities. The success of this initiative will contribute to reducing 5.5 billion dirhams annually if Dubai is able to manage its services using blockchain technology. Blocks will eliminate the cost of document processing[132].

3. Experience of Vietnam

In the recent years, the startup trend has spread everywhere in Vietnam. More and more startups have been established, especially in fintech area. Vietnam had about 40 fintech companies in 2016 and reached more than 150companies by the end of June 2019. In Vietnam, althoughfintech is still quite new, the number of fintech companiesis increasing quickly. In particular, most fintech companiesare providing customers with online payment tools (suchas Onepay, 123 Pay, Vina Pay or MoMo). Also, somefintech companies are providing the services of moneytransfer (such as Matchmove, Cash2vn or RemittanceHub), mobilizing community capital (such as FundStart orComiloca), and online lending (such as LoanVi or Tima).With the growing trend of fintech development, Vietnam hasattracted many foreign investors in this field. For example, inearly 2018, Lotte Card (belonging to Lotte Group of Korea)spent nearly VND 1,700 billion to acquire Techcom Financefrom Vietnam Techcombank. Currently, this company (LotteFinance) is providing consumer lending services in Vietnam.Fintech companies have provided customers withmore options when accessing financial services, instead ofcustomers only accessing through the traditional bankingmodel as

[132]Rihab Adel Salaheddine Amine. International experiences in financial technology. GIEM.Volume 109. 2021. P 57

before. Recognizing this, in March 2017, the State Bankof Vietnam established a Fintech Steering Committee tosupport the completion of the legal framework and facilitatefintech companies' development. Along with that, manycommercial banks are also actively cooperating with fintechcompanies to take advantage of the available technologicaladvantages of these companies. Indeed, the survey results ofErnst & Young show that 85% of banks make the statementthat the strategy of converting to digital banking is their mostimportant goal. In recent years, the cooperation between banks and fintech
companies in Vietnam has also increased significantly, suchas:
- Military Commercial Joint Stock Bank (MB)has cooperated with the Military Industry andTelecommunications Group (Viettel) to offer moderntechnology application services. Specifically, in 2010, MBlaunched the Bank Plus service market with many modernfeatures, Bank Plus has three main service packages: BankPlus account, Bank Plus card, Mobile Bank Plus. ThroughViettel mobile network, MB introduced and connectedmodern banking services to customers without necessarilyexpanding infrastructure and human resources. After onlyone year, MB has more than 45,000 individual customersthrough this channel. - - In November 2012, the Online Mobile Services JointStock Company (M_Service) was licensed by the StateBank of Vietnam to provide MoMo Remittance service,which was coordinated by M_Service in cooperation withJoint Stock Commercial Bank for Foreign Trade Vietnam (Vietcombank).
In October 2015, the State Bank of Vietnamofficially licensed M_Service to provide MoMo E-walletservice.
- In March 2018, Vietnam Joint Stock Commercial Bankfor Industry and Trade (VietinBank) signed a cooperationagreement with Opportunity Network Company (ON),which is the leading UK Fintech company. Currently, ON isa partner of UBS, Citizens Bank, Alfa-Bank, London StockExchange Group,

Intesa Sanpaolo, Caixabank, Eurobank,YPO, Dentons. This partnership enables VietinBank'sbusiness customers to connect with over 15,000 businessesin 113 countries. With this cooperation, domestic businesseswill have the opportunity to expand the market with foreignpartners. Along with that, VietinBank will accompanycustomers in each connection business, providing financialsolutions. Thereby, VietinBank will help customers access tobanking services optimally.

- At the end of 2018, Vietnam Prosperity Joint StockCommercial Bank (VPBank) cooperated with SAP SE Groupto equip solutions for digital banking and mobile bankingneeds. Accordingly, VPBank deployed SAP OmnichannelBanking (OCB) software, along with SAP (PE) advancedsupport services and SAP application maintenance support(AMS) to improve service quality.

- Besides, International Commercial Joint Stock Bank(VIB) has cooperated with FinTech Weezi to launch MyVIBKeyboard, a social networking application. This applicationallows customers using MyVIB mobile banking applicationto transfer money quickly within 5 minutes while chatting onsocial networks such as Facebook Messenger, Viber, Zalo,Whatsapp, WeChat, Twitter, Snapchat[133].

4. Experience of Japan

Japan has taken a proactive approach in developing a comprehensive legal and regulatory framework to stimulate the growth of its Fintech sector. In 2016, the Japanese government designated Fintech as a promising area for growth in its "2016 Japan Revitalization Strategy." This strategic prioritization was quickly followed by concrete actions, including the amendment of regulations such as the "Bank Act" in May 2016 to encourage banks to establish IT-related subsidiaries dedicated to Fintech development.

[133] Nguyen Thi Kim LIEN, Thu-Trang Thi DOAN, Toan Ngoc BUI. Fintech and Banking: Evidence from Vietnam. Journal of Asian Finance, Economics and Business Vol 7 No 9. 2020. P 421-423

Alongside these legislative efforts, the Japanese government restructured its policy management system, introducing the "Regulatory Sandbox" framework. This innovative approach aims to facilitate Fintech growth and innovation by providing a secure environment for experimentation with new technologies and business models, while ensuring appropriate regulatory oversight. Beyond the legal and policy realms, the Japanese government has also taken steps to create aconducive ecosystem for Fintech companies to thrive. The Ministry of Economy, Trade, and Industry (METI) launched a program from October 2019 to June 2020 that offered a 5% discount on credit card, debit card, prepaid IC card, or smartphone purchases at registered retail stores and small to medium-sized restaurants. This initiative was designed to incentivize the adoption of digital financial services among both businesses and consumers. Furthermore, the Financial Services Agency (FSA) and the Tokyo Metropolitan Government (TMG) have established dedicated teams to actively attract foreign financial service companies considering expansion into the Japanese market. This targeted approach underscores the government's commitment to positioning Japan as a hub for international Fintech players. Additionally, the Japanese government has undertaken a broader set of measures to support the digitization of its financial and administrative systems. These efforts include digitizing personal identification, conducting research and testing on personal information cards, integrating electronic personal information identification into smartphones, and implementing a data management system to streamline government administrative processes. By leveraging digital technologies, the government aims to enhance the overall efficiency and accessibility of financial services and public sector operations. Through this multifaceted approach, the Japanese government has demonstrated a clear dedication to fostering a dynamic and innovative Fintech ecosystem, creating a regulatory environment that encourages experimentation, supports the adoption of

digital financial services, and positions the country as an attractive destination for both domestic and international Fintech players[134].

5.Experience of China 'Ant Financial'

Ant Financial, now known as Ant Group, is a Chinese financial technology company that has played a significant role in reshaping the financial landscape in China and beyond. As the operator of the world's largest digital payment platform, Alipay, Ant Group has become a global leader in FinTech, driving innovations in digital payments, wealth management, lending, insurance, and more. Ant Group's rapid rise and impact on the financial industry demonstrate the potential of FinTech to disrupt traditional banking systems. It has become a case study in how digital finance can drive financial inclusion, innovation, and economic growth. However, it also highlights the challenges that come with such rapid expansion, particularly in terms of regulatory oversight and maintaining stability in the financial system. Ant Group was founded in 2004 as a subsidiary of Alibaba Group, initially created to support the e-commerce platform by providing a secure and efficient online payment system, which led to the creation of Alipay. Beyond payments, Ant Group expanded into various financial services. Yu'e Bao, a money market fund launched by Ant, became one of the largest in the world, allowing users to invest small amounts of money with ease. MYbank, a digital-only bank, and Ant Fortune, a wealth management platform, are other examples of Ant's ventures into different financial sectors. Ant Group leverages cutting-edge technologies like blockchain, artificial intelligence, and big data to enhance its services. Blockchain technology is used in various applications, including cross-border payments and supply chain finance.

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[134]Phung Thi Thu Ha, Le Thu Hoai. INTERNATIONAL EXPERIENCE IN FINANCIAL TECHNOLOGY (FINTECH) DEVELOPMENT AND LESSONS LEARNED FOR VIETNAM. IJARW. Vol. 5 Issue. 10. 2024. PP 166- 167

According to Reuters, Ant Financial aims to raise $5 billion in shares that could be worth $100 billion. The last round of capital raising in 2016 valued the company at around $60 billion, so the new round of capital raising could start at a valuation of between $80 billion and $100 billion[135].

6- Experience of United Kingdom

The United Kingdom has firmly established itselfas the second-largest hub for Fintech investmentsglobally, trailing only the United States. Despite itsleading position in the European Fintechlandscape, the sector in the UK experienced asignificant decline in investments in 2022. Duringthis period, Fintech investments in the countrydecreased by nearly 56%, falling from $39 billionto $17.4 billion. This downturn was largelyattributed to the impact of high interest rates andpersistent inflation. The drop in investmentactivity extended beyond the total value, with thenumber of M&A, private equity, and venturecapital deals in the UK Fintech sector alsodeclining, reaching only 593 transactions in 2022.This sluggish performance continued into the firsthalf of 2023, with Fintech investment in the UKplummeting to $5.9 billion. Despite thesechallenges, the UK's Fintech ecosystem remainsrobust, comprising over 1,600 companies, a figureexpected to double by 2030. The sectorcontributes an estimated £11 billion ($13.4billion) to the UK economy and sustains more than76,000 jobs. To further strengthen this ecosystem, the UK government has made the Fintech sector atop priority, particularly as the country navigatesits future relationship with the European Union.
In May 2019, the U.S. Treasury and the UK'sTreasury established the U.S.-UK FinancialInnovation Partnership (FIP) to promotecollaboration

[135] Kallech Meryem, Saadaoui Mourad. FinTech in companies and banks, experiences of some countries, with reference to the case of Algeria. Book of FinTech-Innovations & Digital solutions.University ofMedea. 2021. P 230-232

within the private sector, facilitatethe exchange of regulatory expertise, and drivegrowth and innovation. The FIP operates throughtwo primary pillars: regulatory and commercial.Recognizing the strategic importance of theFintech industry, the UK government launched acomprehensive review of the country's Fintechlandscape in February 2021, led by Ron Kalifa,OBE. The Kalifa Review presented numerousrecommendations, including alterations to UKlisting regulations, enhancements to tech visas,the establishment of a regulatory 'scalebox,' andthe creation of a Center for Finance, Innovation,and Technology. The government has alreadybegun implementing some of theserecommendations, underscoring its commitmentto maintaining the UK's position as a globalFintech leader.To achieve this success, the UK government hasprioritized technology investments from theoutset, leveraging its cutting-edge technologicalcapabilities, strong appetite for innovativeproducts, and leading legal framework to createfavorable conditions for both SMEs and financialinstitutions to thrive in the Fintech space.Furthermore, the UK has been at the forefront ofsupporting new regulations in financial services,exemplified by the introduction of the FintechSandbox in 2015 and the "Fintech Sector Strategy"in 2018, which offered policies and initiatives tohelp Fintech businesses overcome short-term andlong-term challenges. The demand for innovationhas also been a significant driver of Fintechservice development in the UK. By the end of2020, around 12 million people in the UK hadopened accounts with digital-only banks, andnearly two-thirds of the population usedcontactless cards. Additionally, 83% of UK SMEsutilized mobile banking, prompting traditionalfinancial institutions like

Santander to implementcloud-based solutions to enhance efficiency,expedite loan approvals, and improve customerexperiences[136].

8- Malaysia's experience in Islamic FinTech

One of the successful experiences in Islamic FinTech is Ethis Group, a Malaysia-based Islamic crowdfunding platform that has made significant strides in the global Islamic FinTech landscape. Ethis Group operates in line with Shariah principles and offers investment opportunities in ethical and socially responsible projects, primarily focusing on real estate and social impact initiatives.

Ethis Group has successfully expanded its operations beyond Malaysia, establishing a presence in markets such as Indonesia, the UAE, and beyond. By leveraging technology, Ethis has been able to attract a diverse group of investors from around the world, fostering cross-border collaborations and investments.

Ethis Group utilizes advanced digital platforms to facilitate seamless investment processes, ensuring transparency, efficiency, and ease of access for investors. This use of technology has enabled the company to scale its operations and attract a broad base of users.

Sukuk Prihatin is regarded as an important innovation for Malaysia because this is the first time in Malaysia a retail sukuk is offered to individuals and corporate investors and via a digital platform. The online subscription is a commendable achievement and strengthens Malaysia's position as the leading country in the global Islamic fintech index

A retail Shari'ah debt instrument, Sukuk Prihatin, was rolled out in August 2020, to rally public contributions in supporting the national COVID-19 response and rebuilding costs.

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[136]Phung Thi Thu Ha, Le Thu Hoai. INTERNATIONAL EXPERIENCE IN FINANCIAL TECHNOLOGY (FINTECH) DEVELOPMENT AND LESSONS LEARNED FOR VIETNAM. IJARW. Vol. 5 Issue. 10. 2024. P 167

Through the sukuk, the government aimed to raise USD115 million (RM500 million) which would then be channeled to Kumpulan Wang Amanah COVID-19 to support three specific government initiatives. In just a one-month of its launch (18 August 2020 – 17 September 2020), the Sukuk was oversubscribed by up to USD151.7 million (RM660 million)[137].

8. Bahrain's Experience in Islamic FinTech

At the heart of a region that is expected to witness a boom in the fintech industry in the coming years, Bahrain is pushing forward to become the Gulf's hub for innovation and finance. These initiatives will open up opportunities for fintech projects.

- With regard to the Islamic financial services sector, Bahrain is a pioneer in this vital sector and has more than 40 years of experience as a financial services center in the region. During this period, Bahrain was one of the pioneering countries in creating and adopting the Islamic financial services sector and placed great importance in creating an advanced regulatory environment at the international level and is now working to create an integrated system that supports financial technology services companies.

In a step towards encouraging the growth of Islamic financial technology companies in particular, systems have been implemented that allow small and medium-sized enterprises in Bahrain and the region to obtain financing that is compatible with Islamic law through Islamic crowdfunding, and small and medium-sized enterprises are now allowed to obtain traditional financing through means.

These reforms are part of broader government initiatives to encourage innovation and entrepreneurship across all economic sectors and are of great importance to achieving growth in the regional and international Islamic financial technology sector and Islamic banks. (bahrain fintech bay, needs to adapt to the changing needs of its customers.

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[137]45-Islamic Development Bank.case studies on Innovations in Islamic Finance. 2023. PP 11-12

- The fintech sector continues to provide new growth opportunities, and "Tarabut Gateway" became the first company to graduate from Bahrain Fintech Bay's regulatory fund and the subsidiary of local company Almoayed Technologies, was one of the first companies to enter the sandbox to test technology-based open banking solutions.

- Digital population service: A series of regulatory updates and directives issued by the Central Bank of Bahrain have been necessary to keep pace with the rapid advances in the field of fintech, with open banking being one of the latest examples of this, through the launch of one of the open banking solutions providers in order to expand fintech and banking services Token.io fully digital branches open a to boost the growth of the enterprise sector.

The first Bahraini initiative of this association is to establish a crowdfunding platform that will SMEs, and the Central Bank of Bahrain has issued regulations to regulate crowdfunding businesses in anticipation of changes in this industry.

The consortium also aims to restore growth to the global Islamic banking industry by promoting financial inclusion and creating new business opportunities [138]

[138] Malika Ben Alakma..The role of FinTech in promoting financial inclusion-The Bahraini experience.Book of FinTech-Innovations & Digital solutions.University ofMedea. 2021. PP 219-261

Conclusion

Fintech is vital for individuals as it enhances the security of their money and is more convenient than keeping money at home or traveling. However, providing e-finance involves different players such as banks or financial institutions, mobile network operators, fintech providers, regulators, agents, retail chains and customers. It can eliminate high transaction costs and provide affordable, convenient and secure banking services to poor individuals in developing countries. Fintech and AI are among the most important technological tools and techniques that affect various functions present in banks to reach and retain the customer, as they play the role of the intermediary player effectively by reducing the administrative and other costs of banks and giving them an equal opportunity. Fintech along with AI and blockchain will re-engineer banking services. Digital finance through fintech providers has positive implications for financial inclusion in emerging and advanced economies. The convenience that digital finance provides to individuals with low and variable incomes is often more valuable to them than the higher cost they will pay to access traditional financial services.

Digital financial services can be more convenient and affordable than traditional services, enabling low-income and poor people in developing countries to save and borrow in the formal financial system and earn significant financial returns. The use of artificial intelligence in banking financial services can reduce operating costs and improve the performance and profitability of financial institutions, so most institutions seek to invest in modern financial technology and artificial intelligence applications and tools. Artificial intelligence applications help save time due to their speed and high accuracy in completing the required tasks and enable reducing the effort on employees through their ability to perform difficult tasks that require great effort from the employee.

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