Kaunas University of Technology

School of Economics and Business

Development of the Lithuanian FinTech Ecosystem: Challenges and Perspectives

Master's Final Degree Project

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Summary

The rise of technology has led to the growth of the FinTech field, which aims to enhance financial services through technological means. Nevertheless, developing a perspective FinTech ecosystem requires consistent engagement from different ecosystem participants. Without each participant collaboration, multidirectional communication, knowing their role and potential gains, it becomes difficult to develop a functioning FinTech ecosystem.

The object of research is Lithuanian FinTech ecosystem. The aim of this paper to identify and present challenges and perspectives that are being faced, while developing a FinTech ecosystem.

The article discusses the growth and development of the FinTech industry globally, with a focus on the FinTech ecosystems in Lithuania. The analysis of ecosystem development, financial ecosystem and FinTech ecosystem is being presented. Other countries' FinTech ecosystem development is being analyzed. The study highlights the transformative impact of FinTech on the financial industry and the need for traditional financial institutions to adopt new technology to stay competitive. Later on, the analysis identifies key players in the FinTech ecosystem, including governments, financial institutions, entrepreneurs, FinTech startups, technology developers, financial customers, and traditional financing institutions. After the analysis of scientific literature, a theoretical model of FinTech ecosystem development was created, by which, further empirical research of qualitative semi-structured interview was performed. The study found that the development of the Lithuanian FinTech ecosystem, highlighting its supportive environment, good infrastructure, and friendly regulations. It identifies the need for collaboration and cooperation among ecosystem participants, regulatory support, and effective risk management policies for the ecosystem's efficient development and stability. The research underscores the need to strengthen the ecosystem's collaboration among participants, enhance regulation and supervision, increase governmental and regulatory support, provide capital support, and improve the educational system. The article also provides insights from interviews with Lithuanian FinTech ecosystem participants and presents recommendations for enhancing the ecosystem's maturity, including strengthening collaboration, improving regulation and supervision, increasing governmental and regulatory support, providing capital support, and enhancing risk management policies and educational system.

Špiliauskas Paulius. Lietuvos FinTech ekosistemos vystymas: iššūkiai ir perspektyvos. Magistro baigiamasis projektas / vadovė prof. dr. Gerda Žigienė; Kauno technologijos universitetas, Ekonomikos ir verslo fakultetas.

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Santrauka

Technologijų vystymasis lėmė FinTech srities augimą, kuri siekia gerinti teikiamas finansines paslaugas tobulindama juos technologiniais sprendimais. Tačiau, perspektyvios FinTech ekosistemos vystymas reikalauja pastovaus įsitraukimo iš skirtingų ekosistemos dalyvių. Be kiekvieno dalyvio įsitraukimo, bendradarbiavimo, tarpusavio komunikavimo ir savo vaidmens ar naudų nežinojimo, tampa sunku vystyti veikiančią FinTech ekosistemą.

Tyrimo objektas yra Lietuvos FinTech ekosistema. Šio darbo tikslas yra nustatyti ir pateikti iššūkius bei perspektyvas, su kuriomis susiduriama kuriantis FinTech ekosistemai.

Darbe aptariamas FinTech pramonės augimas ir plėtra, atkreipiamas dėmesys į FinTech ekosistemą Lietuvoje. Pateikiama ekosistemų vystymosi, finansų ir FinTech ekosistemų analizė. Taip pat nagrinėjamas kitų šalių FinTech ekosistemų vystymasis. Darbe pabrėžiamas FinTech transformacijos poveikis finansų pramonei ir būtinybė tradicinėms finansų institucijoms priimti naujas technologijas, kad išliktų konkurencingomis. Analizuojami pagrindiniai FinTech ekosistemos dalyviai, įskaitant vyriausybes, finansines institucijas, antreprenerius, FinTech startuolius, technologijų kūrėjus, finansinius klientus ir tradicines finansavimo institucijas. Po mokslinės literatūros analizės buvo sukurtas teorinis FinTech ekosistemos vystymosi modelis, pagal kurį atliktas empirinis tyrimas, kokybiniu pusiau struktūrizuotu interviu. Tyrimas parodė, kad Lietuvos FinTech ekosistemos vystymasis pasižymi palankia aplinka, gera infrastruktūra ir draugiška reguliavimo sistema. Darbas atskleidžia būtinybę bendradarbiauti tarp ekosistemos dalyvių, reguliavimo palaikymo ir efektyvių rizikos valdymo politikų ekosistemai efektyviam vystymuisi ir stabilumui užtikrinti. Tyrime atskleidžiama būtinybę sustiprinti ekosistemą skatinant dalyvių bendradarbiavimą, gerinant reguliavimą ir priežiūrą, didinant valdžios ir reguliavimo institucijų paramą, pateikiant galimą kapitalo paramą ir gerinant švietimo sistemą. Darbe taip pat pateikiami pasiūlymai dėl Lietuvos FinTech ekosistemos brandumo stiprinimo, atsižvelgiant į informantų pateiktą informaciją, įskaitant bendradarbiavimo stiprinimą, reguliavimo ir priežiūros gerinimą, didinant valdžios, ir reguliavimo institucijų paramą, pateikiant investicines kapitalo galimybės, ir gerinant rizikos valdymo politiką bei švietimo sistemą.

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Abbreviations:

AI – Artificial intelligence.

Assoc. prof. – associate professor.

ATM – Automated Teller Machine.

C2C – Customer-to-consumer.

DPP – Data Protection Policy;

EEA – European Economic Area.

FCIS – Financial Crime Investigation Service.

FinTech – Financial Technologies.

ICT – Information and Communication Technology.

Lect. – lecturer.

MiCA – Markets in crypto-assets

NFT – Non-Fungible Token.

OECD – Organization for Economic Co-operation and Development.

Prof. – professor.

SEPA – Single Euro Payments Area.

STI – State Tax Inspectorate.

WW1 – World War 1 1914-1918.

Terms:

Blockchain – a transaction recording system across computers, which creates a block with every transaction, and all these transactions later are connected to the chain in chronological and linear order.

FinTech – a merged word of "financial technology", describes the adoption of modern technologies by companies to challenge the conventional ways of providing financial services and gain a competitive advantage.

NFT – it is a unique and irreplaceable cryptographic asset, with individual metadata, identification code, and digital signature, which makes it special from others.

Introduction

Relevance of the topic: The topic of financial technology has become increasingly relevant in recent years as technology continues to rapidly evolve and shape the way we do business. FinTech refers to the use of technological solutions for improving and innovating financial services, together with their products. It can be described as an interdisciplinary field that merges finance, technology management, and innovation management (K. Leong & Sung, 2018). The rising awareness of various digital platforms, electronic devices, and the internet has enabled companies to create new and efficient ways of presenting financial services not only for natural persons but also for legal persons (Gomber Kauffman, Parker, Weber (2018), Gomber, Koch, Siering (2017), and others). This has led to an explosion of FinTech start-ups and the emergence of new financial products and services. But with every innovation and a new thing, there is a need for attention and evaluation, of the possibilities and challenges, which could be faced during the development process.

Despite the current popularity of FinTech, its history dates to the late 19th century when advanced financial technologies like the pantelegraph were used for signature verification by banks. This period is known as FinTech 1.0, which was followed by FinTech 2.0 which saw the introduction of ATMs and the development of digital money, financing, trading, and online banking. The Global Financial Crisis in 2008 led to the emergence of FinTech 3.0, marked by automation, specialization, and decentralization. The rise of FinTech startups, blockchain technology, and the dominance of millennials has led to the current state of FinTech 4.0. The history of FinTech is a continuous evolution of technological advancements in financial services.

The integration of financial services into the digital lives of customers is a major challenge for financial institutions worldwide. Despite the importance of digital transformation to remain competitive, the complex regulatory and security requirements of the financial industry pose significant obstacles to this process. FinTech companies have emerged as a key player in this transformation, but the growth of the FinTech ecosystem is hampered by several challenges. There is a need of continuous collaboration between the ecosystem participants. Economies that heavily rely on cash and a lack of trust in the financial system, in some regions, can obstruct the adoption of digital payments and FinTech services. Financial institutions must build trust with customers by ensuring the safety and security of their data to overcome this challenge. Furthermore, a shortage of funding opportunities also slows down the development of the FinTech sector. While venture capital-supported entrepreneurship is gaining popularity, some regions lack adequate funding options for FinTech startups. Researchers Unsal, Oztekin, Cavus, Ozdemir (2020), Diemers, Lamaa, Salamat, Steffens (2015), Leong, Sung (2018), Blakstad, Allen (2018) and others, created various analyses and scientific literature on building, developing, analyzing FinTech ecosystem, what are the opportunities of ecosystem's entering the market, challenges, and future perspectives. **After the analysis of the literature review, the research problem question is formulated:** Despite the potential of growth and innovation with various factors that influence the development, how does the FinTech ecosystem developing in the Lithuanian market, and what challenges, and perspectives do its participants face?

Research object: FinTech ecosystem and its development in the Lithuanian market.

Aim of Research: To identify the Lithuanian FinTech ecosystem's stage of development, identify challenges that are being faced, and possibilities of future perspectives.

Research objectives:

1. To identify the FinTech ecosystem development in other countries, to find and recognize challenges in other countries, that are being faced with perspectives for the future;
2. To identify the ecosystem, point out the financial ecosystem, to find what is needed for the successful development of an ecosystem.
3. To analyze, the current Lithuanian FinTech ecosystem development;
4. To conduct an interview with FinTech ecosystem members in Lithuania, based on questions created regarding the analysis and results;
5. Based on the analysis, identify, and reveal the challenges and perspectives of FinTech ecosystem development in the Lithuanian market;
6. Analyze the data gathered from the interview, according to the results, and present recommendations for a better development process of the Lithuanian FinTech ecosystem.

Methods: Analysis of scientific literature and other sources, analysis of statistical data, identification of key aspects for challenges and perspectives, analysis of data representations. Followed by a qualitative data survey of semi-structured interview method with Lithuanian FinTech ecosystem members, collected data analysis, and presentation.

1. FinTech Ecosystem Development Problems and Relevance

The ecosystem is a community of living and non-living elements in the environment connected by mutual relationships and exchange processes. It is a system that encompasses all functioning organisms in a particular environment interacting with external factors. In a living environment, it is the relationship between organisms such as plants or animals and their living environment. In a non-living environment, it is even the provision of tourist activities to consumers, showcasing natural resources, locations, or wilderness. Sir Arthur Tansley introduced the fundamental definition of the ecosystem in 1935 by providing its initial and primary description, as a “<…> community or assemblage and its associated physical environment in a specific place.” (Pickett & Cadenasso, 2002). Ecosystem succession can be characterized by three key aspects: Firstly, it is a systematic and predictable progression of community development. Secondly, this progression is governed by the community's influence on the physical environment, even though the physical environment sets certain boundaries for the ecosystem's development. Finally, it culminates in a stable ecosystem where the interrelationships between organisms are sustained within a certain amount of available energy (Odum, 1969). The ecosystem is a dynamic and complex entity, functioning as a single unit, where mutual relationships allow it to develop, grow, evolve, and improve. Each element of the ecosystem plays a certain role: consumers utilize resources provided by producers, while producers create and provide products to meet consumer needs.

The FinTech ecosystem is not an exception. A stable and mutually beneficial relationship between different FinTech companies is essential for the growth of the FinTech industry, similar to the symbiotic relationship between two or more distinct organisms that live together for the benefit of one or both. Five key components have been identified as being part of the FinTech ecosystem, which are: startups in the FinTech industry, developers of financial technologies, government entities, financial customers, and traditional financial institutions (Lee & Shin, 2018). From a perspective of biological ecosystem, the FinTech ecosystem also consists of biotic and abiotic factors. Individual financial customers could present as biotic factors, while abiotic factors, could be government with regulations, FinTech startup companies, and other institutions or service providers. These components work together in a mutually beneficial way to foster innovation, stimulate economic growth, encourage collaboration and competition within the financial sector, and ultimately improve the experience for consumers of financial services.

According to Hao (2020), Over the past few years, numerous startup incubators and acceleration programs have been established to garner attention for the FinTech market. Constructing a FinTech ecosystem is crucially important for the market, and it requires cooperation among various parties to advance the sector. This collaboration can lead to the generation of numerous innovative ideas, the promotion of new solutions, the attraction of investments, and skilled labor.

FinTech solutions are widely spread across the world and every country presents its challenges and perspectives. The author (Mirzaei, 2022) did research on FinTech ecosystem development in Iran. Mirzaei mentions, that the financial services in Iran are going through a shift transformation and the usage of electronic payment methods is rapidly rising. A huge demand for new and innovative financial solutions has been created, because of the large and technologically skilled young population, with rising awareness of the use of financial services by accessing various digital devices. This led to a breakthrough in the development of the FinTech ecosystem, which presents various online financial solutions. One of the biggest challenges is Iran’s financial sector is highly regulated due to its significant role in the economy. On the other hand, one of the factors that created a possibility for FinTech companies to successfully establish in the Iranian market was – the rising user influence of the internet and mobile devices, which by the end of 2020 was reaching almost 97% of Iran's population. That creates a perspective for more people and companies to the possibility of accessing various services that FinTech companies can provide. The analysis database, in the article, was used from the data presented by E-Commerce Monitor Online Market Research and the central bank of Iran. It was compiled by financial technology companies, that already established their headquarters after 2012 in Iran and currently engaged in FinTech activities. But companies that are solely offering sales or marketing avenues to insurance firms or real estate agents are not included. Online based technologies were considered, because of the development of internet usage and market perceptions. The geographical concentration was also taken into consideration because most of the FinTech companies were established in most important cities of the country, where the highest rate of population is concentrated, and cities are well developed. With the environmental capabilities, companies can establish their businesses more easily by presented utilities. The author notices that FinTech companies are more likely to establish their businesses at the geographical location with a higher level of economic activities, which helps them to be closer to investors and other financial institutions.

The highest focus of FinTech market in Iran is at banking and payments area. Despite the market growth, it has declined because of international sanctions, which created new challenges for the development process and foreign companies to enter the market. But the impact of sanctions was evidently beneficial for numerous startups, allowing them to establish their own businesses and gear up for the eventual entry of major international companies into the market (Salamzadeh & Kawamorita Kesim, 2017). On the other hand, despite the late development of Iranian FinTech ecosystem, it caught up with the latest technologies as more individuals and organizations like banks, which expresses more interest in this particular area, got involved. The considerable interest in the payments sector can be attributed to Iran's robust banking infrastructure, which resulted that most of the FinTech companies are in payments sector. Numerous investment firms, accelerators, incubators, and science parks were established in Iran, to drive and develop the ecosystem. These factors triggered the Iranian market to becoming a rapidly growing startup hub in the Middle East.

Another FinTech ecosystem development was analyzed in market of China. Author Chen (2016), analyzes the FinTech development in financing, wealth management, payment and other areas. Chen mentions that the majority of financial institutions fundamental capabilities are two: first, the capability to effectively and safely reach a wide spectrum of customers, and second, the proficiency to understand, evaluate, and mitigate risks associated with their customers. The development of technology has created possibilities for both fields, which resulted in a possibility for customers to access services from far away, without problematics of time and distance, and helped with credit assessments with a popularity of credit cards. Author analyzes China market and often compares it to United States, because that was the market, where FinTech was initially introduced. For example, with over 450 million users, Alipay's active account holders exceed PayPal's global count by multiple times and despite the fact, that PayPal purchased the Paydiant and Braintree, its annual growth rate of payment transactions was at 25 %, which is considerably much lower, because mobile payment transactions by banks and third-party payment providers in China had a significantly higher growth rate. Chinese payment providers not only have a larger customer base, but also, they are heavily dependent on mobile technology. The dependency of technologies and populations technological development resulted a perspective for FinTech ecosystem to develop successfully in the market.

The author presents three main driving factors, that influences how successful FinTech ecosystem development will be:

– Influence of ability to know the market and meet its needs;
– Influence of inclusive finance;
– Influence of government policy and regulations.

Chen mentions that other countries, like: Brazil, which allowed to permit non-bank entities to act as bank correspondents and offer financial services; Kenya, which authorized the nation's mobile network operator to present digital financial services; China, where regulators permitted Alipay to offer payment services with an escrow feature, leading to a surge in both online consumption and FinTech expansion. This enabled FinTech firms to enhance financial inclusion by providing supportive flexibility. Additionally, regulations need to ensure customer protection by providing regulations to enhance transparency and safeguard consumer interests.

According to newspaper article by Ketlerius (2018) in "Kauno Diena", there was an interview with Mantas Katinas, while he was former managing director of "Invest Lithuania", now one of the biggest Eastern and Central Europe games market company's "Wargaming" CEO (*Mantas Katinas | WoW University*, 2021). In the interview he mentioned that the biggest issue is the educational system. The educational system could be referred to as a part of governmental element, which is one of the main components of FinTech ecosystem. The educational system is Lithuania is not flexible enough and does not prepare enough specialist. The lack of educational institutions which route should be directed towards modern economics, the quality of studies should also increase, because graduated person in engineering or IT may not be qualified in perspective of international level. High schools are the first limitation which direct around 60 percent of people toward Social Sciences, because that is how the Lithuanian educational system develops them. Of course, it is not a bad thing that more than half of the students are being directed towards the social sciences, because economics needs financial analytics, economists, managers that are not pure mathematicians. There is a need for logical thinking and problem solutions, teamwork which works without mathematical knowledge. In addition, Katinas, mentions that there is a governmental issue with lack of infrastructure and competences. For example, investors cannot come to the city if there are no convenient air transport services. Lithuania's immigration system is only in early development stage because there is an issue for foreign talents to come and work in such industry. To become FinTech center, Lithuania should have companies from Great Britain, Asia and even America. Of course, it is very important to have a patriot of Lithuania, who could be sighted and become a leading company in FinTech environment.

Improving and new technologies are changing the financial industry by presenting customers and companies with new using possibilities, creating possibilities to change business models, by analyzing already gathered data for various markets like investments or estate. To stay up with the changing market, traditional financial institutions, such as banks and other financial service companies need to research the market, and look at the possible threats and certainties, that could be faced as a result of challenges and perspectives. In addition, the need to adopt new technology and develop better FinTech capabilities is mandatory. The way financial services are delivered, with a growing number of consumers, the digital revolution, and businesses turning to Financial Technology services (Mohamed & Ali, 2018). The convenience and accessibility of financial services offered through digital means, as well as the cost-effectiveness and flexibility of these services, are driving the growing popularity of FinTech. But with every possibility, risks are inevitable.

FinTech can include everything from mobile banking apps to digital currencies, to algorithms that are used to make investment decisions. Many FinTech companies are focused on using technology to make financial services more accessible and more efficient, as a result of often seen as disrupting traditional financial institutions. Nowadays, human population in January 2022 was already around 7.91 billion (Kemp, n.d.) people and raising. 67.1% (Kemp, n.d.) of population is using mobile phones and 62.5% (Kemp, n.d.) of population are internet users. This means, that the awareness of technologies is raising and part of these technologies are financial technologies. The FinTech is much closer in person's everyday routines then they think. It is from the smallest things, like purchasing something in supermarket or groceries store – to making high value purchases, planning, and managing the finances or investing, just by using phones in our pockets.

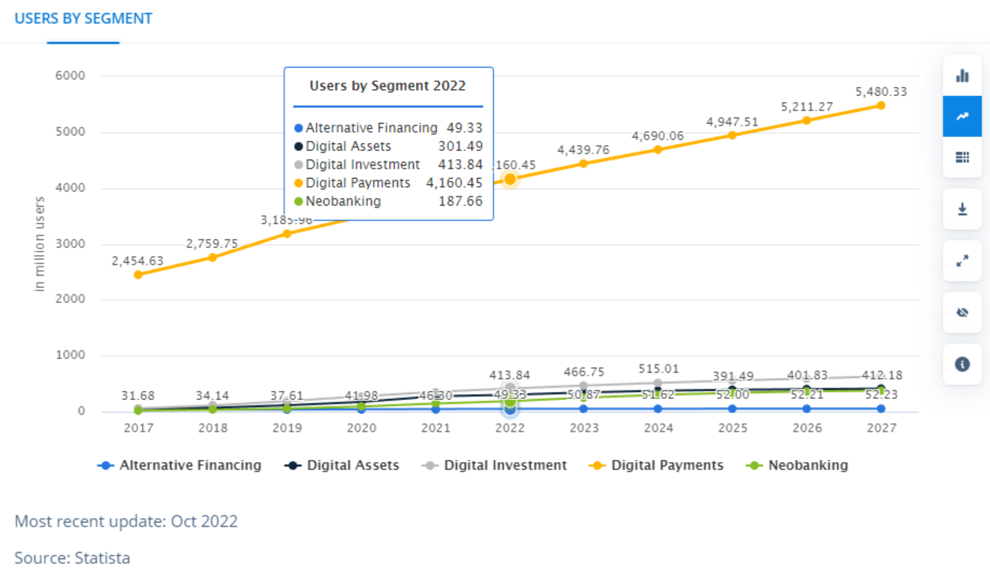

Fig. 1. FinTech users by segment *(Statista, 2022)*

Statistical data shows that in 2022 there were more than 5.11 billion users of FinTech worldwide (see Fig. 1), which is around 65% of the population. In addition, in 2022 more than 13 920 thousand billion US dollars (around 12 837 billion €) were used for transactions by FinTech solutions in various segments (see Fig. 2). "The total value of investments into fintech companies worldwide increased dramatically between 2010 and 2019, when it reached 215.1 billion U.S. dollars. In 2020, however, FinTech companies saw investments drop by more than one third, reaching a value of 127.7 billion U.S. dollars, but the investment value increased again in 2021 up to 226.5 billion U.S. dollars." (Statista Research Department, 2022). At the moment, by the latest data, in 2022 first half of the year, there were already around 107.8 billion U.S. dollars (99.35 billion €) (see Fig. 3) invested into FinTech companies.

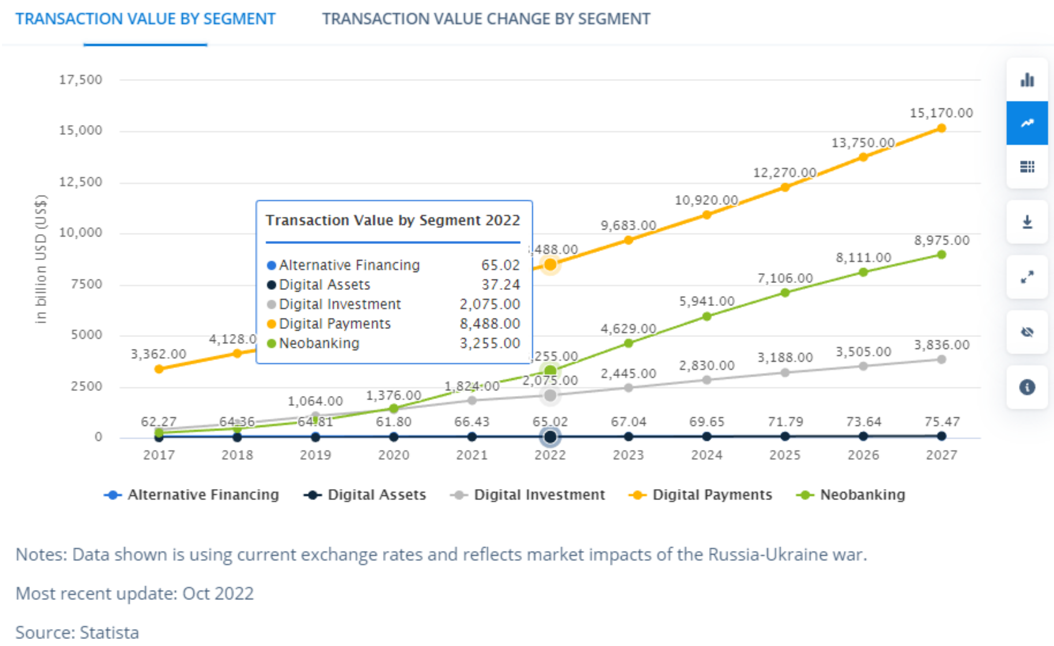

Fig. 2. FinTech transactions by segment in billion USD *(Statista, 2022)*

Using the data gathered from Google Trends it could be stated that a very significant change of search keyword “FinTech” from year 2015. “Although it is challenging to state when FinTech started, it gained the attention of scholars in the aftermath of the 2008 financial crisis” (Mansour Saleh, A., 2021). Despite the financial crisis, the FinTech startup occurred at the time of new technology development. At that same time, the AI and other technologies like blockchain were developing rapidly. And integration of these developing technologies into people’s daily life emerged FinTech becoming attractive topic.

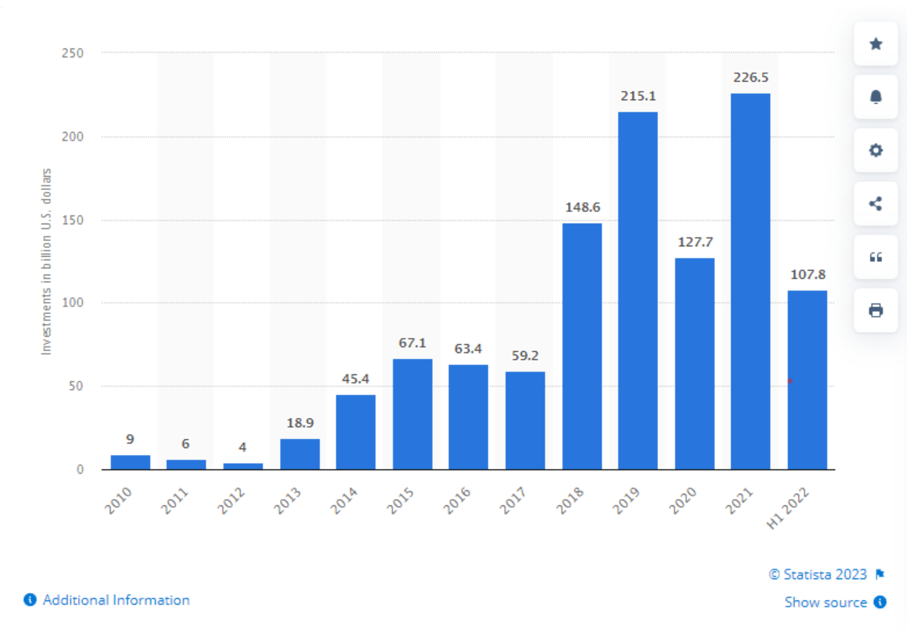

Fig. 3. Total value of investments into FinTech companies worldwide *(Statista Research Department, 2022)*

Consumer survey data from report of McKinsey (*Europe's Fintech Opportunity | McKinsey*, 2022), shows that Financial technology companies are improving customers satisfaction rates (see Fig. 4.). Competitive pricing was a main reason for choosing FinTech, with following same number for easy access.

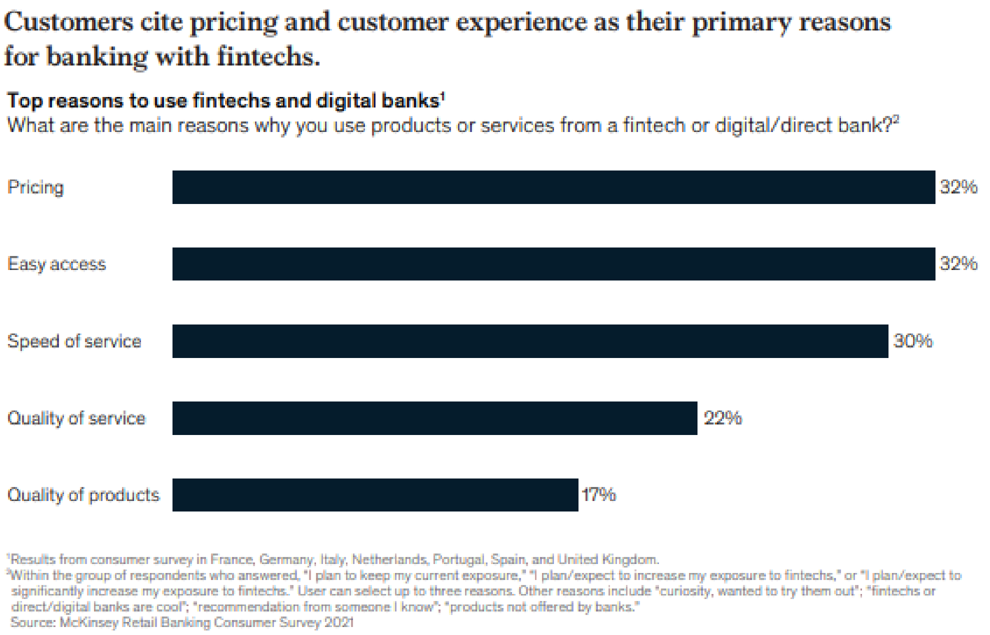

Fig. 4. Top reasons to use FinTech and digital banks (*Europe's Fintech Opportunity | McKinsey*, 2022)

As mentioned in the report, FinTech companies are making significant contributions to the financial services industry by introducing new revenue streams, disrupting traditional offerings and operations, and promoting a more dynamic and stable financial sector. Their agility and speed allow them to quickly adapt to new trends such as embedded finance and distributed ledger technology. This enables them to bring new products and services to the market faster than traditional financial institutions, giving them an advantage in capturing emerging opportunities and markets. Additionally, their ability to quickly adopt and adapt technology positions them well for long-term success and innovation in the financial industry.

FinTech in Lithuania is not a very popular term to be used or seen in various headlines. But there is a need to look into some historical event, financial technology was introduced in the early 1990s. It was a time when the first international payment card was introduced by Vilniaus Bankas (now SEB) in 1993. Later after two years, in 1995 on November 19th, the same bank introduced the first ATM in Lithuania (*Pirmasis bankomatas Lietuvoje*, n.d.). Later on, from 2000 the first online banking was introduced and followed by the introduction of Paysera, which is the first Lithuanian EMI, mobile signatures by Omnitel (now Telia), car parking apps, QR payments, P2P lending platforms, FinTech study courses by VGTU and MRU and so on. The Lithuanian government has made major efforts in recent years to market the nation as a FinTech center. In 2015, the Lithuanian FinTech Association was formed with the goal of promoting the growth of the FinTech industry and creating a suitable business climate for FinTech enterprises. In 2016, the government also developed a regulatory sandbox, which allows FinTech firms to test new goods and services in a controlled setting before releasing them to the general public.

At the end of 2022, from the annual report “The Fintech Landscape in Lithuania 2022-2023” made by the Public Establishment “Invest Lithuania”, there were already 263 FinTech companies, which were successfully operating in the Lithuanian market and have legal entity (Invest Lithuania, 2023).

Fig. 5. FinTech ecosystem in Lithuania *(Rockit, 2022)*

Table 1. FinTech ecosystem solutions in Lithuania. *Presented by author.*

FinTech business model	**Description**
Big Data and Analytics	The financial industry uses technology to work with a large scale of data and advanced analytical techniques to gain insights and make informed decisions. This includes using data from various sources, such as financial transactions, social media, and sensor data, to identify patterns and trends, detect fraud, and make predictions about financial markets and customer behavior.
Savings and Investments	The use of technology enables individuals to manage their savings and investment accounts with ease, utilizing mobile apps, websites, and other digital platforms. Furthermore, data and analytics are utilized to offer personalized recommendations and advice on savings and investment strategies.
Lending	Technology is used to facilitate peer-to-peer lending and borrowing between individuals and businesses, through digital platforms and online marketplaces. Additionally, data and analytics are utilized to assess creditworthiness and make lending decisions. Alternative lending options such as crowdfunding, invoice financing, and supply chain financing are also available.
Payments	Technology is used to improve and innovate the payment process. Including: the creation of fresh modes of payment, such as digital wallets and mobile payments, as well as leveraging technology

FinTech business model	Description
	to enhance the reliability and effectiveness of established payment methods, such as debit and credit card transactions. Payment FinTech companies can also offer services such as fraud detection and prevention, and the ability to track and analyze payment data. It aims to make the payment process faster, safer, and more convenient for both businesses and consumers.
Financial software	Technology is used to provide software solutions for the financial industry. Including: digital banking platforms, personal finance management tools, investment platforms, and more. Financial software FinTech companies often use cutting-edge technologies like AI and machine learning to improve the user experience, automate financial processes, and provide valuable insights. These solutions are often offered to financial institutions but also to end customers like small businesses and individual users.
Digital Banking	Technology is used to provide digital banking services. These services can include online and mobile banking, digital wallets, P2P payments, and more. These companies often partner with traditional banks and financial institutions to provide their services. General aim to provide a more convenient, user-friendly, and efficient banking experience, by leveraging digital technologies like mobile apps, cloud computing, and AI. They also offer additional features such as budgeting and saving tools, real-time account monitoring, and cashback rewards. Additionally, many Digital Banking FinTech companies are focused on providing financial services to underbanked or unbanked populations who may not have access to traditional banking services.
Compliance & Cybersecurity	Technology is used to provide solutions for compliance management, risk management, and fraud detection, as well as cybersecurity technologies such as firewalls, intrusion detection and prevention systems or encryption. Compliance and cybersecurity FinTech companies may also offer services such as security consulting and incident response. Compliance FinTech companies provide solutions that help financial institutions navigate the complex regulatory landscape, by providing software that automates compliance tasks, and alerting institutions to areas where they may be non-compliant. Cybersecurity FinTech companies provide solutions to help financial institutions protect against cyber threats, by providing software and services that identify and respond to potential security breaches, protect against malware, and encrypt sensitive data.
Blockchain & Cryptocurrency	Technology is used to provide financial services for blockchain technology users and digital currencies. Blockchain FinTech companies improve the

FinTech business model	Description
	security and efficiency of existing financial services, such as cross-border payments and supply chain finance. They also develop blockchain-based solutions for the financial industry, including decentralized exchanges, smart contracts platforms, and more. Cryptocurrency FinTech companies often use blockchain technology to provide digital currency services, such as the ability to buy, sell, and store digital currencies. They also use blockchain technology to develop new financial products and services.
Insurtech	Technology is used to improve and innovate the insurance industry. These companies aim to make the process of buying and using insurance more efficient and convenient for consumers, using various advanced technologies like AI or machine learning to make predictions about risk while also providing insurers with new tools and data to better assess risk and price policies.
Other	Technology is used to create an innovative platform for online affiliate marketing networks, by personalizing the communication, increasing engagement and interactions with customers. In addition, they create solutions for content creators, who want to get paid in exchange of content discovery tools or e-shops.

An increasing number of growing FinTech hubs in Lithuania, shows that this is a very good place to create and develop such ecosystem. As mentioned before, by the data gathered from Invest Lithuania 6-th annual report “The Fintech Landscape in Lithuania 2022-2023” (2023), there are 263 FinTech companies successfully operating in Lithuania. This number is a little bit lower than the 265 (see Fig. 6) companies in the previous year, but that could be affected by the economic downturn. The following document showcases the most recent findings, accomplishments, and future projections regarding the FinTech industry in Lithuania. Invest Lithuania conducted comprehensive research to showcase the sector's primary developments and noteworthy achievements. Although there wasn't a significant increase in the number of FinTech companies operating in Lithuania in 2022, the number of employees in this sector's workforce grew by 19% from 2020, reaching more than 7 thousand. Lithuania is making significant efforts to continue nurturing the skills required by this industry. For instance, the Center of Excellence in Anti-Money Laundering has initiated training and certification programs to educate experts in compliance, anti-money laundering, and counter-terrorism financing. The government has also allocated €80M for a comprehensive 3-year National Upskilling and Reskilling Programme, aimed at developing in-demand skills, including those associated with FinTech and IT.

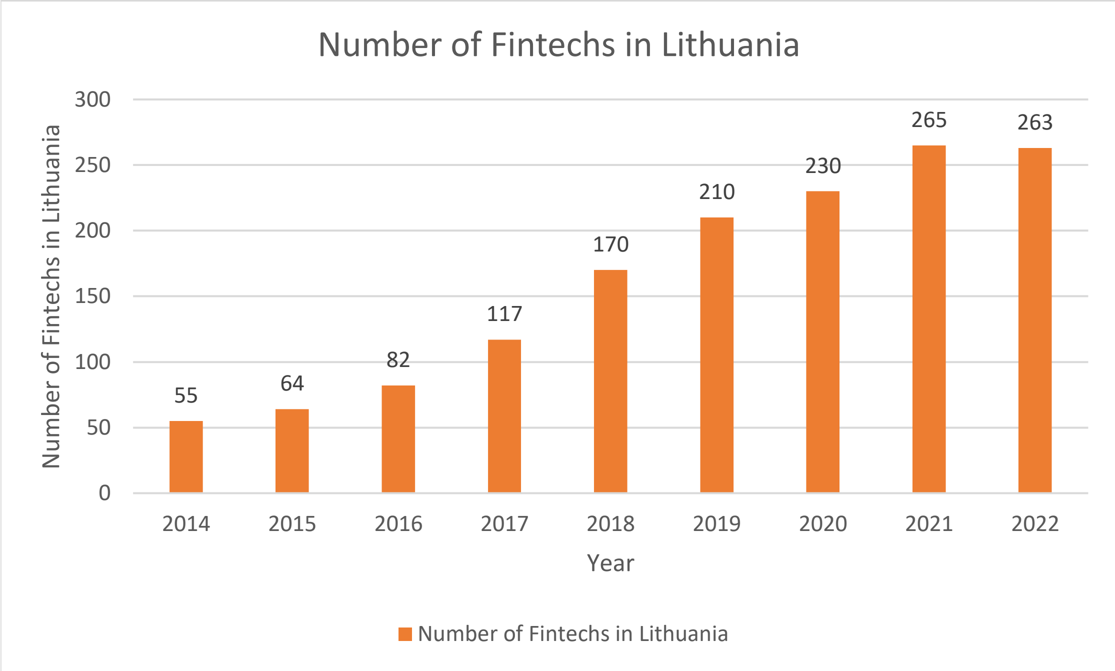

Fig. 6. The amount of FinTech companies successfully operating in Lithuanian market. *Presented by author with data from "The Fintech Landscape in Lithuania 2022-2023" (2023).*

In addition, Lithuania has a good business environment for development, by Index of Economic Freedom (Country Rankings, 2023) Lithuania is in a 17th place. By the data gathered from EUROSTAT by the end of 2021 there were more than 52 thousand ICS specialist employed in Lithuanian market (Statistics | Eurostat, n.d.). According to research of the Organization for Economic Co-operation and Development (OECD), Lithuania in International competitiveness index (Bunn, 2022) stands at 8-th place, which shows good competitiveness and neutrality of tax policy. Additionally, the quality of life index, of Lithuania is 21st from around the globe (Numbeo, 2022). Lithuania is 8-th among the lowest risk jurisdictions globally (Basel AML Index 2022, 2022). According to the report, Lithuanian now stands at a 1st place for being the largest FinTech Hub in the Europe by the number of issued license, that serves more than 25 European million customers by FinTech licensed Lithuania. In addition, Lithuania's capital Vilnius, among other mid-sized Europe cities, stands at a 2nd place for foreign direct investment. According the data from Fintech HUB LT, in report, the total amount of funds raised by local financial technology companies, grew to around 67.9 million €. In report from Invest Lithuania (2022) funds raised by local FinTech grew from more than 15.6 million €, to more than 65.6 million € as of the end of the 2021. That shows a significant growth of FinTech ecosystem in Lithuanian market.

2. FinTech Ecosystem Development in Theoretical Solutions

To successfully analyze the development of an ecosystem, there is a need to understand the concept of it. The analysis of the ecosystem will encompass more than just the business environment; it will also incorporate a broader perspective derived from a biological standpoint. The examination will involve an analysis of the functions and entities involved, leading to a more focused analysis of a specific group, namely the financial ecosystem, and one of its participants, FinTech. By scrutinizing financial technology, the primary groups within the ecosystem will be identified, which will lead to an examination of the key design elements of the ecosystem.

2.1. Ecosystem

Everything that surrounds us in a World is many different ecosystems. Some of them are biological and living organisms, whiles others are synthetic organisms without actual life. In addition, the scale is also very broad, from microscopic bio-organisms or mechanical organisms like microchips, to huge corporations and their ecosystem, animal ecosystems and even the universe itself is a big ecosystem. In an ecosystem, all components have interdependent relationships with one another, either direct or accidental. “Ecosystems are prototypical examples of complex adaptive systems, in which patterns at higher levels emerge from localized interactions and selection processes acting at lower levels.” (Levin, 1998a). Complex systems consist of multiple interdependent parts, which differ in their type, structure, and function in relation to the system. There are consistent patterns in both the organization and operation of ecosystems across different areas.

The term “ecosystem” firstly came from biology. The biological environment term according to the Cambridge University Dictionary (2023) is being defined as “all the living things in an area and the way they affect each other and the environment”. An ecosystem consists of two parts: biotic or organic part and abiotic, or inorganic part. An ecosystem comprises a biotic component, which consists of living organisms, and an abiotic component, which comprises non-living elements of the environment. These two parts are integrated to form a single functioning system (Ågren & Andersson, 2011). An ecosystem experiences ongoing movements of processes, including exchange with external environments. Nonetheless, for the concept of an ecosystem to have practical value, the internal exchanges should be more significant than those occurring across its borders.

2.2. Financial Ecosystem

These days, the term ecosystem is being used more frequently and now it has a more commercial definition “a group of businesses or business activities that affect each other and work well together” (Cambridge Dictionary, 2023). It is a broad term that encompasses a variety of institutions and intermediaries that provide financial services to businesses and individuals. These services include things like lending money, issuing, and trading securities, facilitating transactions, providing investment management and advice, and more. “The field of finance is a large and diverse ecosystem and the role of the financial sector in the broader economy and the environment can sometimes seem complex” (Bose et al., 2019, p. 1). According to authors Jacobides, Cennamo and Gaver (2018), academics have highlighted the distinct features of an ecosystem, depending on the focused group of study.

The financial sector ecosystem can be divided into several different subsectors, including:

- Banks: Commercial banks and other depository institutions take deposits from individuals and businesses and use those funds to make loans to borrowers.
- Insurance: Insurance companies provide risk management products to individuals and businesses, such as life insurance, property and casualty insurance, and health insurance.
- Investment: Investment banks and other financial firms provide a wide range of services, such as underwriting new securities, facilitating mergers and acquisitions, and providing advice and research to investors.
- Asset management: Asset management companies and other financial institutions help individuals and businesses invest their money in a variety of financial products, such as stocks, bonds, and mutual funds.
- Real estate: Real estate investment trusts (REITs) and other real estate-focused companies provide individuals and businesses with a way to invest in properties and mortgages.
- Other financial services: Other firms provide a wide range of financial services, such as payment processing, credit card services, wealth management, and more.

All these subsectors work together for the economy ecosystem functioning. For example, Banks lend money to a Business, then the business use the loan to invest or make a product, then the product is sold and generates revenue, after that the revenue is used to pay back the bank. All these interactions between these subsectors are very complex, dynamic and constantly changing with the economy and market conditions. To make these interactions easier to use and faster, financial services are being paired with technologies, which leads to an ecosystem of Financial Technologies – FinTech.

2.3. FinTech

For a past couple decades, the technological processes improved a lot and financial sector changed because of disruptive technologies and digitalization. As a result, a connection between technologies and finances was created. Over past couple years, Fintech startup grown from around 12 thousand in 2019 to more than 26 thousand in 2021, per year (Statista, 2023). Most of the time technologies comes into our daily life, and FinTech is not an exception. The term FinTech is getting more and more popular in business world. FinTech, is a worldwide used term, for describing the new technologies that are used to help, support or enable financial services. According to Schueffel's (2016) made scientific research, on definition of FinTech, he concludes, that the overall single definition of FinTech does not exist, because there is no agreement as to what it entails. Although it could be defined "<…> as a cross-disciplinary subject that combines Finance, Technology Management and Innovation Management." (K. Leong & Sung, 2018). In addition, Bettinger (1972), defined FinTech as the use of modern management techniques and computer technology to enhance the financial services industry. This involves combining the traditional expertise of banks with innovative technological advancements to create more efficient and effective financial systems.

Despite the rising popularity of FinTech nowadays, analysis of historical events, shown that the beginning Financial Technologies has originated in 19th century, when one of the first sights of advanced FinTech was used in 1860s, where innovation by Giovanni Caselli named pantelegrafo (pantelegraph) or telegrafo autografo (autograph telegraph) was introduced to copy a drawing or name and send electronical signal by wire to banks, for signature verification (Pelosi, 2010).

The connection between technologies and financial services has a history which already starts at the 19th century. This part of history is sometimes called FinTech 1.0, which starts in the late 19th century and lasted till the start of WW1. “During this period, technology such as the telegraph, railroads, canals and steamships underpinned financial interlinkages across borders, allowing rapid transmission of financial information, transactions and payments around the world” (Arner et al., 2015, p. 1). One of the first sights of advanced FinTech was used already in 1860s, where pantelegraph created by Giovanni Caselli, was used to verify signatures by banks. Later, “In 1950, Diners Club issued its first card, made of cardboard, for use in 27 restaurants in New York City.” (Stephey, 2009), that was the time, when first and widely used credit card was introduced: “Diners Club firs multipurpose charge card”. These events could be considered as a start of financial technologies era.

Later, with the start of FinTech 2.0, there was a beginning of ATM machines. “The first machines installed at a branch of Barclays Bank in Enfield, North London, and inaugurated on June 27, 1967. Sometimes referred to as a robot cashier, the machine was officially marketed as De La Rue Automatic Cash System (DACS).” (Konheim, 2016). That day, actor Reg Varney, made the first withdrawal of £10 (Barclays, n.d.). Since then, it was a time of development, of digital money, financing, trading, online home banking. This period was till the Global Financial Crisis in 2008. That was the start of FinTech 3.0. “This phase is the era of Automation, Specialization and Decentralization. Fintech 3.0 marks the beginning of dissemination of financial services which are not solely under the jurisdiction of Financial Institutions.” (Goel & Garg, 2019). The Global financial crisis in 2008, when lots of investments value dropped owned by various financial institutions, which was based on mortgage-backed securities, developed trust issues for many people of traditional banking system. Lots of people lost their jobs, and many of them were financial professionals, but that motivated them to change their mindset, which led to a new era of FinTech industry. In 2009 Bitcoin was released and later, another factor was smartphones with internet connection, which was a possibility to use various financial services like Apple Pay or Google wallet. “The banking industry is ripe for change with the rise of fintech startups, the growing popularity of blockchain technology, and the dominance of millennials. The industry is evolving and the ever-increasing need to prepare for cybersecurity threats remains top of mind, as banks continue evaluating new threats and potential fraud risks.” (Sorrentino, 2015). This is being followed even today, while on the other hand, some sources and authors exclude the FinTech 4.0 era, with an introduction of Blockchain technologies, NFTs, and open banks/neobanks, that are free to use or with a minimal fees. All these innovations creates a very big family and organism witch is called – FinTech ecosystem.

These days there a lot of different operation, which could be processed using FinTech and be used not only by individual persons, but also by legal persons:

- Payment;
- Digital lending;
- Insurance and health care technologies;
- Financial media and data solutions;
- eCommerce and marketing technologies;
- Investments and capital markets technologies;
- Human resource and payroll technologies;
- Others.

Fintech companies are focused on using technology to disrupt traditional financial services and create new, innovative products and services. Professor of Finance of Fribourg’s School of Management, Dr. Patrick Schueffel defined financial technologies as “a new financial industry that applies technology to improve financial activities" (Schueffel, 2016, p. 32). A key distinction between traditional financial institutions and FinTech is the utilization of innovative, advanced and digital technologies.

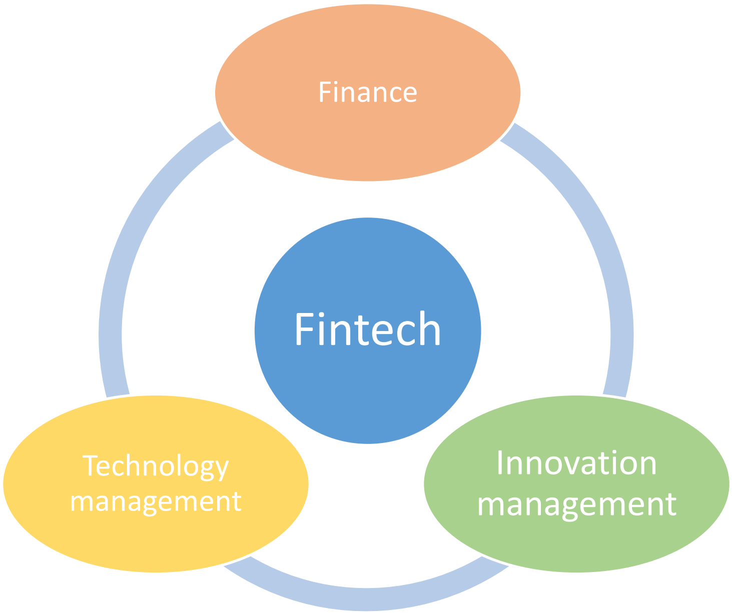

Fig. 7. FinTech as a cross-disciplinary subject. *Presented by author according to Leon & Sung (2018).*

Looking at an schematic example (Fig. 7.) of Leon & Sung (2018) definition, for a better understanding, an example of Bolt Technology OÜ can be presented. This company has a business part in Lithuania as a Bolt Services LT. They are using innovation management as an idea to provide not only transportation services like taxi or renting a scooter, but also food delivery process, by using technology management like mobile applications to improve taxi and food ordering financial services, with upfront payment, which will not change during the using time. As a result, using a definition of FinTech by Leon & Sung (2018), it could be contemplated as a FinTech service.

Table 2. Definition of FinTech term. *Presented by author.*

Author	**Definition**	**Main features**
Laidroo, Koroleva, Kliber, Upeika-Apoga, Grigaliuniene (2021)	"<…> start-ups or established companies with varying capabilities for either disrupting or contributing to the provision of traditional financial services."	• Varying capabilities • Disrupting or contributing
Hill (2012)	„The word itself is a concatenation of "finance" and "technology"." „But "Fintech" has a more specialized meaning which focuses on 21st century developments utilizing new technology innovations which are more often than not disruptive challengers to	• New technology innovations • Not disruptive challenges • Addressing the needs of consumers and businesses investors and regulator

Author	Definition	Main features
	the Big Financial Institutions. These new applications and financial services cover a wide field addressing the needs of both consumers and businesses, investors, and regulators.“	
Oxford Advanced Learner‘s Dictationary	“Computer programs and other technology used to provide banking and financial services”	• Computer programs • Other technologies • Provide banking • Provide financial services
Leong, Sung (2018)	"a cross-disciplinary subject that combines Finance, Technology Management and Innovation Management." “any innovative ideas that improve financial service processes by proposing technology solutions according to different business situations, while the ideas could also lead to new business models or even new businesses”	• Cross-disciplinary subject • Innovative idea that improves financial service process • Proposing technology solution
Arner, Barberis, Buckley (2015)	““FinTech”, a contraction of “Financial technology”, refers to technology enabled financial solutions. It is often seen today as the new marriage of financial services and information technology.	• Technology enabled financial solutions • New marriage of financial services and informational technology
Festa, Elbahri, Cuomo, Ossorio, Rossi (2021)	“FinTech is a combination of innovative technological platforms and new business models that facilitate everyday financial services.”	• Innovative technological platforms • New business models • Facilitate everyday financial services

2.4. FinTech Ecosystem

To clarify the understanding of a financial technologies, it is necessary to understand and analyze its ecosystem. In order to do that, the connection between different structures has to be known.

Traditional financial institutions, such as banks and credit card companies, may also be involved in the fintech ecosystem, either by partnering with fintech firms or by developing their own fintech products and services. Venture capital firms play a key role in the fintech ecosystem by providing funding to fintech startups. Service providers, such as cloud computing companies or payment processors, may also be involved in the ecosystem by providing the infrastructure and support that fintech firms need to operate. Regulatory bodies, such as central banks and financial regulatory agencies, play a crucial role in the fintech ecosystem by establishing the rules and guidelines that fintech firms must follow. Overall, the fintech ecosystem is a complex and constantly evolving network of players who are working together to shape the future of financial technology. But there is a need for persistent engagement among three crucial parts: governments, financial institutions, and entrepreneurs. The difficulty lies in creating and nurturing a FinTech ecosystem, as it cannot function properly unless each constituent comprehends its role and the benefits it stands to gain from participating in the ecosystem.

The fintech ecosystem refers to entrepreneurs, governments and financial institutions (Diemers et al., 2015) involved in the development and delivery of financial technology services and products. But despite the three main parts of this ecosystem, it is possible to see, that there are additional, but crucial parts, which are presented in fig. 8 and mentioned by Lee and Shin (2018):

- Fintech startup
- Technology developers
- Government
- Financial customers
- Traditional financing institutions

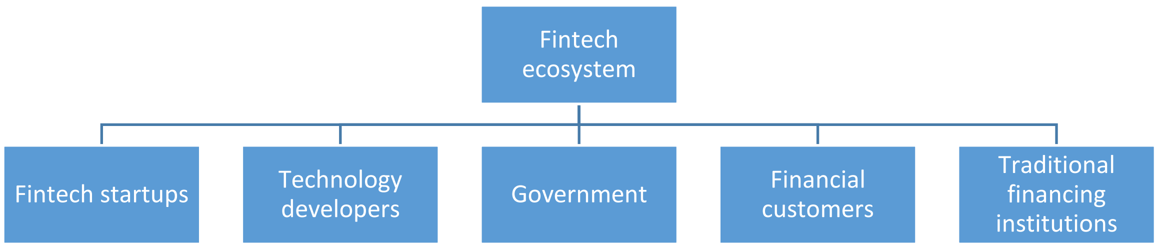

Fig. 8. Five elements of FinTech ecosystem. *Presented by author according to Lee and Shin* (2018)

To better understand each element of the ecosystem, there is a need to recognize the key roles of each participant.

FinTech startups are innovative companies that use technology to provide financial products or services. They operate in various areas, including payments, lending, and personal finance management. Fintech startups often focus on using technology to make financial services more efficient and accessible, and they may use data and algorithms to deliver personalized and automated services. "Fintech startups are called disruptors because they bring forward disruptive innovation, which creates a phenomenon called 'Digital Disruption'." (Siek & Sutanto, 2019).

Technology developers are FinTech technology developers are individuals or even teams, that are responsible for developing and creating technology solutions for the financial sector. These solutions may include software, applications, platforms, and other technologies that are used to deliver financial products or services in a more efficient, convenient, and secure way. Fintech technology developers may work for a financial institution, a fintech startup, or a technology company that specializes in financial technology. They could potentially participate in every stage of the development cycle, ranging from conceptualization and design to coding, testing, and eventual deployment. “Technology developers create a favorable environment for fintech startups to launch innovative services rapidly.” (Lee & Shin, 2018)

Governments should organize and apply various laws and policies with regulations that will help the FinTech ecosystem with the development process. Governments may also help the fintech ecosystem by providing funds and resources for R&D. Furthermore, governments may play an important role in promoting consumer protection and financial inclusion, especially among underbanked or unbanked groups. They should guarantee that the FinTech ecosystem complies with rules and regulations in order to protect customers’ interests and avoid illegal activities. This would foster new business arrangements and job opportunities in the financial and technology sectors, which will contribute to the overall competitiveness of the country.

Financial customers are individuals or groups that make use of financial services such as banking and investments are known as financial customers. In the context of the startup ecosystem, it may refer to those who use financial services provided by new companies or startups in the FinTech industry. These may include people who use mobile banking applications, organizations utilizing digital payment methods, or investors participating in crowdfunding initiatives. “Nowadays, customers in the financial sector demand intelligent, however easy-to-use financial services independent of location and time, and at continually decreasing costs.” (Gomber et al., 2017)

Traditional financing institutions by contributing market information and experience, global and local banks, private equity companies, and venture capital funds may play an important role in the ecosystem. Furthermore, by developing relationships with FinTech firms, these financial institutions may promote innovation. These collaborations can provide financial institutions with a competitive advantage by allowing them to swiftly bring innovative goods and services to the market.

Table 3. Definition of FinTech ecosystem term. *Presented by author.*

Author	**Definition**	**Main features**
Building FinTech Ecosystems: Emerging Trends & Policy Implications OXEPR 2019	“Fintech ecosystems are complex networks of interacting FinTech start-ups and scale-ups, financial institutions, regulators, governments, investors, and talent institutions who share an interest in advancing the financial services industry through technological innovation.”	• Complex networks • Financial services industry through technological innovation
Lee & Shin (2018)	“A stable symbiotic fintech ecosystem is instrumental in the growth of the fintech industry.” “<…>symbiotically contribute to the innovation, stimulate economy, facilitate collaboration and competition in the financial industry, and ultimately	• Is instrumental in the growth of the FinTech. • Contributes to the innovation • Facilitate collaboration and competition

Author	Definition	Main features
	benefit consumers in the financial industry.”	
Palmie, Wincent, Parida, Caglar (2020)	“<…>ecosystems around a disruptive innovation emerge and affect established industries.” “<…> an ecosystem as a multicompany system tends to be more resource rich than a lone firm. <...> ecosystem could present incumbents with more favorable conditions to join the ecosystem than when the disruptor is an isolated company“	• Around a disruptive innovation emerges and affects industries • Multicompany system

After analyzing the ecosystem’s participants and crucial need of connection between different them, maturity of FinTech ecosystem could be broadly categorized into four stages:

Emerging, at this stage, the fintech industry is just beginning to emerge, and there are only a handful of startups attempting to establish themselves in the market. Fintech companies in this early stage are likely to focus on product development and brand establishment, while facing challenges such as uncertain regulatory environments, insufficient funding, and inadequate infrastructure

Developing stage, when the fintech industry is beginning to grow, as more startups are entering the market and investors are starting to take an interest. Regulatory frameworks are becoming more established, and fintech companies are starting to form partnerships with traditional financial institutions. Companies in this stage are likely to focus on scaling their operations and expanding their customer base to capitalize on the increasing demand for fintech products and services.

Mature, the ecosystem has reached a mature stage, with numerous successful companies operating in the market. Regulatory frameworks are well-established, and it is common for fintech companies to form partnerships with traditional financial institutions. At this stage, companies may be more focused on optimizing their operations and expanding their product offerings to meet the evolving needs of their customers and stay competitive in the market.

Consolidated, when ecosystem reached a stage where it is fully integrated into the traditional financial system. Fintech companies have become dominant players in the market, and traditional financial institutions have either adapted to this new reality or have been displaced. Companies at this stage are likely to focus on maintaining their market position and continuing to innovate to stay ahead of the competition, as the demand for fintech products and services continues to grow.

2.5. FinTech Ecosystem Development

Developing a FinTech ecosystem is a challenging task, as it requires a high degree of ongoing collaboration among governments, financial institutions, and entrepreneurs (Diemers et al., 2015).

Within literature, four crucial design components are identified that facilitate the formation and growth of a financial technology ecosystem. Authors Diemers, Lamaa, Salamat and Steffens (2015) exclude them as a: Business environment/access to market; Government/regulatory support; Access to capital; Financial expertise (Fig. 9) .

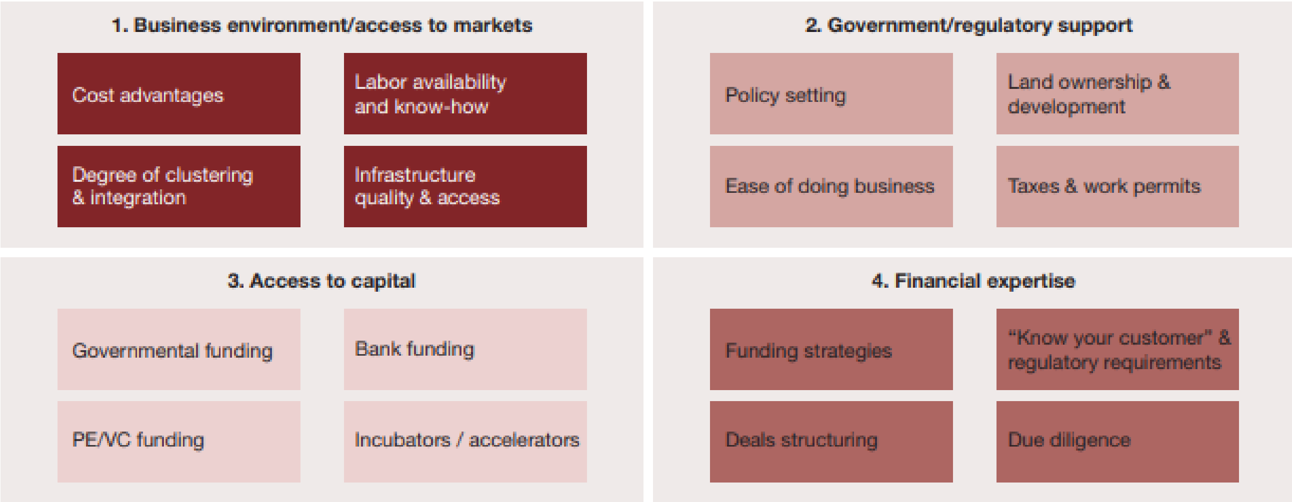

Fig. 9. FinTech ecosystem development framework *(Diemers et al., 2015)*

In order for successful, developing process, all these environment participants have to cooperate and work together for good future results. Every part of the system plays a crucial role, at implementation and development stage. Diemers, Lamaa, Salamat, Steffens (2015) presented how important it is for participants to cooperate and what is the development framework of FinTech ecosystem.

Business environment/access to markets – there should be advantages not only for the companies, but also to the environment that they are working in. As a result of creating a financial advantage for a country or region. In addition, participants of an ecosystem should provide utilities that are available and if monetized – affordable. Create technology hubs, where availability of professionals is being presented, present needed infrastructure including utilities, ecosystem, and connections.

This can be accomplished by ensuring that essential resources and physical infrastructure such as utilities, equipment, land, roads, and real estate facilities are readily available and affordable for entrepreneurs. Additionally, it is important to establish hubs or centers where entrepreneurs can receive assistance with integrating their businesses and collaborating with others to achieve shared goals. Furthermore, it is crucial for these technology clusters or hubs to offer easy access to a diverse range of knowledge and labor resources, including IT developers, analysts, and management professionals. This will ensure that the ecosystem is well-equipped to support the growth and development of FinTech companies.

Government/regulatory support – could possibly influence a lot by adapting custom taxes and fees that are especially lower for FinTech ecosystem participants. Creating an environment, with a possibility of ease for doing business by creating policy settings and regulations, provides help with funding, investments, and promotions. Share information between parts of an ecosystem. Invest in infrastructure, help with handling the real estate or service management responsibilities and structure.

Access to capital – fundings could be provided not only from the incubators or accelerators, but also from the governments. Governments could possibly provide financial support not only for FinTech companies, but also to various funds, incubators, and banks to encourage investments into startups. There should be a possibility for individuals to invest in entrepreneurs through crowdfunding, following with a possibility for later partnerships and collaborations.

In the FinTech ecosystem, access to capital is primarily sourced from four main areas: Governmental and bank fundings, Incubators and (or) accelerators and PE/VC fundings. Incubators provide investments and grants. "Governments may fund the construction of the FinTech hub, by providing seed funds, interest-free grants, or even through provision of subsidized office and co-working spaces." (Diemers et al., 2015). In addition, governments may encourage with funds the growth of ecosystem. While Venture Capital (VC) funds help with involvement for beginning and acceleration, offering partnerships, networking opportunities, help with developing and implementation into the market.

Financial expertise – An ecosystem should be provided with advisory services and financial expertise, especially to entrepreneurs at early stages of development. To navigate through the laws and regulatory landscape. Provide with all the necessary counseling and promote changes in regulation. As a result of supporting the entrepreneurs of an ecosystem and increasing attractiveness.

Offering consulting services, developing, and implementing financial products, training, education and investments. Financial expertise could help with creating strategies and deal structures. They could help with ensuring that the solutions are secure with regulations.

Author Anagnostopoulos (2018), reviewed the effect of FinTech development against the broader environments and presented, what dimensions and how they influence the expansion. Author excluded 9 dimensions, that affect the growth of Financial Technology:

Demographics, high national internet and mobile penetration – it is stated that Generation Z will operate in the world of remote connectivity. Emerging technologies and usage of the internet influenced people to adapt by also emerging companies to change their strategies, innovate them. That will result in better clarity, speed, connectivity, reach, and assistance, whenever there is a need at any possible time.

Shifting expectations – with the change of industry, with introduction of new or updated technologies and various technological solutions, customer's behaviors change. Expectations are raising and awareness of relationship creation, individual adaptation is showing that customers want flawless and robust, on-time, personalized material. By the Global FinTech Report from PricewaterhouseCoopers (2019), Global Financial Services Advisory Leader at PwC US Julien Courbe mentioned, that "Customers need quick, convenient and personalised service. Fintech can help to offer such service.". So focus into final client is becoming one of the main priorities.

Re-inventing business models **–** shifting customer's expectations, forces companies to change their strategies and start focusing more into the client, making it "<…> at the heart of the operations." (Anagnostopoulos, 2018).

Cost-efficiency – freshly baked FinTech companies are almost free of regulations. Companies operating expenses are a lot lower than traditional Financial institutions. As a result of possibility, to present environment with lower price per product or service.

Niche concentration – FinTech companies has an possibility to work an expand in very focused on one specific operation that they present to customers, like: payments, investments, lending, etc. As a result, companies could take into consideration the shifting customers expectations and focus on improving very narrow market segment, by presenting personalized offers, customized deals, lower costs and other advantages.

Cyber safety – it is a very relevant term used, especially nowadays, when a lots of processes are being handled with a use of modern technologies and internet. It is important driving dimensions, because the issue of privacy and security having high attention. Save transactions, save payments, personal data privacy.

The financial crisis and regulations-enabled growth – as mentioned in various other literature (Diemers et al., 2015; Leong & Sung, 2018; Mohamed & Ali, 2018 and others) after the financial crisis in 2008, Financial Technology ecosystem draw a lot of attention, which created the effect of growth In FinTech solutions and other open banking possibilities. The distrust and lack of confidence, of traditional financial institutions, led customers wanting to manage their investments, saving and other financial businesses by themselves.

Diversification and funds disintermediation – this allows for a variety of different players and business models to coexist and compete in the market. This diversification can lead to increased innovation and more options for consumers. The disintermediation of funds, which refers to the process of cutting out intermediaries or traditional financial institutions from financial transactions. This can be achieved through the use of technology such as blockchain, which enables peer-to-peer transactions and reduces the need for intermediaries. After article analysis of Nowiński & Kozma (2017), it is possible to say, that the disintermediation can lead to lower costs, increased efficiency, and more control for consumers and businesses. However, diversification and disintermediation also bring challenges, such as regulatory barriers, security and privacy issues, and the need for a skilled workforce.

Regulations as a source of disruption – regulations, depending on the country that an ecosystem is being implemented, can foster innovations or be a source of disruption.

2.6. Ecosystem Perspectives

It is important to note, that Lithuania has been one of the leaders in field of technology development an innovation. According to Invest Lithuania, this country has one of a largest, licensed companies FinTech Hub in the European Union. Lithuania is well infrastructure country with FinTech friendly regulations, presenting a ease of doing business. The momentum of FinTech hub growth was in 2016, when national Bank of Lithuania presented and Fintech Strategy, to accelerate and promote the growth of an ecosystem. The collaboration between the government and central bank has had a positive effect. Lithuania’s global reputation of FinTech has been attracting a lot of expertise. The main competence of FinTech hub in Lithuania is payments, more than 31% of companies presenting possibilities of technologically advanced payments. According to State Tax Inspectorate data, presented by Invest Lithuania (Fig. 10) there was a very big growth in 2018-th year in revenue generate by FinTechs, in Lithuania. Later, there was a stable but pretty impressive increase, which shows that the ecosystem is growing, and Lithuania is suitable for its development. Lithuania has a supportive ecosystem with co-working spaces, hubs, other supportive ecosystem companies, business-friendly governmental institutions, and local investors. In addition, The Bank of Lithuania operates CENTROlink, a payment system that serves as a gateway to the Single Euro Payments Area. This infrastructure provides technical access to SEPA for various payment service providers, including banks, specialized banks, credit unions, and electronic money or payment institutions licensed within the European Economic Area (EEA). It which allows customers to make cashless euro payments in EU and not European Union countries, also, country is able to present a fast license issuing in the EU and issue startup visa, for other companies, to access a market while migrating with various benefits.

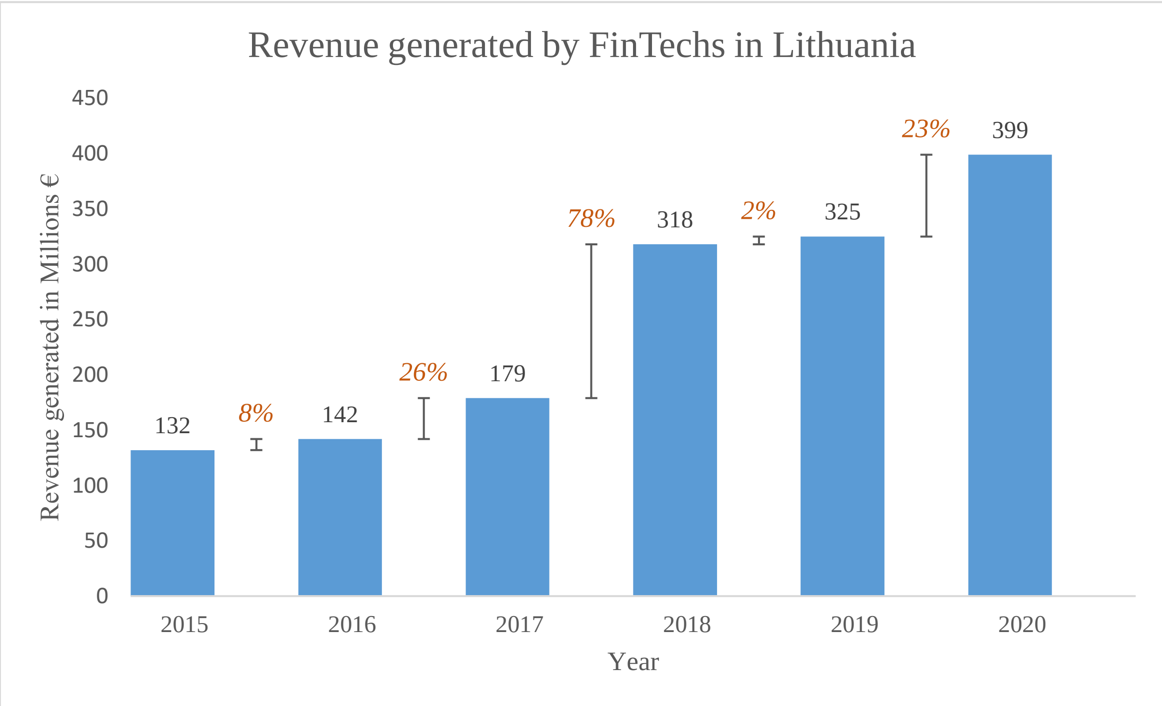

Fig. 10. Revenue generated by FinTechs in Lithuania. *Presented by author with data from "The Fintech Landscape in Lithuania 2022-2023" (2023).*

Most types of clients serviced are Small and Medium-Size Enterprises. In Lithuania, to get a license of a financial institution which works with payments, insurance, electronic money is only 6 to 9 months because of progressive and effective regulations. To get a Crowdfunding Platform Operator license, about 3 months. The government presents a Newcomer Programme, that makes the new entries easier, additionally companies can test their product under supervision and guidance in regulatory sandbox.

After gathering and analyzing proposals from market participants and institutions, the Ministry of Finance in Lithuania collaborated with an expert group to create the first set of guidelines for the development of Lithuania's fintech sector from 2023-2028. These guidelines outline 5 key directions aimed at reinforcing Lithuania's position as a top tier fintech hub in Europe. According to vice minister of finances Vaida Markevičienė, the objective of these guidelines is to ensure Lithuania's continued dominance in the highly competitive international fintech sector, while also bolstering the regional center's standing. The Ministry of Finance has established an ambitious plan for fintech development over the next five years, with a focus on creating a conducive environment for high-quality growth in the sector, attracting investments, and fostering innovation. Consequently, these initiatives are expected to result in greater value generation for both the Lithuanian economy and financial system.

According to the analysis of Iranian market, author mentions, that: “Most of the Iranian financial institutions and banks spotted FinTech as the way of the future.” (Mirzaei, 2022). This is a very good perspective from regulatory environment, coupled with changing behavior of banking customers, which result the support and trustiness, because of better possibilities for developing the FinTech ecosystem and motivating to adopt open banking. Firstly, banks in Iran started their own digital solutions in response to FinTech companies, but later on they started to collaborate with each other as a result of more and more private and governmental banks offering various digital services through FinTech companies.

According to Chen (2016) analysis of China in perspective of FinTech ecosystem development, certain nations rely significantly on traditional banking rather than direct funding via capital markets. While financial institutions often prioritize profit-seeking, their lasting success hinges on the extent to which their services meet practical, everyday requirements. The primary competencies of most financial institutions should be the ability to effectively reach customers and the capacity to evaluate and manage risks. In the current era of digitalization, big data technologies associated with machine learning have made the collection and analysis of data more efficient. This creates an opportunity to identify customers, identify their needs, and offer financial services whenever and wherever required. Moreover, there is a growing demand for delivering cost-effective and high-quality financial services to individuals who lack access to formal banking or other financial institutions. These services may vary from borrowing and savings to insurance, payments, money transfers, and more. Inclusive finance is now globally crucial, as it empowers individuals who were previously underserved to attain economic self-sufficiency, reduces income inequality, and fosters employment opportunities. As a result, inclusive finance has significant positive impacts on both society and the economy. According to author, by presenting various cases, Chen presents that FinTech has the perspectives and can grow very fast by meeting practical, everyday requirements. In the realm of FinTech firms, the crucial factor is the ability to envision financial innovations. Merely highlighting the benefits of technology is inadequate; it's essential to utilize technology to meet practical, everyday requirements in the market.

2.7. Ecosystem Challenges

Although there is not much literature about Lithuanian FinTech ecosystem development challenges, other authors present, that the developing FinTech ecosystem could be a challenging mission, because it requires a lot of cooperation between different part like financial institutions, investors, stakeholders, governments and regulators. Authors Lee & Shin (2018) identified six technical and managerial challenges for developing a “fintech startups and traditional financial institutions: investment management, customer management, regulation, technology integration, security and privacy, and risk management.”

Mirzaei (2022) mentions that in order to comprehend the interactions of competition and cooperation within the FinTech industry, it is necessary to examine the ecosystem beforehand. While analyzing the development of FinTech ecosystem (Diemers et al., 2015) presented, that the key participants are:

government, entrepreneurs and financial institutions, with additional elements mentioned by author are: incubators, angel investors, accelerators and FinTech startups. “These elements contribute to the innovation, stimulate the economy and facilitate the collaboration in the financial industry” (Mirzaei, 2022). One of the triggers that the authors mention, which led to the creation of challenges, was the high unemployment rate among young people and the reduced ability of the public sector to accommodate a fresh workforce. Other triggers that created challenges were insufficiencies in rules and regulations for the market, infrastructural gaps, and inadequate funding.

Lee and Shin (2018) suggest that FinTech innovation has the potential to significantly impact and revolutionize the financial industry, but the FinTech ecosystem encounters several challenges. These challenges include managing investments, handling customers, complying with regulations, integrating technology, ensuring security and privacy, and managing risks. Managing investments is a significant obstacle for FinTech, who require considerable funding to develop and launch their products or services. However, attracting investors who are willing to take risks on untested business models can be difficult. In addition, customer management presents a challenge for FinTech firms as they must offer services that are valuable and create a positive customer experience to foster customer loyalty in a competitive market. Regulatory compliance is also important for FinTech companies as they operate in a highly regulated industry. They must comply with various laws and regulations, be aware of potential. Integrating technology is another challenge for FinTech firms, as they must ensure that their technology can interoperate with existing financial systems and infrastructure while maintaining high levels of security and data privacy, banks need to partnership and cooperate. In addition, FinTech companies handle sensitive financial and personal data, which raises significant security and privacy concerns. Therefore, it is vital for them to implement robust security measures to protect against cyber threats and ensure data privacy. FinTech companies must engage in effective risk management to navigate the uncertain and constantly evolving financial landscape. Identifying and managing market or operational risks is crucial.

According to Chen (2016) , typically perspective customers lack sufficient savings or tangible assets that can be utilized as collateral. They also frequently lack appropriate property titles, permanent addresses, pay stubs, prior finance history, and other essential documentation required for risk assessment. These obstacles pose significant challenges for conventional financial institutions. In addition, one of the challenges that triggers the FinTech ecosystem development is the regulations and government policies. It is necessary to find a regulatory balance in FinTech that provides the required flexibility while safeguarding consumer interests. The author’s idea is that the critical importance is to find a balance between supportive flexibility and consumer protection in FinTech regulation. If regulations focus solely on the existing financial system and consumer protection without incorporating supportive flexibility, the growth of FinTech may be sluggish despite the rapid development of technology. However, there are a lot of other triggers, that creates various challenges for FinTech companies in financial market, because it is being influenced by political, economic, and financial circumstances, along with the customs and behaviors of financial consumers.

Author states, that for rapid FinTech development, China benefited from two key factors: the advantage of being a latecomer and crucial growth of technology, finance, and practical demand. In comparison with United States, the gap in financial services that required fulfillment is much bigger in China. As one of the breakthroughs, when triggering challenges were turned into perspectives, was the start of Alibaba, C2C shopping platform Taobao. At the beginning, because of buyers and sellers not seeing each other in person created a lot of trust issues. During that period, Chinese banks were hesitant to offer payment services for e-commerce as the low-value, high-frequency nature of the transactions did not align with the business models they followed, this resulted in the creation of Alipay. The demand for low amounts frequent transactions was the driving force, which led to the emergence of technological innovations in payment systems. Another trigger that became a challenge was security problems, because of the tales that evoke fear about losses, caused by hijackers or phone thefts. While on the other hand, China in banking industry overall security is in top rankings in the world. Technological efficiency, cost efficiency and broad coverage of mobile users, led to perspectives created for FinTech ecosystem to develop like in the case presented by the author with Alipay.

Government must create a suitable environment for FinTech ecosystem, that the environment promotes the innovations. They need to have a clear and consistent approach towards the fintech ecosystem development, collaborate with other stakeholders and keep up with the fast-moving technology. They also need to be willing to adapt to the changing needs of the fintech ecosystem and be open to feedback and suggestions from the industry. In order to get a better result, governments should help. There should be a strong and perspective supply of professional and expertise in various departments like IT developers, ICT specialist, risk management and compliance specialist. In addition, the overall economy and salaries for the workers should be at a high rate. The target client market should have perspectives. To create a supply of FinTech ecosystem, there should be a demand for it. It is crucial that the country should have the possible client market, or the regulations of governments and financial institutions allow the possibility to entry other markets, despite the fact of developing an ecosystem locally.

2.8. FinTech Ecosystem Development Model

According to analyzed presented in literature about FinTech participants, their need of collaboration and importance in FinTech ecosystem, theoretical model was created to present the influencing crucial design parts and participants of ecosystem's development.

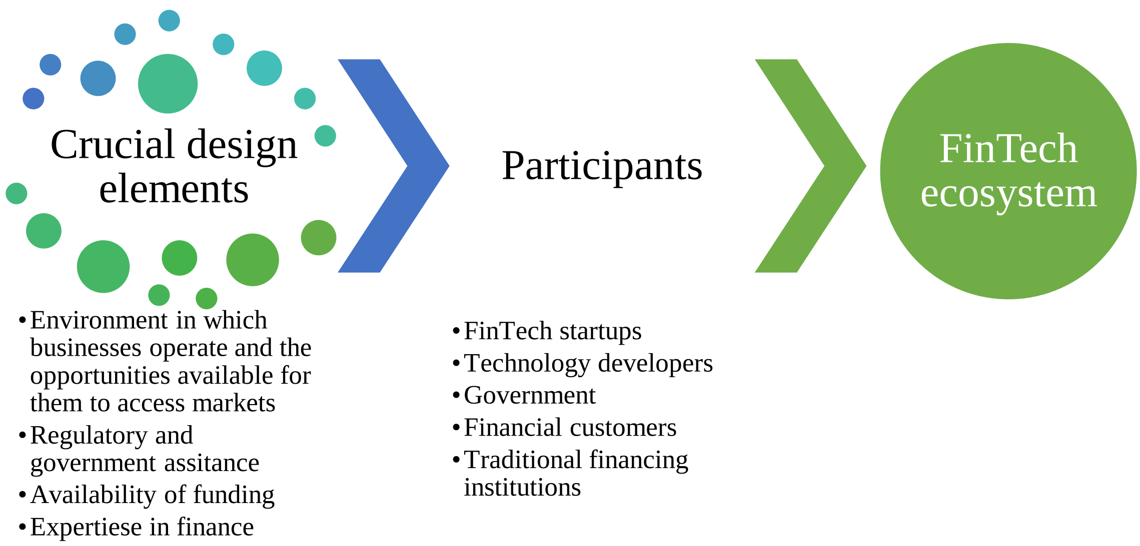

Fig. 11. Theoretical model of FinTech ecosystem development. *Presented by author.*

3. Research Methodology

Aim of the research: To analyze the development process in Lithuanian FinTech ecosystem, identify challenges and perspectives that are being faced.

Empirical research goal:
1. analyze, the current Lithuanian FinTech ecosystem development;
2. analyze and reveal the challenges and perspectives of Lithuanian FinTech ecosystem development;
3. present recommendations for a better development process of the Lithuanian FinTech ecosystem.

Research methods and tools: Because the research is based on qualitative approach, the method which will be used for data gathering – semi-structured interviews, which will be held, in order to gather date from as various ecosystem participants and their experiences. Qualitative social research commonly uses interviews as a method for collecting data. Interviews are well-suited for the assumptions of qualitative methodology, as they provide a means to deeply understand the perspectives of participants, gather rich details about social life, and capture unique nuances of data (Gaižauskaitė, 2016). It is expected that the interviews will be conducted by face-to-face conversations with audio recording technology used, but it is a possibility of online meeting applications to be used with audio/video recording. To ensure trustworthiness, collected data will be checked by analyzing all the accessible and additional data online. The qualitative research is going to be an interview of Lithuania's FinTech ecosystem participants, that are willing to share their success or failure stories with additional factors that influenced one or another result. The qualitative interview will be performed for various ecosystem participants from different sectors of ecosystem. All the interviews will be completed regarding research ethics and recorded for later on analysis if permissions will be given. After analysis, interviews are transcribed, and text used for data analysis. For the analysis, text coding program MAXQDA is being used, to create code system for analysis according to scientific literature. At the end of analysis, results are being presented.

Ethic of the research: Research will be done according to ethical discretion, data protection, norms, confidentiality and arrangement policies. If possible, to create a comfortable and secure space for interviews with FinTech ecosystem participants, the most suitable environment for both sides will be chosen. The respondents will be presented and introduced to research purposes, description, and questionnaire before the interview. Informants will be presented, the interview will be recorded, information will not be presented to the public, and only be used in analysis. Data will be collected by personal interviews. All the outcome of the interview will be held and used according to the latest DPP. Informants that presented data will be coded into alphabetic order A-F.

The research units for this article are: When preparing for survey research, it is crucial to make a sensible determination about the appropriate number of respondents to be included in the survey and the methods for selecting and engaging them in the study. Determining the size of the sample, a balance is sought between the quantity of the sample, the quality of the data collected, and the resources available for the study (Gaižauskaitė, 2014). If the research includes a strong interview dialogue and a longitudinal in-depth exploration of narratives or discourse details, then the study can be conducted with the least number of participants, as long as the combination of participants is highly specific for the study (Malterud et al., 2016). Nielsen and Sova (2013) recommendation is to plan for five users but anticipate four to participate. Adding more users beyond the planned amount would be a waste, as testing the same user interface repeatedly with additional users will not yield much new information. The authors argue that a sample size of less than five participants can be sufficient to develop a theory that uncovers 80% of the issues related to the empirical object.

The study will follow Nielsen's and Sova's sampling methodology, either determining a minimum sample size or continuing with the sampling process until data saturation is achieved. For the analysis FinTech ecosystem in Lithuania participants, will be interviewed, by representing their institution or company, influence that they do to ecosystem, and challenges coupled with perspectives, that could be identified from their point of view.

Observations units: FinTech ecosystem participants in Lithuania.

Data source used: Data gathered from interviews.

Questions:

1. How would you describe the activities of your institution? What impact does the activity of your institution/association have on the financial technology ecosystem in Lithuania?
2. At what stage of development is the Lithuanian FinTech ecosystem currently in? What is your opinion on the Lithuanian FinTech ecosystem and its development?
3. What market conditions are necessary for the successful formation of a financial technology ecosystem? In your opinion, what has the greatest impact on the development process of the FinTech ecosystem? What presents the most challenges and negatively affects the development of the ecosystem?
4. What is your opinion on the existing laws, regulations, conditions, and regulatory measures that shape the FinTech ecosystem in Lithuania? Do they hinder or help its development? How do EU regulations influence the development of the ecosystem, and how does the Lithuanian FinTech ecosystem compare to those of other countries in a broader context?
5. In your opinion, which participants in the FinTech ecosystem have the greatest influence on its establishment and development in Lithuania: FinTech startups, technology developers, government agencies, financial service consumers, or traditional financial institutions? And why?
6. What are the weaknesses in the Lithuanian FinTech ecosystem that, in your opinion, require more attention to address and improve existing gaps? What, in your opinion, needs to be improved in the current Lithuanian FinTech ecosystem?
7. What are the strengths of the Lithuanian FinTech ecosystem that help it develop and grow successfully? What prospects do you see for the Lithuanian FinTech ecosystem, and what can we expect in the future?
8. How do you evaluate the education system in Lithuania? Is enough attention being given to education about financial technologies?

4. Empirical Research Results Analysis

First, the data for empirical research was collected and analyzed in order to be organized and clarified, to ensure its completeness and validity. This involved sorting and purifying the data to eliminate any inconsistencies and avoid possible errors in later analysis. Second, considering the responses provided by the informants, to analyze them in a proper manner a system of codes and sub-codes was used for various aspects that were being analyzed. This allowed to better summarize and interpret gathered qualitative data. To provide additional context and insights, analysis was done based on the insights of various authors (Diemers, Lamaa, Salamat, Steffens (2015); Leong, Sung, Tan, Xiao, Tan, Sun (2017; 2018)). These authors had analyzed the FinTech ecosystem, and their insights helped to create a coded system for analysis of the data. To ensure the validity and trustworthiness of results, the analysis includes informant quotes in the results tables.

4.1. Lithuanian FinTech Ecosystem Participants

For better understanding, table 4 contains short, but detailed information on the Lithuanian FinTech ecosystem participants that actively participated in the research. The goal of this table is to clearly identify each participant while also providing a better understanding of their contribution to the growth of the Lithuanian FinTech ecosystem.

To achieve this, the table introduces each participant with their institutional name, along with the part of the ecosystem that they represent. Furthermore, a short description of each institution’s aim is also included, highlighting their role in the ecosystem. Each participant's involvement in the development of the Lithuanian FinTech ecosystem is highlighted in their own words to offer a more authentic portrayal of their impact. By providing this detailed information, the table offers valuable insights into the Lithuanian FinTech ecosystem, enabling readers to understand the key players and their contributions. It provides a comprehensive view of the ecosystem, which is essential for developing a deeper understanding of the ecosystem's current state and identifying areas for improvement.

Table 4. Characteristics of research participants. *Presented by author.*

Representing institution of informant.	**Representing ecosystem part**	**Aim of institution**	**Influence for Lithuanian Fintech Ecosystem development**
Association “FINTECH Hub LT”	Support services	The aim is to bring together and provide backing to licensed Fintech companies in Lithuania, advance their interests, establish conducive environments for their activities, expansion, and progress, endorse superior risk management and compliance norms.	Showcase Lithuania as a leading Fintech center worldwide. “<...> unites the majority of licensed FinTech companies in Lithuania, representing their needs by communicating with various institutions and promoting sharing, and learning between them. <…> promote changes in the laws." Providing fintech companies with knowledge and trainings, “<…> raise maturity and educational knowledge.”; “<…> we face problems and communicate with regulators <…>”, Bank of

Representing institution of informant.	**Representing ecosystem part**	**Aim of institution**	**Influence for Lithuanian Fintech Ecosystem development**
			Lithuania and other institutions.
Association “INFOBALT”	Support services	The aim is to utilize digital technologies as the primary catalyst for enhancing social well-being and promoting economic development. With a vision, to serve as a comprehensive platform for policy-making, fostering dialogue, building networks, and facilitating sales and trading activities.	INFOBALT's primary objective is to support the growth of the DigiTech industry and assist companies in the sector to achieve success. “<…> participate in the development of the country's FinTech strategies and guidelines, and communicate with the Bank of Lithuania. <…> selling Lithuania <…> attract new companies, new cultures, their business cultures with new technologies.”
Bank of Lithuania	Regulations, regulatory support, supervision	The aim is to generate advantages for society by pursuing the establishment of a dependable financial system and promoting sustainable economic growth. Increase Lithuania’s financial sector competitiveness in perspective of other countries. To increase the maturity of financial sector, strengthen the economic and financial literacy of society.	License issuing, supervision, collaboration with other institutions toward better ecosystem development. “We are the institution that not only issues licenses to new companies and participants in the financial market but also supervises them. <…> actively participate in various FinTech communities and also collaborate actively with other institutions to create that common value. <…> improving and streamlining processes internally to promote maturity of financial market participants.”
UAB “Bccs global”	Cluster	The aim is to spearhead the advancement of information technology in Lithuania by providing a comprehensive experience that facilitates the exchange of ideas and knowledge among industry professionals, unlocks new opportunities, and share competency with the world.	FinTech and Web3 innovation hub and enabler. “We create innovative, custom solutions for the Fintech and web3 industries. <…> provide services in technological areas such as programming, blockchain, cybersecurity, information security, and compliance.”

Representing institution of informant.	Representing ecosystem part	Aim of institution	Influence for Lithuanian Fintech Ecosystem development
UAB “Ondato”	FinTech company	The aim is to transform compliance into a valuable business asset, while simultaneously ensuring that services delivered in cyberspace are secure, with a possibility to avoid any fraudulent activities, scams or money laundering. Working with know your client procedures.	To ensure correct collection, management, and updating of customer information or data about customers. “We assist financial companies with everything related to the “know your customer” procedure. We enable remote customer onboarding in every possible way, so that they can do it in any jurisdiction. Another thing we ensure is that they comply with regulatory requirements.”
Ministry of Finance of the Republic of Lithuania	Policy setting	The Ministry of Finance is a policy maker. It shapes state policy in various areas assigned to the Minister of Finance. The Ministry of Finance proposes legislation that defines how financial institutions should operate. It participates in European law, where negotiations on European Union legislation take place.	“We are preparing legal acts, drafts of legal acts that are later approved by the Government, as we are a part of the government. Through legal acts, we define FinTech activities, what can and cannot be done, what requirements they must meet, and so on. We occupy a coordinating role. We participate in negotiations on European Union legal acts, where the representatives of the Ministry of Finance are official representatives in the Council working groups and represent Lithuania's position there”

The descriptions of the research participants suggest that they play a vital role in the development of the FinTech ecosystem. It is noteworthy that all participants are actively engaged in the ecosystem's growth through collaborative efforts and active participation in a range of activities. These efforts aim to facilitate the development process by presenting innovative ideas, regulating, and inspecting the ecosystem, and promoting successful growth.

As a result of their combined efforts, the ecosystem is able to flourish and achieve its objectives. Each participant brings a unique set of skills, expertise, and resources to the table, which when combined with those of other participants, contribute to the ecosystem's success.

In the upcoming sections, I will provide detailed descriptions of each participant, highlighting their primary activities and contributions to the ecosystem's development. By examining the contributions of each participant, we can gain valuable insights into the factors driving the growth and success of the FinTech ecosystem.

Association “FINTECH Hub LT” was established to foster the growth and development of the Lithuanian FinTech sector by promoting a collaborative environment and providing access to resources for its members, including expertise, training, and funding opportunities. It actively promotes the sector both domestically and internationally through partnerships with regulatory bodies, financial institutions, and venture capitalists, and its "FINTECH HUB LT" program supports FinTech start-ups in Lithuania through mentorship, networking opportunities, and funding support.

Association “INFOBALT” promoting the growth and development of the Lithuanian information and communication technology (ICT) sector, including the FinTech industry. The Association achieves its goal by providing its members with access to training, networking opportunities, industry expertise, and advocating for favorable policies and regulations that support the growth of the ICT sector in Lithuania. By promoting cooperation and knowledge-sharing among its members, advocating for favorable policies and regulations, and promoting the sector both domestically and internationally, INFOBALT is driving innovation and promoting the success of the Lithuanian FinTech industry.

Bank of Lithuania is responsible for implementing monetary policy, regulating the financial sector, and supporting the growth of the Lithuanian FinTech ecosystem. The bank has established a regulatory sandbox for FinTech start-ups and participates in events and activities to promote the sector both domestically and internationally. By implementing these initiatives and supporting the development of the FinTech industry, the Bank of Lithuania is playing a critical role in driving innovation and supporting the success of the sector in Lithuania.

UAB “Bccs global” is a Lithuanian FinTech cluster that provides a range of services to the financial industry, such as payment processing and risk management. The company has a strong focus on technology and innovation, and its team of experts works to create advanced solutions for clients. BCCS global has developed proprietary technologies, including a secure and flexible payment processing platform, and ensures compliance with regulations by working closely with industry associations and regulatory bodies.

UAB “Ondato” is a FinTech company, that offers identity verification and KYC solutions to various industries, including financial services, e-commerce, and sharing economy. The company's technology enables businesses to onboard and verify customers quickly and securely using various verification methods, including biometrics and facial recognition. The company is known for its exceptional customer service and support, providing dedicated account managers and technical support teams.

Ministry of Finance of the Republic of Lithuania, serving as a regulator and policy maker. The ministry has introduced various initiatives and programs, such as a regulatory sandbox and a specialized FinTech license, to encourage innovation and growth in the sector. Additionally, the ministry promotes the Lithuanian FinTech industry and attracts foreign investment and talent, positioning Lithuania as a leading destination for FinTech companies and entrepreneurs.

4.2. Lithuanian FinTech Ecosystem development identification

To successfully identify the challenges and perspectives involved in the development of the Lithuanian FinTech ecosystem. To do so, it is essential to determine the current stage of development of the ecosystem. To achieve this, at the beginning of the research, the participants are asked to provide insights into the current state of the Lithuanian FinTech ecosystem and to identify the necessary conditions for its successful future development.

According to the interviewed participants of Lithuanian FinTech ecosystem, most of them indicated (see table 5), that current state of development, in context of other countries, is in “Early stage of Mature”. However, some informants mentioned that the ecosystem is already very strong, and nowadays could be indicated as a mature. According to other informants, there are still more things to improve in order for Lithuanian FinTech ecosystem to become mature, but they mentioned, that the connection and collaborations across ecosystem’s participants is very visible, as a result of, moving towards strong and mature ecosystem.

Table 5. Lithuania’s FinTech Ecosystem development stage. *Presented by author.*

Code	**Development stage**
Mature	“<…>ecosystem has formed very strongly, and it is already mature.” (Informant A) “<…>I would definitely call it mature.” (Informant E)
Early stage of Mature	“<…> on the way to maturity” (Informant B); “<…> on the way towards maturity.” (Informant C); “Early maturity.” (Informant D) “<…>transitional period towards maturity.” (Informant F)

According to authors Diemers, Lamaa, Salamat and Steffens (2015), in order to create a stable and strong Financial Technology ecosystem, every member and every part of it must continuously collaborate and work together. This is confirmed by the statements of informants. All respondents confirmed that, for a strong ecosystem development it is especially important to cooperate between one another, continuously share the information and news, and support at all levels. Only collaborating ecosystem participants who share a wide range of information, communicate their problems to each other, and jointly seek for the best solutions, can achieve the common goal of creating a strong, efficient, and developing ecosystem. The informants also emphasized, that the regulations and supervisions are very important for the successful development of the Lithuanian FinTech ecosystem. Various regulations, laws, and provisions help the ecosystem to develop, provide various incentives, help ecosystem participants successfully establish themselves in the market and protect against various problems, such as shadow activities or money laundering. Adequate supervision also allows other ecosystem participants to feel safe, because regulators and governmental institutions, supervise the activities of ecosystem members, seek to prevent the violations or circumventions of laws, and try to protect not only companies or other institutions, but also clients. It should be remembered that the goal of supervision and regulations is not to harm the ecosystem, or its participants, but to make it safe and reliable. In the interview, informant C mentioned that one of the goals, nowadays, is not to just grow, allowing untrustworthy companies that may have unclear relationships with other parties, or engage in illegal shadow activities, can lead to serious problems in ecosystem, but rather to maintain a safe and reliable environment where the quality of provided services is ensured. Informants also mention that the encouragement is very important development aspect, because to grow in the number of participants at the ecosystem and for the ecosystem, as an organism itself, to grow and expand, it is important to provide incentives, to expand export possibilities, encourage and stimulate growth, but not to hinder it. Institutions should participate not only in internal affairs but also present Lithuania as a possible place of establishment for companies from other countries, by presenting the incentives and creating suitable conditions. Therefore, the international aspect is also important, creating opportunities and providing information in other languages, for future market participants from other countries, helping to develop and establish activities in Lithuania. Also, it should be remembered, that the creation of the ecosystem is also contributed by suitable and convenient business conditions, which must be clear and easily understandable, reducing bureaucratic burden, educating the Lithuanian society not only about what Financial Technologies are, but also about finances in general, raising financial literacy and understanding.

Table 6. Lithuania's FinTech Ecosystem development mandatory conditions. *Presented by author.*

Code	**SubCode**	**Development stage**
Business Environment/access to market	Collaboration between ecosystems participants	"<…> how much collaboration is there."; "<…> collaboration between various institutions and FinTechs." (Informant A) "Both the private and public sectors are currently making every effort, and we talk about it, working in various groups, and making proposals" (Informant B) "<…> it is a constant work of the whole sector. <…> cooperation is very important. <…> attention of all state institutions to all those regulations and risk management issues, and overall questions" (Informant C) "The need for innovation and close collaboration among ecosystem stakeholders." (Informant D) "Our uniqueness lies in collaboration between market participants and policy makers." (Informant F)
	Environment	" <…> business conditions must be transparent, easy, and with the least

Code	SubCode	Development stage
		bureaucratic burden. (informant B) “<…>Risk management, because finance is risk. (Informant B) “The important thing is that Lithuania continues to be able to adapt to the constantly changing economic and political situation.” (Informant C) “<…> that is human resources and intellectual resources.” (Informant E) “<…> business environment has an impact.” (Informant F)
Government/regulatory support	Regulations and regulators	“<…> main will be regulations.” (Informant A); “<…> because regulations are extremely important.” (Informant C) “It's probably that the regulatory environment, the regulation, and regime itself.” (Informant E) “<…> governmental institutions. Very strict regulations, and companies must comply with them. <…> regulations are good in principle, because they bring clarity and it becomes clear that if I do things this way, then everything is good with my activity. But there are many of these requirements, and it greatly complicates the company's operations, and it is important to think about how to make these requirements more accessible when moving towards the future.” (Informant F)

Code	SubCode	Development stage
	Supervision	“<…> adaptive supervision mechanisms.” “FinTech companies are properly supervised <…>.” (Informant A); “We must not forget about other things. As I mentioned before, there is money laundering, sanctions, terrorist financing, and so-called shadow companies, which really exist and use legal arbitration to open a company.” (Informant C) “<…> supervisory institutions” (Informant F)
	Export expansion	“<…>export development is important. <…> They must export to other countries and this growth should be encouraged, not criticized. (Informant A)
	Leadership	“To make the ecosystem strong on its own, we need leaders in all institutions” (Informant A)
	Financial literacy	“ <…> financial literacy is really not at a high level.” (informant B)
	Internationality	“<…> internationality would be very important.” (Informant A)
	Regulators	“The regulator, it must be the one that encourages growth, it oversees, but does not hinder growth.” (Informant A)

It is interesting to note that the most attention from informants is given to the aspect of “Government/regulatory support”. This indicates that the conditions for the development of Lithuanian FinTech ecosystem, should be mostly support by policies, ease of doing business, taxes, and work permits.

4.3. Challenges of FinTech Ecosystem Development in Lithuania

To find out, from informants, what challenges the Lithuanian FinTech ecosystem faces, the respondents were first asked about which market participants they believe have the most influence on the development of the ecosystem. Based on the analysis by the author Diemers et al. (2015) and

Lee, Shin (2018), five main market participants were identified: FinTech startups; Technology developers; Governmental institutions; Financial customers and Traditional financing institutions.

Table 7. Which participants mostly influences the development process of Lithuania's Fintech Ecosystem. *Presented by author.*

Code	**Development stage**
Financial institutions	"Bank of Lithuanian adaptive supervision." (Informant A)
Fintech startups	"Meanwhile in Lithuania, of course, it's startups <…>." (Informant B)
Technology companies	"Meanwhile in Lithuania, of course, it's <…> technology companies." (Informant B)
Governmental institutions	"One of the essential is the Governmental institutions, and regulations. And if there is no regulation or it will be either too strict, or otherwise, too loose. So other participants, even the associations, will not want to do anything about it." (Informant C) "If they change their attitude and start regulating the ecosystem more strictly, for example, last year we lost licenses for 15 FinTech companies from our ecosystem." (Informant A) "Regulators. <…> They inevitably have to change themselves to keep up with changing market needs" (Informant D) "Governmental institutions in the first place for initial attractions, and later on others." (Informant F)
Financial customers	"Anyway, everything starts with whether it is being used or not. <…> Customers start using it actively. Then the market becomes more active. All service providers actively start building services around it, gluing everything together, and so on, and then comes regulation." (Informant E)

The most attention was given to regulators and governmental institutions, but financial customers have the least impact on the development process. Considering today's society and opportunities to access various FinTech platforms from different countries around the world, it is not surprising that financial customers are not as important and emphasized. The majority of companies, coming from other countries, as well as Lithuanian companies, have customers from all abroad. This indicates the fact, that the financial customers aspect is not considered so much, because customers from other countries have all the opportunities to use provided services. However, this does not mean that they are unimportant. One of the informants strongly emphasized that financial customers are important, because they are the objects that create demand and create a market. Without demand, there would not be a need for supply. On the other hand, the majority of informants paid more attention to other ecosystem participants. As mentioned before, the most attention was given to governmental institutions. It is noticeable that they have an important influence on the development of the ecosystem. They create a certain financial environment, give certain tools, provide financial incentives, and attract other companies from different countries. It is very important, that governmental institutions understand the regulatory significance and impact on ecosystem participants, create an appropriate regulatory system that is not overly restrictive, but at the same time does not have too many loopholes that would harm the overall ecosystem activity. Regulators must be interested in the existing market and not to lag behind it, they must encourage other ecosystem participants to improve and expand, as well as take into account prevailing trends, new requirements and the benefits for consumers and suppliers. FinTech startups, technology companies and financial institutions should not be forgotten. The Bank of Lithuania, as the main supervisor of the ecosystem, must provide adaptive supervision and growth mechanisms and monitor the activities of companies. FinTech startups, responsibly, with a mature perspective, should participate in ecosystem activities, analyze the market and provide relevant services, cooperate with technology companies, which can provide benefits not only to FinTech companies, but also to traditional financial institutions, by offering various tools and services.

By conducting a more detailed analysis of challenges, the main triggers that affect the development of the ecosystem were identified and could be seen in table 8. One of the most urgent issues causing challenges is the interpretation of regulations. Current laws are created and released with loopholes that can be interpreted in different ways. Unclear descriptions propose a challenge to ecosystem participants, as different people can interpret and implement the laws differently, resulting in differing compliance requirements. Although regulators strive to create an ecosystem that is convenient for market participants, they do not always understand the significant impact even the slightest change in laws can have. Over the past year, due to changes in laws, according to informant A, 15 FinTech companies in Lithuania lost their licenses. In addition, ecosystem participants are facing the problem of irrational decisions, that being made by regulator and governmental institutions. Their advices, or as informants call it, CEO letters, becomes not a helpful reminders of the hygiene matters that participants must perform to successfully develop the ecosystem, but becomes obligations and commands on what must be done, or else things will go wrong. Additionally, the crypto area is currently not defined and monitored appropriately. Although the Financial Crime Investigation Service monitors their activities and tries to control them, during the interview, it was mentioned that more and more financial customers are being frauded, their money is being stolen. EU regulations also affect the development of the ecosystem, and upcoming new regulations are expected to have a significant impact on FinTech company costs. This will require to create new jobs for exclusive positions and improve used accounting systems to provide various data that was not previously required, which incurs additional expenses to comply with EU requirements. However, these are mandatory things because, in any case, Lithuania is part of the European Union, and their requirements must be followed.

Table 8. Lithuania's FinTech Ecosystem development challenges. *Presented by author*..

Code	**SubCode**	**Development stage**
Government/regulatory support	Policy settings (Interpretations of regulations)	"There is a lot of room for interpretation in the laws." "Of course, we also have irrational decisions." (Informant A) "Laws are not clear, because 10 people can read the same

Code	SubCode	Development stage
		law and have 10 different opinions.” (Informant C)
	Regulators and regulations	“A lot of changes, a lot of new laws, and neither the regulator nor the legislator understands the impact it has on FinTech because they don't know how those FinTech systems work. <…> The CEO letters are becoming like laws instead of help for fintech, like “look at this”. <…> Well, there is a lack of appropriate competencies there, and because of those inappropriate competencies, the growth is not yet where it could be ” (Informant A); “The biggest threat still exists in areas where there are unsupervised FinTechs. For example, today, the same applies to crypto.” (Informant C) “Regulations goal is to help in any case. But there is a dark side to all these regulations and laws, which in essence may have more negative impact than positive.” (Informant C) “Excessive regulation by the regulator during this term and disproportionate pressure on existing and new Fintech companies” (Informant D) “One of the most important regulatory issues is how to protect client funds from being mixed with company funds. Not all companies ensure that protection” (Informant C)
	EU Regulations	“The current and upcoming regulations will have a significant impact on their costs.” (Informant A);

Code	SubCode	Development stage
		“The requirements are high, they constantly change, and it's not that the Bank of Lithuania came up with and makes those changes. But no, we are obliged to various legal regulations of the European Union.” (Informant C) “Well, in any case, it directly affects and that is one of the essential moments. It is a must thing. Because we are a member state of the European Union, and we also have to comply with European Union regulations and cannot make our own interpretations.” (Informant C)
	Ease of doing business	“The overall communication and communication between institutions are inconsistent and do not match. <…> communication that is communicated is one thing, but what is understood is another thing.” (Informant A) “Opening up of data exchange. Among banks, between FinTechs, between the public sector and private sector.” (Informant B)
	Policy settings	“We don't need to reduce risks, we need to manage them. In my opinion, this risk reduction policy is harmful to the ecosystem.” (Informant A) “Risk management, improvement of internal business conditions, especially regarding reporting. In general, digital transformation, including open banking and data exchange.” (Informant B)

Code	SubCode	Development stage
	Taxes & work permits	“The main nuance is how to maintain those licenses, how to comply with all those requirements, and in most cases we see that companies do not really understand fully, for example, especially if they come from third countries, they do not understand European regulations, they do not understand Lithuanian regulations, in that sense, the legal framework is very complex.” (Informant C) “It was necessary to prepare for the licensing procedures, there should be a re-licensing process in place, but somehow it is happening slower in our country.” (Informant F)
Business environment/access to market	Labor availability and know-how (education)	“Do we all understand what fintech is? No, we don't understand. <...> There is a lack of knowledge in the region.” (Informant A) “I would say in every aspect, there should be improvement, and the system should be changed fundamentally. <…> there is a shortage of specialists in certain areas.” (Informant B) “When companies say: "Everything is fine here, we will ensure financial stability.", but unfortunately, later the situation appears very bad and some even fail to submit all the balance sheets, profit, loss, and other reports on time.” (Informant C) “<…> then talent issues arise.” (Informant D) “There is still a lack of competence because of the

Code	SubCode	Development stage
		quantity of institutions and everything else. We have too few people, especially trained for this field” (Informant D)
	Infrastructure quality & access	“Companies are faced with the challenge of coming to Lithuania and becoming unique, because initially financial technologies were very new, but now we have a lot of, for example, electronic money institutions and they all become very very similar.” (Informant C) “<…> money laundering, financing, sanctions, various circumventions.” (Informant C) “Companies do not take full responsibility, they get a license, but not always make the necessary effort to maintain it. People are too optimistic about their abilities.” (Informant C) “Yes, we have many companies, but the problem is starting to arise that there is a shortage of good leaders, good compliance personnel, AML personnel, and so on. <…> We simply don't have enough employees today who could keep up with all these technologies.” (Informant C)
Access to capital	Funding	“There is still a lack of capital in the region. It still exists, and it seemed that the situation was improving greatly with the establishment of various early-stage funds and so on. But this year we have found ourselves in a situation where we really don't have anything to choose from again.“ (Informant D)

Code	SubCode	Development stage
		“The involvement of market participants in the drafting of legislation, as in many cases they are being attempted to be included, but the market is not involved.” (Informant F)

During the analysis of data and information provided by informants, it is possible to see, that in order to have a high-quality and at the same time develop perspective FinTech ecosystem in Lithuania, there is a constant need for collaboration for ease of doing business. The same is mentioned in the literature about ecosystem development. However, there are challenges such as data sharing and openness, because not all ecosystem participants openly share their data, not to mention that they are required to provide them to regulators. There is also a communication challenge between certain ecosystem participants, where communication is about one thing, but in the end, it turns out that the parties understand each other differently. The informants also emphasized that there is currently a problem where regulators are providing more and more risk reduction policies, but it is much more important to manage these risks, because reduction policies are harmful to the ecosystem. One of the challenges is that there is a lack of capital for establishing companies in Lithuania. Although the situation seems to have improved and early-stage funds have started to emerge, there is currently a problem that there is only one broad-based fund left in Lithuania and not focused on the FinTech market. This makes it difficult for new companies to establish themselves and emerge, because companies not only use funds for establishment, but also needs to hire appropriate employees to comply with various regulatory requirements and have suitable people in AML or compliance positions. However, there is often no funding available for that. It is also noted that ecosystem participants, not only FinTech companies, but also state institutions or regulators, face gaps in the education system where the public is not properly introduced to what FinTech is, what its activities or goals are. There is a lack of financial literacy, and prepared people do not always have the necessary knowledge and skills. So there are cases where specialists do not meet the job requirements due to a lack of competence.

4.4. Perspectives of FinTech Ecosystem Development in Lithuania

During the interview, it was noticed that, apart from weak points in the development of the Lithuanian FinTech ecosystem that creates various challenges, the informants were very pleased and proud of the Lithuanian FinTech ecosystem. Ecosystem participants emphasized, that although laws can sometimes be irrational or there could be interpretations, they are very happy with them because regulations ensure smooth ecosystem development, where there are no shadowy companies, shadow activities, or violations that harms the whole ecosystem and its development. Communication and cooperation among themselves are particularly emphasized, which sets the Lithuanian FinTech ecosystem apart from other countries and provides new and existing market participants with opportunities to work together, provide and solve various problems, related to both external and internal factors. Everyone tries to come together, talk, spend time and even work overtime to develop and improve the ecosystem. There are associations like Infobalt in Lithuania that unite various working groups that help with legal and other issues. There is also one association, Fintech Hub, that specifically works with licensed service providers, helps them with their concerns, and collaborates with regulators or other government agencies.

Table 9. Lithuania's FinTech Ecosystem perspectives. *Presented by author.*

Code	**SubCode**	**Development stage**
Business environment/access to market.	Degree of clustering & integration	"There is a separate team for fintech companies, there is a lot of knowledge." (Informant A) "Profits of fintech companies are steadily growing, the number of employees is increasing, and there is very active attention paid to money laundering prevention and all kinds of sanctions, and so on." (Informant C) "Lithuania participates in the workgroups of the European Union, provides proposals, and certainly, because we are one of the leaders, they do take into account our comments, remarks, or ideas." (Informant B) "Invest Lithuania is a non-profit institution that provides free services, consultations to companies and foreign investors, helps companies understand the regulations, provides contacts, and so on." (Informant C)
Government/regulatory support	Policy settings	"Others, on the other hand, companies say that we want to go where there is clearly defined, strict regulation, because it creates credibility for us. <…> strict Compliance and Anti-Money Laundering preventions." (Informant A) "Also, it is necessary to note that there are other regulations in place, such as the new regulation by MiCA for crypto companies." (Informant C) "MiCA is coming. It already exists, but the transfer and enforcement is from 25-th year, after 24 months from when it was approved, so it

Code	SubCode	Development stage
		will be in April. And we have already agreed and made certain changes. Money laundering prevention laws have also, to some extent, tightened the operations of virtual currency operators.” (Informant F) “CENTROlink, which is our main driver, because it provides an opportunity for FinTech to connect to SEPA payments.” (Informant A) “Currently, there are finalized FinTech guidelines, which will be valid for five years, and the Bank of Lithuania, Invest Lithuania, the Ministry of Finance, EIMIN, and other institutions are focusing all their attention on how to continue being the fintech hub.” (Informant C) “FINMIN and INMIN create a certain legal environment, provide certain measures, create that environment, and sometimes provide financial incentives.” (Informant B)
Government/regulatory support	Ease of doing business (Communication)	“We still communicate and talk, and we try to listen to each other in one way or another. In other countries, this is not the case, there is no ecosystem, and they do not talk to each other.” (Informant A) “As a country and as a business, we all come together and try to talk and solve certain problems. <…> we stand shoulder to shoulder. The Bank of Lithuania is more flexible if a company wants to consult with representatives of the central bank” (Informant B)

Code	SubCode	Development stage
		“In case of a problem, all institutions come together and collaborate. They do not hesitate to spend their time, even overtime, to find solutions, to answer those questions and we are really actively working to find options.” (Informant C) “The regulatory environment and our speed and dynamism. We are not a very big country, so we can react quickly and dynamically to things.” (Informant D) “ <…> the ecosystem is really inclined to unite and search for common solutions.” (Informant B)
Business environment/access to markets	Labor availability and know-how (Education)	“Now, there are scholarships for fintech at KTU, and we also went to different fintech companies with VU to get acquainted. At VU, in IT and mathematics, we have had our own separate lecture for many years, where we come to talk. In economics at VU, I talk about fintech, the bank talks about the bank, someone else talks about blockchain, and other board members speak about law. <…> There are at least six people who say “I agree, money doesn't matter. We want to educate the society”.” Informant (A) “<…> there are private programs that teach.” (Informant B) “We have conducted surveys and almost all Lithuanian consumers have heard of FinTech.” (Informant F) “Bank of Lithuania has a separate division that is related to the AML center, which also helps, educates, and provides various training to companies to comply with those

Code	SubCode	Development stage
		requirements. Other institutions and associations also strive to contact FCIS, STI, and other institutions to explain how to comply with those requirements.” (Informant C)
Business environment/access to markets	Degree of clustering & integration	“Because our flexibility and collaboration with all organizations that have a direct impact, determine that success.” (Informant B) We provide insights and I think that we are very innovative, we are very efficient, we really have something to be proud of, and even in discussions with other Baltic countries, with other central banks, we take on the role of showing the way.” (Informant C) “We respond to what is happening in the market, market trends, and policymakers in Lithuania often react much faster than in other European Union countries.” (Informant F)
Business environment/access to markets	Infrastructure quality & access	“Lithuania is a leader in licensed companies in Europe.” (Informant B) “Lithuania has its own value propositions and additional opportunities.” (Informant C) “Our business conditions are very good. Comparing to other countries in attracting foreign companies.” (Informant B)

Invest Lithuania pays attention to attracting new companies from various countries and provides free services or consultations to companies, investors, prepares ecosystem reports, conducts surveys, collects data and provides insights. The Bank of Lithuania, in cooperation with other associations and institutions, participates in various international discussions and foreign events, to showcase Lithuania as a potential location for establishment. Informants noted that the largest universities in

Lithuania, such as Kaunas University of Technology, Vilnius University, and Vytautas Magnus University, create new programs for students, invite them to learn and deepen their knowledge in the FinTech field. Governmental institutions and the Bank of Lithuania, as well as other institutions, organize various trainings for specialists and individuals in specific areas such as AML or compliance. Representatives of companies and other institutions are very willing to participate in educational activities, attend lectures, provide various training, and educate about individual areas they are knowledgeable about. Additionally, companies, in cooperation with universities, are willing to accept students, to learn in real life conditions, practice, and improve in various fields. Regulators and Governmental companies offer various opportunities for new and existing market participants. Opportunities to join various systems, such as CENTROlink, which helps FinTech companies perform payments, and there are also various incubators and hubs where ecosystem participants can participate and express their opinions, discuss, make connections. Lithuania from April of 2025 should establish MiCA, which is designed to provide safeguards for individuals investing in crypto assets and prevent them from falling prey to fraudulent activities. The new regulations will impose rigorous demands on crypto service providers to safeguard their customers' digital wallets and be accountable for the loss of any investor's crypto assets. Furthermore, MiCA will encompass all forms of market exploitation, such as market manipulation and insider trading, that may arise from any transaction or service. Lithuania participates in the European Union workgroups, where it provides various proposals or insights, collaborates with FinTech companies, associations, financial and state institutions of other countries. Lithuania is also known for its leadership in licensed companies among other European countries, which helps to draw attention to our ecosystem, attract new market participants and showcase our maturity. Currently, in cooperation with ecosystem participants, FinTech guidelines for 2023-2028 are being developed in Lithuania. Ministry of Finance states, that Lithuania will aim to position itself as a hub for Fintech in Europe, with a focus on five areas of development. These areas include improving the quality of the Fintech sector, attracting innovative companies to Lithuania, enhancing competencies and talent supply, ensuring the country's security and reliability, and increasing Lithuania's recognition on the global perspective.

4.5. Summary of Results and Recommendations

According to interviews with participants in the Lithuanian FinTech ecosystem, the current state of development is seen as in the early stage of maturity. The ecosystem is moving towards a strong and mature ecosystem, with visible connections and collaborations across participants. Collaboration and cooperation between ecosystem participants are crucial for the ecosystem's strong and efficient development, as well as for creating a stable and strong FinTech ecosystem. Regulations and supervisions are seen as crucial for the successful development of the ecosystem, and encouragement is important to expand the ecosystem and provide incentives for growth. Government/regulatory support is seen as the most crucial aspect for the development of the Lithuanian FinTech ecosystem. Suitable and convenient business conditions, raising financial literacy and understanding, and presenting Lithuania as a possible place of establishment for companies from other countries are also important for the development of the ecosystem.

It was aimed to identify the challenges that the Lithuanian FinTech ecosystem faces by analyzing the views of informants on the influence of various market participants and the triggers that affect the ecosystem's development. During the analysis of literature, main five ecosystem participants were identified: FinTech startups, technology developers, governmental institutions, financial customers, and traditional financing institutions. According to findings, in literature, informants were asked about, which participants of an ecosystem influences development process the most. As a result of analysis, regulators and governmental institutions were found to have the most influence on the development of the ecosystem, while financial customers had the least impact. The interpretation of regulations was identified as the most urgent challenge affecting the development of the ecosystem. Other challenges included irrational decisions by regulators, lack of appropriate monitoring of the crypto area, EU regulations, data sharing and openness, communication challenges, risk reduction policies, lack of capital, and skill gaps. The study emphasized the need for collaboration among ecosystem participants, capital support for new companies, and effective risk management policies.

The research found that while the Lithuanian FinTech ecosystem faces certain challenges, the participants are proud of it and emphasize the benefits of regulations that ensure a smooth and transparent development. Communication and cooperation among the participants are highlighted as a distinctive feature of the ecosystem, with associations like Infobalt and Fintech Hub providing support to licensed service providers. Universities and governmental institutions offer various opportunities for education and training, while Lithuania participates in European Union workgroups and aims to position itself as a hub for FinTech in Europe, focusing on improving the quality of the sector, attracting innovative companies, enhancing talent supply, ensuring security and reliability, and increasing global recognition.

Based on your research findings, there are several recommendations that could be implemented to achieve a better development process for the Lithuanian FinTech ecosystem and to face fewer challenges while creating more perspectives:

1. Despite the collaboration and cooperation among ecosystem participants it needs to be maintained and strengthened: Collaboration and cooperation are key to the ecosystem's strong and efficient development, as well as for creating a stable and strong FinTech ecosystem. Encouraging more partnerships and working groups, promoting knowledge and expertise sharing, and fostering innovation through collaborative initiatives could further improve the ecosystem's maturity.
2. Ensure appropriate regulation and supervision: Regulations and supervision are seen as one of the crucial things for the successful development of the ecosystem. Ensuring appropriate interpretation of regulations, monitoring areas that lack supervision, like crypto, and having clear communication channels between regulators and ecosystem participants can help solve to challenges faced by the ecosystem.
3. Increase Governmental and regulatory support, in collaboration with other ecosystem associations: Government/regulatory support is also seen as one of the most crucial aspect for the development of the Lithuanian FinTech ecosystem. Providing suitable and convenient business conditions, raising financial literacy, and understanding. In collaboration with other ecosystem participants who represent Lithuania, present it as a possible place of establishment for companies from other countries could attract more investors and innovative companies to the ecosystem.
4. Providing capital support for new and existing companies: Lack of capital is a very big trigger that presents challenges faced by the Lithuanian FinTech companies. Providing capital support for companies, such as venture capital funds, could attract to establish innovative companies to the ecosystem.
5. Enhance risk management policies and educational system: Effective risk management policies could help ecosystem participants manage risks associated with financial transactions, data sharing, and cyber threats. Offering training and education programs for ecosystem participants

could enhance their ability to manage risks, acquire required competencies and present know-how.

By implementing these recommendations, the Lithuanian FinTech ecosystem could overcome its challenges and continue to grow and evolve into more mature, strong, and innovative ecosystem, creating more perspectives and opportunities for development.

Conclusions

1. The analysis of FinTech showed that it is transforming the financial industry by offering new possibilities for customers and businesses. Traditional financial institutions must adopt new technology to stay competitive. Collaborative efforts among FinTech Ecosystem participants can generate innovative ideas and attract investments. Analysis of statistical data showed, that the FinTech sectors is growing, and Lithuanian FinTech sector is not an exception. Despite the slowing growth of FinTech companies, Lithuanian Ecosystem presented more qualitative growth by presenting more specialist, generated revenue, and growing sectors.
2. The ecosystem is a complex entity that includes all living and non-living elements in an environment and functions as a single unit through mutual relationships. Likewise, the FinTech ecosystem fosters innovation, stimulates economic growth, and enhances the financial service experience for consumers through the collaboration of different components. The FinTech ecosystem is a complex network of players, including traditional financial institutions, venture capital firms, service providers, and regulatory bodies, who are working together to shape the future of financial technology. In addition to governments, financial institutions, and entrepreneurs, other crucial players include fintech startups, technology developers, financial customers, and traditional financing institutions. Four important design elements for establishing and developing a fintech ecosystem include access to market, government/regulatory support, access to capital, and financial expertise.
3. Lithuania has a supportive environment for the development of the fintech industry, with an increasing number of companies operating in the country. The workforce in the sector has grown by 19% since 2020, and the government is making efforts to nurture the skills required by the industry. Lithuania is competitive and has good infrastructure and friendly regulations. The country has a supportive ecosystem, with co-working spaces, hubs, supportive ecosystem companies, business-friendly governmental institutions, and local investors. The Ministry of Finance has collaborated with an expert group to create guidelines aimed at reinforcing Lithuania's position as a top tier fintech hub in Europe.
4. The analysis of interviews with Lithuanian FinTech ecosystem participants revealed that the ecosystem is moving towards maturity, with a strong potential for growth and visible connections between ecosystem participants. Collaboration and cooperation between participants are deemed crucial for the ecosystem's efficient development and stability, with regulatory support seen as a key factor in successful development, to further develop the ecosystem, suitable business conditions, financial education, and presenting Lithuania as an ideal location for FinTech companies from other countries are also important.
5. The analysis of results, showed, that regulators and governmental institutions are having the most significant influence on the Lithuanian FinTech ecosystem's development, while financial customers had the least impact. The analysis emphasized the need for collaboration among ecosystem participants, capital support for new companies, and effective risk management policies. However, during the research I found that the ecosystem's participants are proud of it and emphasize the benefits of regulations that ensure a smooth and transparent development, with communication and cooperation among the participants highlighted as a distinctive feature. Lithuania aims to position itself as a hub for FinTech in Europe by improving the quality of the sector, attracting innovative companies, enhancing talent supply, ensuring security and reliability, and increasing global recognition.

6. The recommendations for the Lithuanian FinTech ecosystem include strengthening collaboration among ecosystem participants, ensuring appropriate regulation and supervision, increasing governmental and regulatory support, providing capital support for new and existing companies, and enhancing risk management policies and strengthen educational system. Implementing these recommendations could help overcome challenges and create more opportunities for development, making the ecosystem more mature, strong, and innovative.

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