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FINTECH ECOSYSTEM DEVELOPMENT IN ESTONIA

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ABSTRACT

FinTechs, companies utilising innovative technological solutions for providing financial services, are causing significant changes in the financial services industry and in the economy in general. Some suggest that they will replace the traditional financial intermediaries, others consider them to be a complement to traditional service providers. Thus, the aim of the thesis is to determine the status of the Estonian FinTech ecosystem and to understand the main factors influencing its development.

For achieving the objective of the thesis, the author uses a case study approach that encompasses a survey among Estonian FinTech companies, a total of 9 interviews with the representatives from different FinTech ecosystem players, document analysis, and PEST analysis. The survey covers 82 FinTechs from which 39% responded. The questionnaire included questions on the company's general data, market segments, problems faced by the company and FinTech outlook in general. Interviews are based on 7 to 20 questions depending on the interview and cover representatives from FinTech companies, from a traditional bank, from the Ministry of Finance, from the Financial Supervision Authority and from the Central Bank of Estonia.

During the study, it appeared that the regulators have the biggest role in developing the Estonian FinTech ecosystem. The regulations are considered necessary, however, they should provide some leeway to companies starting its business. In terms of general ecosystem characteristics, ease of doing business and availability of skilled labour are one of the important reasons for establishing FinTech in Estonia. FinTechs appreciate the initiatives of start-up visa and e-residency. In terms of customer base, the main restriction comes from the smallness of Estonia. However, FinTech companies see it as a positive aspect as the company needs to focus on international markets from the start. In relation to the disruptive nature of FinTechs, Estonian incumbents and FinTechs do not see it as much as disruption, but more as cooperation.

Keywords: FinTech, financial innovation, ecosystem, regulations, banks

INTRODUCTION

There has been a digital shift in the economy caused by the introduction of new digital technologies and the availability of those technologies to the general public. The new technologies change the way how people think and act in their private lives and also in business. The way in which business is done is changing, as digitization allows doing business more globally with lower costs. In finance, this shift has been associated with the emergence of FinTechs, companies utilizing digital technologies for the provision of financial services. In some cases these companies are considered to be only start-ups introducing disruptions to the functioning of the traditional financial services, others consider that this term should also encompass already established firms.

The FinTech movement is causing significant changes in the financial services and in the economy in general. Some suggest that it will replace the traditional financial intermediaries, others consider them a complement to traditional service providers. Despite the long history of digitization of financial services, the literature on FinTechs has emerged only in recent years. The literature analysis showed that the annual number of publications did not change much until 2009 and was in stable level 3-10 publications per year. Moreover, the amount of scientific papers is even smaller. (Zavolokina et al. 2016). Existing research on FinTech covers the FinTech concept, the development of Fintech company, the disruptive nature of FinTechs, regulatory sandboxes, and some other regulatory issues. In addition, there are studies concentrating on the specific types of FinTechs (e.g., crowdfunding, mobile payments). However, the FinTech ecosystem in general has been poorly studied. Moreover, the previous research has not covered FinTech ecosystem in Estonia. Therefore, the aim of this thesis is to determine the status of the Estonian FinTech ecosystem and to understand the main factors influencing its development.

In order to fulfil the objective the thesis attempts to answer to the following research questions:

1) Who are the main players in the Estonian FinTech ecosystem?
2) Which are the main triggers behind Estonian FinTech development?
3) How is the Estonian regulatory environment affecting FinTech development?

4) How/whether the FinTech development in Estonia is disrupting the traditional banking system?

For achieving the objectives of the thesis, the author uses a case study methodology. Within the case study, the methods employed include a survey, interviews, document analysis, and PEST analysis. The online survey is carried out amongst 82 Estonian FinTechs identified based on different information sources. From these 32 responded to the survey. The survey is built around Osterwalder and Pigneur business model canvas including questions on the company's general data, market segments, problems faced by the company, and FinTech outlook in general. The survey is followed by 9 interviews with representatives from the FinTech companies, from a traditional bank, from the Ministry of Finance, from the Financial Supervision Authority and from the Central Bank of Estonia to get more insights on the Estonian FinTech landscape.

This thesis is divided into three chapters. The first chapter gives an overview of the theoretical background of the FinTech ecosystems based on the literature. It covers the definition of FinTech, FinTech types, regulatory framework, ecosystem characteristics and the future of FinTech and banking. The second chapter provides an overview of the population and sample of FinTechs and used methodology. The third chapter discusses the outcome of the research. First, the regulatory framework of Estonian FinTech ecosystem is discussed. The discussion includes an analysis of the applicable legislation and opinions of the persons interviewed. The second part of the third chapter includes sentiment analysis on Estonian FinTechs and it covers the challenges faced by them. After that, the Estonian FinTech environment characteristics are analysed based on the interviews and different databases and studies. The last part of the third chapter discusses the cooperation between banks and FinTechs. In addition, this part also explores the possible future scenarios of the financial services industry.

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1. FINTECH ECOSYSTEM

Finance has a central position in the economy and it is a facilitator of most of the production and consumption activity. Thus, improvement in the financial sector will have direct positive consequences to the whole economy. (Frame, White 2004, 118) The financial services industry is strongly affected by the digitization. One of the reasons for such impact is that financial services are largely based on information. For example, payments, credit contracts do not include any physical component. Another reason is that many processes are executed without physical interaction. The continuous development in IT leads to the fundamental reorganisation of the financial services value chain with new business models like robo advisory and blockchain enabled services. (Puschmann 2017) The key forces of FinTech revolution are technology innovation, process disruption, and services transformation. Form these three, technology innovation is considered the main engine behind economic growth and industrial transformation. (Gomber et al. 2018) In addition to those forces, the cost-saving requirements and customer demands are also considered important (Gai et al. 2018).

The main impulses for FinTech development are regulatory and tax changes, underlying technologies (cheap communications channels like Internet and mobile) instable macroeconomic conditions, market incompleteness, information asymmetries, transactions, search or marketing cost, banking regulations, convenience and people's comfortability with online money (Ashta, Biot-Paquerot 2018; Frame, White 2004; Tufano 2003). In the following sections, the transformation of financial services is discussed in the context of their ecosystem.

1.1. Definition of FinTech

In order to understand the FinTech ecosystem characteristics, it is necessary to understand what FinTech is. The term "FinTech" is formed from the words "financial" and "technology" and describes in general the connection of modern technologies with established business activities in the financial sector. (Gomber et al. 2017) FinTech may also refer to the use of technology for delivering financial solutions (Arner et al. 2016). Usually, FinTech refers to the innovators and

disruptors that have new business models that offer more flexibility, security, efficiency and possibilities than incumbents (Gomber et al. 2017). Although the term is often used only for start-up companies who provide those solutions, it does sometimes include incumbents like banks and insurance companies using innovative solutions. (Puschmann 2018) In this thesis, FinTech refers to the start-up companies that use new innovative technological solutions in the financial services industry for improving, complementing and disrupting existing services and products.

Although the term "FinTech" has been in the limelight for some time, its meaning still remains unclear for most people. This applies to both the experts, who are dealing with the topic in their daily work, and to those, who are looking it from the outside. FinTech is a rapidly changing and broad phenomenon. (Zavolokina et al. 2016) The term was first used in the early 1990s as the original name of the Financial Services Technology Consortium, which was the project of Citicorp (today Citigroup) to encourage technological cooperation (Hochstein 2015). Although FinTech is often considered as something new, in reality, the interaction between finance and technology has a long history (Arner et al. 2016).

Arner et al. (2016) have divided the FinTech evolution into three periods. The first era lasted from around 1866 to 1967 where the financial industry remained mostly analogue industry, although already to great extent connected with technology. This period is called FinTech 1.0. From 1967 the transformation from analogue industry to digital industry began. By 1987 financial services become digitalized, at least in developed countries. This period from 1967 to 2008 is called FinTech 2.0. (Arner et al. 2016) Financial services were affected by the Internet revolution in the beginning of 1990s. The biggest effect was that is lowered the costs for financial transactions. The technological development led the way to the electronic finance (e-finance). E-finance refers to different financial services performed through electronic means, including internet. By using the means of e-finance, the customers can obtain financial information and services without being physically present in the financial services firm. (Lee, Shin 2018) Until 2008 the FinTech was dominated by traditional regulated financial services providers that used technology to serve their customers. Since 2008 start-ups and established technology companies started to provide financial services directly to the businesses and to the general public. This era is called FinTech 3.0. In this era, the new generation of market participants introduced the new paradigm which today is recognized as FinTech. (Arner et al. 2016) FinTech start-ups have distinguished themselves from traditional banks with personalized services, data-driven solutions, innovative and agile

organisation culture. They combine e-finance, internet technologies, social media, artificial intelligence, and big data. (Lee, Shin 2018)

In addition to the abovementioned three main eras, in relation to developing countries, the fourth era called FinTech 3.5, can be recognised. FinTech development is largely influenced by the evolution of Internet and mobile phones. The evolution of internet and mobile phones made FinTech possible. Nowadays payments have gone beyond B2B links (SWIFT) and there are a lot of different C2B payments in the form of apps. (Ashta, Biot-Paquerot 2018) The fourth era has evolved in developing countries in Africa and Asia largely due to high mobile phone usage. In Africa it has been also facilitated by the underdevelopment of traditional banking. The FinTech's in Africa are mostly providing mobile payment solutions, but also credit services, and micro-insurance. In Asia, the main facilitator (besides mobile use) of the FinTech development is distrust in state-owned banks which control the financial services industry but are vulnerable to corruption and inefficiency. (Arner et al. 2016)

FinTech is an innovative and emerging field, which attracts attention from the public and from investors (Zavolokina et al. 2016). The investments into the FinTech companies has risen dramatically. In 2018, global investments in FinTech companies reached 111.8 billion (KPMG 2019, 4). These numbers demonstrate that the FinTech sector is becoming attractive in the financial world and brings new opportunities to give power to people by making information more easily accessible (Zavolokina et al. 2016).

Zavolokina et al. (2016) delivered, based on their study of FinTech definitions in media, the conceptual framework of FinTech. FinTech has three dimensions: an input, mechanisms and an output. An input includes a combination of technologies, organizations, and money flow. Technologies mean mobile payments, data analytics, crowd-based platforms, and cryptocurrencies. Organizations are start-ups and companies, which focus on providing IT-supported financial services or platforms. The money flow means investments. The second dimension mechanisms include creation, change, or improvement of existing service/product/process/business model for increasing the quality for the customers. The second dimension also included disruption that is explained as the creation of alternatives to the incumbents. The third output dimension refers to the creation of new services/products/processes/business models that rise as an outcome of transformation. (Zavolokina et al. 2016)

Similarly to Zavolokina et al. (2016), Puschmann (2017) has defined three dimensions of Fintech. The first dimension is the innovation object. Innovation objects can be divided into five categories: financial innovation, business models, products and services, organizations, processes, and systems. The second dimension is the innovation degree. Innovation degree is divided into incremental and disruptive technology. Incremental solutions encompass optimization of existing technologies, but disruptive technologies lead to the changes in the entire value chain. The third dimension is the innovation scope which can be intra- or inter-organizational. Based on these dimensions, Puschmann (2017) defines FinTech as "incremental or disruptive innovations in or in the context of financial services industry induced by IT developments resulting in new intra- or inter-organizational business models, products and services, organizations, processes and systems" (Puschmann 2017, 74).

As can be seen above from the definitions and dimensions, FinTech is closely related to the financial innovation. Financial innovation means creating and popularizing new financial instruments, technologies, institutions, and markets. Innovation includes two related acts – invention and diffusion as most of the financial innovations are evolutionary conversions of already existing products. In some ways, financial innovation is similar to any other kind of innovation. The common aspects of these are (Lerner, Tufano 2011):

1) Innovations are costly to develop and diffuse.
2) Innovations are risky.
3) Innovations are often associated with the competitive dynamics between incumbents and newcomers.

However, in many aspects, financial innovation differs significantly from the innovation in manufacturing. According to Lerner (2006) and Lerner and Tufano (2011), the three main differences include:

1) Appropriability - financial firms are rarely applying for patents, thus, product ideas spread across the industry.
2) Regulation - regulatory scrutiny is much greater in the financial services industry, which may cause a barrier for innovation. However, on the other side, the regulatory changes can be also an incentive for innovation.
3) Collaboration- is frequent and the ubiquity of such relationships can motivate the innovation.

4) Interconnection of the financial system - interconnections means that there can be both positive and negative side effects of financial innovation.
5) Transformation of financial innovation - transformation takes place when the innovation spreads from pioneers to the general public.

To summarize, based on the definitions from various authors, FinTech can be defined usage of the new innovative technological solutions in the financial services industry for improving, complementing and disrupting existing services. FinTechs are companies whose main activities are developing and offering such solutions.

1.2. Types of FinTechs

Different authors have divided FinTech companies into different categories.
Arner et al. (2016) have divided FinTech industry into five areas summarized in Table 1.

Table 1. Five areas of FinTech industry

Finance and investment	The financing includes both alternative financing mechanisms such as crowdfunding, P2P lending as well as the financing of the technology itself via venture capital, crowdfunding, private equity etc. Another topic covered with this point is robo-advisory services.
Internal financial operations and risk management	These are the main driver for IT spending by incumbents. Since 2008, the incumbents face major post-crisis regulatory changes that need better compliance systems.
Payments and infrastructure	Internet and mobile payments are the central point in FinTech development, especially in developing countries. Also the securities trading infrastructure is a big part of the FinTech development.
Data security and monetization	As the financial services are getting more and more digitized, the security issues have become crucial due to the vulnerability to cybercrime and espionage.
Customer interface	This includes online and mobile banking. This is one of the areas in which the competition between traditional banks and new IT and telecommunication firms is the biggest.

Source: Arner et al. (2016)

Lee and Shin (2018), in turn, have divided business models of FinTechs into six categories:

1) Payment business model – FinTechs providing payment solutions including mobile wallets, P2P mobile payments, foreign exchange, real-time payments, and digital currency solutions. These are fast developing companies in terms of innovation. The rapid growth

could be explained with the fact that payments are one of the most used, but least regulated financial services. Payments are considered as one of the simplest, but at the same time fastest moving in terms of innovation FinTech business models Technological solutions encompass charging to phone bill, near field communication (NFC), barcode or QR code, credit card, a mobile phone card reader.

2) Wealth management business model – includes robo-advisors that compile their advice using algorithm based on the investors' preferences and characteristics. They are able to provide their services for much lower fee than real-life advisors. Robo-advisors compile their advice using an algorithm based on the investors' preferences and characteristics.
3) Crowdfunding business model – is divided into three types: reward-based, donation-based, and equity-based crowdfunding. In case of reward-based crowdfunding, the receiver of funds provides some kind of reward. Donation-based crowdfunding is used for charitable purposes (no return for contributors). Equity-based crowdfunding is used for finding investors and there is a return for the contributors in the form of portion of ownership in the company. Crowdfunding consists of three parties: the initiator that needs funding, contributors and the moderating organization that enables the arrangement between initiator and contributor.
4) Lending business model – covers P2P consumer and business lending which allows individuals and businesses to execute loan transactions without engaging a bank. P2P lending platforms are not involved in the transaction, but only match the parties and collect fees. Due to the efficient structure, P2P platforms can offer lower interest and better lending processes. As those lending platforms are not involved in the lending itself, the capital requirement applicable to banks, are not applicable to them. P2P lending differs from crowdfunding in terms of its purpose. Crowdfunding is used to finance projects, but P2P lending purpose is to consolidate debt and refinance credit cards.
5) Capital market business model – cover FinTechs involved in investment, foreign exchange, trading, risk management, and research.
6) Insurance services business model – the usage of data analytics to allow insurers to have a more direct link with their customers and improve risk management.

Based on those two models of FinTech types, it can be followed that the main business models of FinTechs should include deposit and lending, investment management, analytics, payment, insurance, banking infrastructure, and distributed ledger technology. These business models are used for dividing FinTechs into different types in the current thesis as well.

1.3. Regulatory Framework

The association between FinTechs and regulations is obscure. There have been studies indicating that regulation, especially taxes, are important stimuli for financial innovation. Innovators use the opportunities given by gaps in regulations, then regulators impose new regulations that in turn give rise to new opportunities. In this circle, the regulatory system might be at a disadvantage and tend to react to innovations with a lag. (Lerner, Tufano 2011) Regulatory changes often take many years to push through, however, entrepreneurship usually occurs in their absence (Isenberg 2010). Technology can encourage regulatory responses that enable arbitrage or change incentives in unexpected ways. Regulators should identify which part of the pre-existing financial system is potentially being disintermediated. (Brummer 2015). Zavolokina et al. (2016) found in their study that regulatory changes is one of the growing topics in the media concerning FinTechs. This shows the importance of clear regulations for financial activities. The changes of legal framework can encourage innovation or on the negative side challenge market players. At the same time, FinTechs influence regulation and legislation and force them to adapt to the current conditions of the competitive global market. (Zavolokina et al. 2016)

The evolution of FinTech into a new paradigm has been challenging to regulators as well as market participants. New FinTechs are entering the financial services industry with little or no prior interaction with regulators. These companies do not have a financial compliance culture and, therefore, they may not comply with applicable financial regulations. This non-compliance can be active, meaning that they believe that they are not subject to regulations meant for traditional banks, or passive, meaning that they are not aware of the regulations that apply to them as well. On one hand, banks and FinTech should be treated equally in the areas they provide the same or close regulated products. However, the FinTechs should be able to develop their business before becoming subject to extensive regulatory rules and high compliance costs. Thus, the solution might be in setting the thresholds for when the companies have to comply with regulations and rules that seek to guarantee the safety and stability of financial institutions. Recognizing the suitable threshold can also help to set boundaries of operations between traditional banks and FinTechs and decide whether the distinction should be based on products or transaction size. (Arner et al. 2016)

Finding the proper balance between the technology industry, financial service provider and regulators requires understanding the aim and reasons behind the regulation. The regulators' main objectives include financial stability, prudential regulation, conduct, fairness, competition and

market development. However, for regulators it is important to understand when and what to regulate. Enforcing new regulations too early might be insufficient and waste of resources. The reasons are that not all innovations are becoming a paradigm shifters. It takes time before technology becomes applicable and reaches final users. Moreover, not all new technologies are widely adopted. Regulators should stay technologically neutral and focus on the results of the technology. This enables regulators to understand whether the technology is adopted by the market and understand the risks that need to be covered with the regulations. (Arner et al. 2016)

As the financial services industry comprises of established FinTech 2.0 and emerging FinTech 3.0 players, it has created two different expectations and needs for industry regulations. FinTechs have lean business model, thus the high costs of compliance are contradictory with their business model. FinTechs are concentrated in developing a viable product and, therefore, need to defer the cost. Thus, FinTechs prefer a principle-based regulatory regime. Principle-based regulatory regime means that the aim of the regulations is more important than solely following the rules and procedures exactly. There is certain freedom of choice in applying the regulations. The opposite view is a rule-based regime. Rule-based regime means following exact rules and processes. This kind of regime is more expensive for FinTechs as they need to identify all the rules and comply with them. However, these systems should not be mutually exclusive. The regulations should be dynamic meaning that they should reflect the size and activity of the business. The challenge is to find a balance between flexible, forward-looking regulations that encourages innovation, and the framework being clear enough to maintain all market participants' confidence. In addition to attempting to avoid the previous crisis, the regulators are also looking for ways to support the financial industry development at the same time keeping the financial stability. It is beneficial for regulators if they start the communication with FinTechs already in the early stages. This allows them to better understand the business models and teams behind the FinTechs in order to better understand whether they are suitable for that role. (Arner et al. 2015)

Innovation hubs are a way of allowing the regulators to understand the business models of FinTechs and for FinTechs to familiarise themselves with regulations. These are intended for providing a dedicated point of contact for FinTechs to enquire information from competent authorities in relation to regulations, licensing requirement etc. In many cases, innovation hubs provide FinTechs with guidance on the conformity of their proposed business models with regulations. The guidance provided in innovation hubs is non-binding. Innovation hubs are open to FinTechs as well as incumbents adopting innovative products, services or business models. The

majority of EU Member States and EEA (European Economic Area) States have introduced innovation hubs. (European Supervisory Authorities 2018, 3-5, 8-9)

In order to provide some leeway for FinTechs, several countries all over the world, but only a few in the EU, have implanted the new regulatory concept named "regulatory sandbox". Regulatory sandboxes allow FinTech companies to use innovative solutions and business models without having to concentrate too much on regulatory constraints. The regulatory sandboxes in every country are a bit different depending on the county's needs. However, the main aim of the sandboxes to allow FinTechs to test their innovative solutions without fear of regulatory consequences. Also, the common feature of regulatory sandboxes is highlighting the consumer benefits, safety, flexibility, and supervision. (Thomas 2018) The aim of sandboxes is to allow the competent authorities and FinTechs to understand the risks and opportunities of innovations and their regulatory treatment within a testing phase. In addition, sandboxes are needed for assessing the innovations compliance with regulatory and supervisory requirements. (European Supervisory Authorities 2018, 16)

The upsides of the regulatory sandboxes include three main aspects. Firstly, the regulatory sandbox increases the knowledge exchange in both directions due to the open communication that goes beyond the usual information that the supervised entities likely share with their regulator. Secondly, the regulatory sandbox allows achieving a balanced level of dispensation without being curtailed by the regulators' liabilities. Thirdly, the existence of regulatory sandbox may flatter innovative businesses to locate their innovation in countries that have communicated their openness in this way. This, in turn, could benefit to the cluster development necessary for fast innovation and, therefore, provide a comparative advantage. As a downside of regulatory sandboxes, the risk for consumers and the financial system should be mentioned. Therefore, clients may not enter into businesses with sandbox and this, in turn, stops the FinTech from growing. Another minus of sandboxes is the lack of standardization, which makes the sandboxes activity unfit for cross-border activities. Another downside is uncertainty that can put regulated entities into an uneven position, as they are not aware of conditions under which their competitors operate. Thus, when implementing the regulatory sandbox, maintaining the even playing field between licensed and unlicensed market participants is a core issue. (Zetzsche et al. 2017)

In the EU by the third quarter of 2018, five countries have introduced regulatory sandboxes. Those countries include the UK, Denmark, Lithuania, The Netherlands, and Poland. In addition, Norway,

Spain, Austria, and Hungary have indicated the plan to launch a regulatory sandbox. The common features of the established regulatory sandboxes are according to the European Supervisory Authorities (2018, 16-18):

1) they are cross-sectoral, e.g banking, insurance and investments;
2) are open to FinTechs as well as incumbents;
3) are not limited to testing the regulated financial services, but can also include products and services that are connected with the provision of regulated financial services (anti-money laundering, blockchain, compliance technologies;
4) license is needed for carrying out regulated financial services;
5) do not waive the obligation to follow EU/national law, but can involve more proportionate application of regulatory requirement;
6) have specific entry conditions for applications wishing to benefit from sandbox;
7) are not limited to specific innovations, but do require true innovation;
8) include the testing parameters;
9) include a controlled exit from the sandbox.

The UK financial supervision authority has the practice of regulatory dialogues with technology providers in order to provide legal clarity in terms of the new initiatives being developed (Zilgalvis 2014). There, the UK was one of the first countries to introduce regulatory sandbox in 2015. The UK lowered the administrative barriers in order to provide FinTechs a safe place to introduce their products without having to comply with all the regulatory requirements. The UK concept is to provide flexible and supervised regulatory sandbox meaning that authorities can make decisions regarding relaxing the regulations based on the specific FinTech company. The FinTechs allowed to benefit from regulatory sandbox are monitored closely to make sure that consumers are protected, but at the same time allow FinTechs not to follow unnecessary regulations that would burden FinTechs. The companies that can benefit from the regulatory sandbox, have to be active in one of the following areas: retail banking, retail lending, general insurance and pensions, pensions and retirement income, retail investments, investment management or wholesale financial markets. (Thomas 2018) Besides that, the company needs to meet the following conditions (Thomas 2018):

1) must be offering innovation that is regulated in the UK financial services market;
2) the innovation must differentiate from existing offerings;
3) the innovation must provide benefits to the consumers and market;
4) the FinTech must prove that they need to use the opportunities used by the sandbox;

5) the FinTech must have a detailed plan for testing its innovation.

The UK regulatory sandbox is considered to be successful.

Another pioneer in FinTech regulations is Singapore. The Monetary Authority of Singapore (MAS) is actively engaging in activities to support and supervise the FinTech development in Singapore by framing an appropriate regulatory approach. MAS principles are risk-focused, disclosure-based, stakeholder-reliant and supportive of enterprise. This means that such approach allows greater flexibility to financial companies that to do not pose a significant risk to the financial system, disclose important information that consumers can rely on and take responsibility in the form of self-regulation and self-supervision. MAS, in turn, takes a consultative approach to support the industry. Based on this approach MAS introduces in November 2016 regulatory sandbox for trials by both FinTechs as well as incumbent to experiment with new financial technology solutions. The regulatory sandbox allows FinTechs and incumbents to experiment with its innovative solutions with fewer risks in an environment where those products are provided to the customers. However, this space is still well defined and with time limits so the consequences of failure could be contained and the impact of failure on consumers and financial stability is limited. MAS is applying the risk-based and case-by-case approach for FinTechs taking advantage of regulatory sandbox. MAS will ease specific regulatory requirements like credit rating, financial soundness, management experience etc. which FinTech otherwise would be subject to. However, there are certain areas where MAS will not relax its requirements. Such areas include confidentiality of customer information, honesty, and integrity of people operating within sandbox, anti-money laundering etc. (Fan 2018)

In order to benefit from the regulatory sandbox, MAS has set the following criteria (Fan 2018):

1) The proposed financial service must include new technology or use existing technology in an innovative way.
2) The proposed service is advantageous to the consumers or industry.
3) The applicant plans to deploy the proposed service in Singapore widely after existing the sandbox or continue to contribute to Singapore in other ways.
4) The scenarios and expected outcomes of the sandbox experiment are well defined and the company needs to report to MAS on a regular basis.
5) The interest of consumers and the soundness of the industry must be protected.
6) The risk arising from the services should be evaluated and mitigated.
7) For exiting from the sandbox, a clear transition strategy should be defined.

As can be seen from above, the conditions and purposes for using the regulatory sandbox are similar in the EU and Singapore. There are differences in details, however, it is clear that sandboxes are meant for testing really new and innovative financial solutions and the companies that wish to benefit from regulatory sandbox regulations have to make sure that consumers interests are protected.

The fast development of FinTechs requires a similar evolution in the RegTech. RegTech refers to the use of technology for regulatory monitoring, reporting, and compliance. The regulatory processes are automated to allow the reduction of costs, improvement of regulatory processes, and compliance. RegTech helps in developing the appropriate regulatory responses to FinTech development. (Arner et al. 2016) Although RegTech focuses mainly on traditional financial services providers, it could provide beneficial solutions also the emerging regulatory hurdles of FinTechs.

1.4. Ecosystem Characteristics

1.4.1. Definition of the Ecosystem

Based on Lee and Shin (2018) to understand the competitive and collaborative dynamics in FinTech innovation, it is important to analyse the ecosystem. The same is also highlighted by Adner and Kapoor (2016) who studied 10 episodes of technology competition that occurred in the semiconductor industry. Adner (2017) defines the ecosystem as the structure that aligns together different partners that need to interact to materialize the focal value proposition. According to Sussan and Acs (2017), an ecosystem is a purposeful collaborating network of dynamic ever-changing interacting systems. As FinTech is based on innovation, the term innovation ecosystem is also relevant. Jackson (2011) defines the innovation ecosystem as a complex connection between entities with the purpose of empowering technological development. Innovation ecosystems have two different purposes for public sector and private sector. The public sector encourages innovation because of job creation, export and local quality of life. The main purposes of private sector are in the value chain development and investor returns. (Oh et al. 2016) The below concepts indicate that the ecosystem covers many different players that need to work together to empower innovation.

The term “ecosystem” includes the words “eco” and “system”. “Eco” originates from ecology and covers the connections of living things with their environment. “System” refers to the organized whole or body. Although the ecosystem, as a concept, comes from the study of natural ecological ecosystems, the use of ecological concepts in management and organizational literature has a long history. (Durst, Poutanen 2013) The term is also connected to the term “system” which refers to a group of independent organizations that interact with each other and function together to achieve a purpose. The main difference between the system and ecosystem is that the latter has both living and non-living components. (Sussan, Acs 2017, 57)

Digital ecosystem is a term that emerged in the early 2000s (Sussan, Acs 2017). It can be defined as “a self-organizing, scalable and sustainable system composed of heterogeneous digital entities and their interrelations focusing on interactions among entities to increase system utility, gain benefits, and promote information sharing, inner and inter cooperation and system innovation” (Li et al. 2012, 119). For digital ecosystem, the digital technologies are the non-living component and people using the technologies are the living component. These are connected with digital infrastructure an open system that links systems and networks at several levels and is continuously changing. (Sussan, Acs 2017) According to Li et al. (2012), the main characteristics of the digital ecosystem are:

1) Self-organization – means that the processes are happening without external intervention and do not have any outcome as the process is on-going.
2) Scalability –its ability to remain efficient if there is a large amount of input data.
3) Sustainability - reconciliation of internal and external environments, social and economic demands.
4) Dynamism – continuously changing the profile of digital entities

Adner (2017) has distinguished two ways of looking at the ecosystem:

1) Ecosystem as affiliation - ecosystem as a set of connected actors prescribed by their networks and platform affiliations.
2) Ecosystem as structure - approaches the topic form the angle of access and openness and highlights the breakdown of traditional industry boundaries. The strategy in this view is more focused on increasing the number of participants in the ecosystem.

Ecosystem as affiliation is suitable for describing the interactions on a macro level as it looks at the aggregates and is more focused on general governance and community enhancement, with

limited perceptions on value creation. The ecosystem as structure defines the ecosystem via value proposition and tries to identify the set of players that need to interact in order to create proposition. The main difference between the ecosystem as affiliation and ecosystem as structure is that ecosystem as affiliation concentrates on the actors, but ecosystem as structure on the activities. In terms of value proposition, ecosystem as affiliation ends with possible value propositions, but the ecosystem as structure starts from the value proposition. Therefore, Adner (2017) defines the ecosystem as the structure that aligns together different partners that need to interact to materialize the focal value proposition. Alignment refers to the mutual agreement of the ecosystem participants in relation to their position and flows. Participants may have different end results in mind, however in case of successful ecosystem all participants are happy with their position. The ecosystem is multilateral in terms of partners and relationships that have joint value creation aim. The foundation of the ecosystem is value proposition. The main elements of the ecosystem as structure are activities, actors, positions and links. Activities determine the actions to be done in order for the value proposition to materialize. Actors are the organisations executing the activities. One actor can undertake several activities and vice versa several actors can undertake one activity. Positions specify where the actors are situated in the process. Links define transfers (information, influence etc) across actors. (Adner 2017)

1.4.2. Elements of the FinTech Ecosystem

For achieving success, different players of the FinTech ecosystem have to contribute. According to Lee and Shin (2018) the main elements of the FinTech ecosystem that contribute to the innovation, stimulate economy, facilitate competition and benefit the consumers are:

1) FinTech startups;
2) Technology developers;
3) Government;
4) Financial customers and
5) Traditional financial institutions.

FinTech startups are in the centre stage of the ecosystem. FinTechs are the main drivers of the innovation in financial services and are behind the phenomenon of unbundling financial services. The unbundling is one of the main drivers behind the growth of the financial sector. Also, this is the area where incumbents have disadvantages. However, traditional banks have advantages in economies of scale and financial resources. (Lee, Shin 2018) Lerner (2006) analysed the sources of financial innovations between 1990 and 2002 based on the news stories in the Wall Street

Journal and found that small firms and less profitable firms are more innovative than larger firms. In addition, the firms that innovate more become more profitable in the following years. (Lerner 2006)

Technology is creating value in financial services in several ways. First, the cost cutting that includes, in addition to the reduced processing costs, other transaction costs. As an example, the customers do not need to spend time going to the bank in person. In some countries, this also means less risk, as technology allows carrying less cash that in turn means a lower likelihood of being robbed. Second, the revenues increase, because banking becomes available anytime and anywhere. This allows quicker transactions that increase revenue. As more and more transactions are done electronically, the data is collected and big data analysis enables better targeting and quicker adaption based on the changing needs of customers. Third, the whole industry benefits from the emergence of newcomers since they are out of the range of banking regulations by sidestepping deposits. (Ashta, Biot-Paquerot 2018)

Technology developers are the companies providing digital platforms and are creating an advantageous environment for FinTech development by digital innovation (Lee, Shin 2018). Fichman et al. (2014) have defined the digital innovation as "product, process or business model that is perceived as new, requires significant changes on the part of adopters, and is embodied in or enabled by IT". FinTechs can use big data analytics to personalize their services, cloud computing for reducing costs, algorithmic trading strategies enable usage of robo-advisory. Social media offers a platform for the growth of crowdfunding and P2P lending. Also, mobile network operators are offering infrastructure with lower costs for mobile payment and mobile banking. In turn, FinTech companies are generating a return for technology developers. (Lee, Shin 2018)

Governments are engaged in the ecosystem mostly by the regulatory side that is discussed in more detail above, in section 1.3.

Financial costumers are the source of income for FinTechs. The customer base mainly comprises of individuals, and small and medium size enterprises (SMEs). The main users of FinTech services tend to be younger, urban, wealthier, tech-savvy individuals. (Lee, Shin 2018) In terms of customers, it is important to expand the customer base and keep it sustainable and long-term. Lee and Teo (2015) have discussed in their study about Alipay (Asian payment FinTech) and M-Pesa (African payment FinTech) financial inclusion and importance of it. The roots of those two

successful FinTechs lay in financial inclusion. The unbanked and underserved bring additional business opportunities to FinTechs and opens no yet exploited demand with relatively low competition for FinTechs. (Lee, Teo 2015) Leong et al. (2017) case study examined the development of youth microloan start-up in China and established that the company's success is partially caused by financial inclusion. The company targeted college students as a segment that was excluded from most of the financial services, however, due to the stipend and allowance they are in low risk category. The aim of the company was in addition to earning a profit, increasing financial literacy at a young age, as this is a catalyst for responsible and sensible financial behaviour during life. Thus, the company was willing to trade-off the short-term profits for building a healthier ecosystem that would implement responsible financial behaviour among youth. (Leong et al. 2017)

Traditional financial institutions are also one of the drivers of FinTech development. Traditional financial institutions try to keep up with the FinTech innovation. Incumbents have competitive advantages in terms of economies of scale and resources. However, incumbents usually concentrate in providing the bundle of services. In addition, if in the beginning, the incumbents treated FinTechs as a threat, now the direction is more on collaboration. (Lee, Shin 2018)

In addition to the abovementioned elements, other important factors for FinTech ecosystem development include political, economic, social, and technological dimensions. Haddad and Hornuf analysed economic and technological motivations that have encouraged the FinTech development in 55 countries. According to their study, the determinants include advanced economy and available venture capital and labour force. Similarly, to other start-ups, FinTechs require sufficient financing for developing and funding their business models. In addition, they found that higher mobile penetration and access to secure Internet servers affect positively the FinTech formation. (Haddad, Hornuf 2018) Ankenbrand et al. (2019) have studied the Swiss FinTech environment in four consecutive years by using qualitative descriptions of political, economic, social and technological (PEST) factors. Moreover, the last study (covers year 2019) includes the ecosystem analysis on the global level based on the PEST-approach. In the FinTech hub ranking Switzerland holds second and third positions (Zurich and Geneva respectively) after Singapore due the favourable conditions for FinTech companies to thrive. Based on the study the drivers behind FinTech development are favourable legislation (banking license "light", regulatory sandbox),a large pool of potential business customers, a broad range of incubator and accelerators programs, an excellent talent base and innovative power. The negative sides of the FinTech

ecosystem are small amount of potential private customers due the size of the country, lack of e-government services and low online participation rate. (Ankenbrand et al. 2019)

The discussion shows that the FinTech ecosystem is a structure for which different players need to interact, support and collaborate for the common purpose of materializing the value proposition by breaking down the traditional industry boundaries. For analysing the ecosystem and its players, it is also important to look at the political, economic, social and technological dimensions for understanding the competitiveness of specific ecosystem.

1.4.3. Challenges for Ecosystems

The important element of the ecosystem is the value proposition. A company's competitive advantage comes from its ability to create more value than its rivals. This, in turn, depends on the ability to innovate. However, the innovation also depends on the external accompanying changes in the environment it operates. In order for the one company to successfully apply its innovative solutions, also the suppliers and cooperation partners need to resolve their own innovation challenges. The location of challenges is equally important to the magnitude of innovation challenges in the ecosystem. The company's possibility to create value is affected by the asymmetric effect of upstream supplier and downstream customers and complements. Depending on the location of challenges, the challenges can increase or decrease the company's competitive advantage from technological innovation. The advantage increases with component challenges by increasing the potential for learning and increasing barrier to imitation. The advantage decreases with complement challenges by slowing the company's advance in the learning curve and by allowing the rivals to catch up. The upstream component challenge does not allow the company to offer its innovation to the market, but the downstream complement challenge prevents the company's customers from using the full potential of the innovation. Therefore, those two challenges have the opposite effect to the company's value proposition. (Adner, Kapoor 2010)

Lee and Shin (2018) have described six main challenges facing FinTech and incumbents in the time of disruptive innovation:

1) Investment management – the selection of promising FinTech project is challenging and financial institutions may choose to invest in internal innovation projects instead of separate FinTech companies.

2) Customer management – FinTech should find a niche for their services and products and provide the best possible solutions in that niche. Also, FinTechs should address customers' needs better than incumbents and offer accessible, convenient, and tailored products.
3) Regulation – Regulatory changes do not always keep up with the innovation of industry and thus FinTechs need to be aware of the regulations. Regulations are discussed in more detail in section 1.3.
4) Technology integration – FinTechs are based on the new technologies and it might be challenging to integrate those with existing systems used by incumbents. Thus, there has to be sound integration plans for FinTech and incumbents cooperation.
5) Security and privacy – FinTechs need to develop appropriate measures for ensuring customer data protection. According to Gai et al. (2018), the typical measures include understanding the active system and reducing the potential attacks by noticing technical details and business processes.
6) Risk management – The risks faced by FinTechs include in addition to the regulatory risks the financial risks (for example liquidity, interest rate risk etc). Therefore proper risk management should essential to the FinTechs.

Ankenbrand et al. (2019) have used in their study of the Swiss FinTech ecosystem, sentiment analysis for evaluating the challenges facing the FinTechs. For Swiss FinTech the most pressing issues are finding customers and availability of skilled staff or experienced managers. Those two are followed by the cost of production or labour, regulation, expansion to international markets, competition and access to financing. (Ankenbrand et al. 2019). Lee and Shin (2018) above also highlight some of those aspects. The challenges that FinTechs face are related to the different players of the FinTech ecosystem. Challenges related to regulations are a direct outcome of government/legislative organs activities or omissions. For example, regulatory sandboxes discussed in section 1.3 are one way of providing leeway to FinTechs. Technological challenges are related to the technology developers, but also to the labour issues. Therefore, for creating favourable conditions for FinTech ecosystem development it is necessary to consider all the players and possible challenges of the ecosystem.

1.5. Future of FinTech and Banking

One of the recurring patterns of business is that the companies in the leading role fail to maintain their position when technologies or markets change. One of the main reasons is that the leading companies stay close to their customers and align investments with the need of their customers. This is the understanding of a well-managed company. In this way, the companies stay ahead in developing new technologies as long as those technologies meet the next-generation needs of their customers. However, the same companies fail to be in the forefront of developing new technologies that do not initially meet the needs of their regular customers and appeal only small or emerging markets. Meeting the needs of established customers takes most of the company's resources. (Bower, Christensen 1996)

The technological changes that affect incumbents are usually not radically new or difficult from a technological perspective. However, they have two important features. First, they provide different performance attributes that on the outset might not be valued by existing customers. Second, those attributes that existing customer value improve so rapidly that new technologies can later invade those existing markets. At this point, the customers start to desire new technology. However, for incumbents it might be too late as the pioneers of new technology already dominate the market. Managers should pay attention to the new technologies that do not necessarily meet the needs of their current customers. The important attributes in evaluating proposed technological innovation are the company's revenue and cost structures. Established companies tend to have higher cost structures to sustain technologies than those required by disruptive technologies. Therefore, the managers see that they need to choose between two options if they wish to pursue disruptive technologies. The first option is to accept the lower profit margins of the disruptive technologies. The second option is to sustain technologies and enter the market sections with temptingly high profit margins. (Bower, Christensen 1996)

Oshodin et al. (2017) studied based on Australian banks how incumbents are responding to the FinTech by using the methods of sensing and responding. Sensing means the company's capacities to quickly understand the changes and their influences. Responding means a company's capacities and willingness to take actions towards financial innovation. In the study, five major areas of sensing activities were recognised. These areas include deep engagement with customers, technology scanning, crowdsourcing of FinTech ideas, channels for inbound FinTech knowledge, and monitoring FinTech players. In terms of responding, some of the banks are trying to cooperate

and partner-up with the FinTechs, but banks are also trying to improve the in-house competences. Also as responding activities the innovation labs, investments, partnership were identified. Based on the study the collaboration and partnership is the best way to continue, as it is a win-win situation for both parties. Banks have a strong brand, customer base and financial resources, while FinTechs are open to the new technologies, and have an innovation culture. (Oshodinet al. 2017)

The motivation for FinTechs and banks cooperation is valid for several reasons. Banks benefit from it in the form of new customer segments, capabilities, products and services and by expanding into new areas and accessing new technologies. At the same time, FinTechs need financial resources, access to banks infrastructures and customers. In addition, FinTechs benefit from the security reputation of banks. (Drasch et al. 2018)

Based on their empirical examination Drasch et al. (2018) derived four bank and FinTech cooperation types: acquisition, alliance, incubation, and joint venture. An alliance is an agreement between companies to share resources and knowledge for common goals. In case of acquisition, the bank buys FinTech and integrates it to its existing structure. Incubation means contributing to the early stage companies by financial, managerial or other support. A joint venture means creating a specific legal structure where resources are pooled, but the risks and responsibilities are carried by participating companies. The study carried out among 136 real-world cooperation cases showed the that most popular way of cooperation is an alliance with 78%. (Drasch et al. 2018)

Basel Committee on Banking Supervision (BCBS) has compiled five scenarios about the future of FinTech and banking. Customer relationships and customer data have the most important role in determining the future role of banks. The five scenarios are (Basel Committee on Banking Supervision 2018, 16-20):

1) The better bank - traditional banks will adopt new technologies, modernize and digitalize. As the incumbents have the very good market knowledge and available resources by adopting new technologies, the banks get better at providing their services and products. Due to the new technologies banks are able to enhance value propositions. The examples include innovative payment services like mobile payments, robo-advisory services, more efficient lending procedures.
2) The new bank - traditional banks will not survive and will be replaced by new technology-driven banks. The new banks use advanced technology that allows them to provide banking services in a cost-effective way. The new banks are technology driven banks, like neo-

banks or banks established by BigTech companies. Neo-banks use comprehensively technology for providing retail banking services through apps and internet-based platforms. Neo-banks can operate at lower costs than traditional banks and thus can apply more aggressive pricing strategies.

3) The distributed bank – a large number of new businesses providing specialized services without an attempt to be universal banks. Banks and FinTech companies operate as partners using different structure like joint ventures etc. Lending platforms cooperate with banks in relation to the marketing of credit products, approval processes, funding, and compliance. Payment processes is one of the core banking processes and is hugely affected by the innovation. One of the areas where FinTechs and banks cooperate is mobile wallets that are developed by third-party technology companies while bank continues to own the financial element.
4) The relegated bank - traditional banks become commoditized service providers and the direct customer relationships are handled by FinTechs. In such case, the FinTechs use the banking license of traditional banks to provide lending, deposit-taking, and other core banking services, but the direct customer relationship is between the FinTech and customer.
5) The disintermediated bank - Banks become irrelevant as customers interact directly with individual financial services providers. In this scenario, the customers do not need to source services through a bank, however, this also means that the customer must bear more risks. Currently, this scenario seems unlikely, however, there are already some examples like P2P lending platforms and cryptocurrencies.

It is most likely that none of the scenarios will come true fully. It is expected that some kind of blend of scenarios will materialize. (Basel Committee on Banking Supervision 2018, 16-20)

Alt and Puschmann (2012) have also proposed a customer-oriented financial market as the future of banking. The factors driving towards the customer-orientation include financial crisis, the changing behaviour of clients, financial innovation and the emergence of non-banks. (Alt, Puschamnn 2012) Based on the different authors, it is expected that in the near future, the incumbents do not become irrelevant, but the direction is towards FinTech-bank cooperation.

2. DATA AND METHODOLOGY

2.1. Population and sample of FinTechs

This thesis focuses on FinTechs in Estonia. The list of FinTechs was compiled based on data retrieved from Crunchbase, Funderbeam, Key Capital, and Finance Estonia databases as in December 2018. Four sources of data were needed because there exists no comprehensive dataset which would provide reliable information on FinTechs in Estonia. The list was compiled in the process of preparing the FinTech in Estonia report by Laivi Laidroo, Mari-Liis Kukk, Liina Voolma and the author of this thesis. The initial definition of FinTechs differed slightly across datasets.

In Crunchbase the FinTech category does not provide very reliable input. Therefore, FinTechs were determined in the course of research by Laivi Laidroo and Mari Avarmaa using the company descriptions and codings and the selected companies were defined as FinTechs if they were involved in providing at least one financial service (financing, insurance, investment, payments and money, regulatory, risk management, trading, or their combination). Their business also had to contain some kind of technology component (e.g., artificial intelligence, blockchain, near-field communication, big data)". The initial list included 47 FinTechs.

Funderbeam provides access to a list of ambitious growth companies. It was possible to filter Estonian FinTechs. The initial list included 73 companies, which were cross-checked with other datasets. (Funderbeam 2018) Key Capital is a company providing financial strategy services. Amongst other things, they have provided their list of Estonian FinTech companies. (Key Capital 2018) It included 95 companies.

Finance Estonia is a financial sector representative organisation that aims to increase the knowledge of Estonia's financial sector advantages in the following areas: Capital Markets, Credit Providers, Crowdfunding, FinTech, and International Private Banking. (Finance Estonia 2019) Their FinTech work group had prepared a preliminary map of Estonian FinTechs which contained 65 companies. This was cross-checked and matched with other datasets. In order to verify the data,

the information from company web pages was used to determine whether the company could be classified as a FinTech. In addition, the data list was crosschecked against the Estonian Business Registry. Only FinTechs incorporated in Estonia were considered for this thesis.

After corrections, the initial list of FinTechs in Estonia included 82 companies (see Appendix 1). This forms the population. All FinTechs were divided into one of the below seven types:

1) Analytics – data mining, data analytics, business analytics, big data analysis, machine learning, artificial intelligence used for automated advice, chatbots, customer relations management, data handling
2) Banking infrastructure – user interface, processing enhancement, infrastructure technology, different trading platforms and different software companies with a focus on the financial sector
3) Deposit and Lending – crowdinvesting, crowdlending, invoice trading and other lending companies (such as fast loans, etc.)
4) Distributed Ledger Technology – cryptocurrency and everything that had to do with blockchain technology (even if it was a payment or crowdfunding at the same time)
5) Insurances – insurance-related products and services
6) Payments – mobile payment, online payment, money transfer and anything related to payments somehow
7) Investment management – online investment processes based on algorithms and models, robo advisors, social trading.

Figure 2 illustrates the Estonian FinTech landscape. Based on the information available in the different above-mentioned databases, most FinTechs are engaged in distributed ledger technology followed by deposit and lending and no FinTechs are engaged in investment management. There are only three companies qualified as analytics and insurance FinTechs in Estonia.

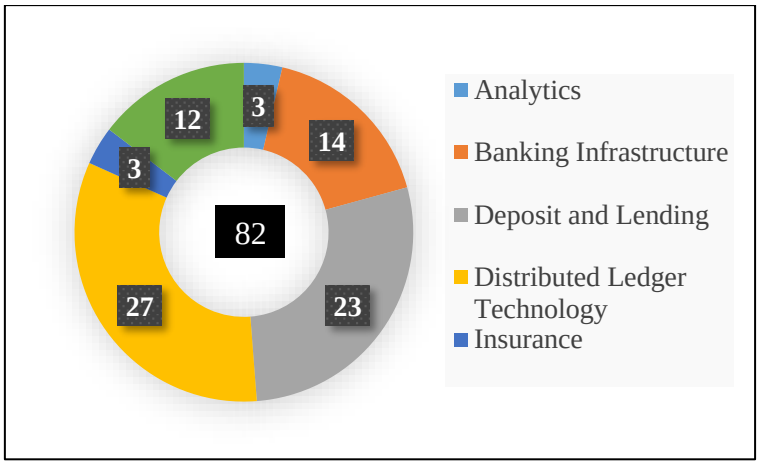

Figure 2: Distribution of Estonian FinTechs by type of activity
Source: Laivi Laidroo, Mari-Liis Kukk, Liina Voolma and author of this thesis based on Crunchbase, Funderbeam, Key Capital, and Finance Estonia

The sample is composed of FinTechs that responded to the survey. The sample consists of 32 companies that form 39% of the population (marked in the column "Response to the survey" in Appendix 1). The highest number of responses were received from payment companies, followed by distributed ledger technology and deposit and lending companies. The least answers were received from insurance companies, however, the total population of those companies was also one of the smallest.

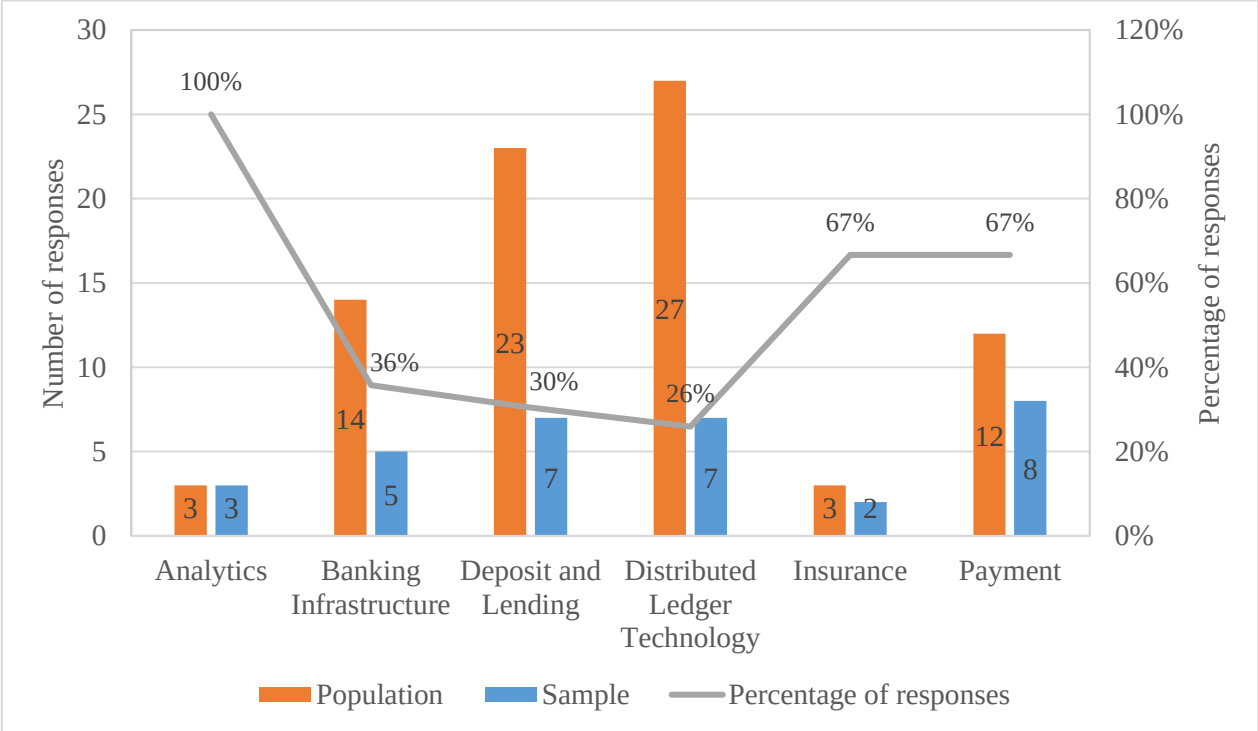

Figure 3. Comparison of sample and total population of survey
Source: Author of this thesis based on the outcome of survey

The lowest response rate characterises the group of companies classified under distributed ledger technology, however, at the same time, this group also had the most companies within it. One possible reason for low response rate in that group could relate to the fact that some of these companies have been established by foreigners who have just a legal headquarter in Estonia with most of the actual business occurring elsewhere. Also, this line of business has received more negative publicity during recent years, so the willingness of these companies to disclose information about their activities may be lower. 100% response rate was achieved in the group of analytics FinTechs for which the population is 3 companies.

The below figure 4 compares the proportion of companies specific FinTech type form the population and from the sample to detect any peculiarities.

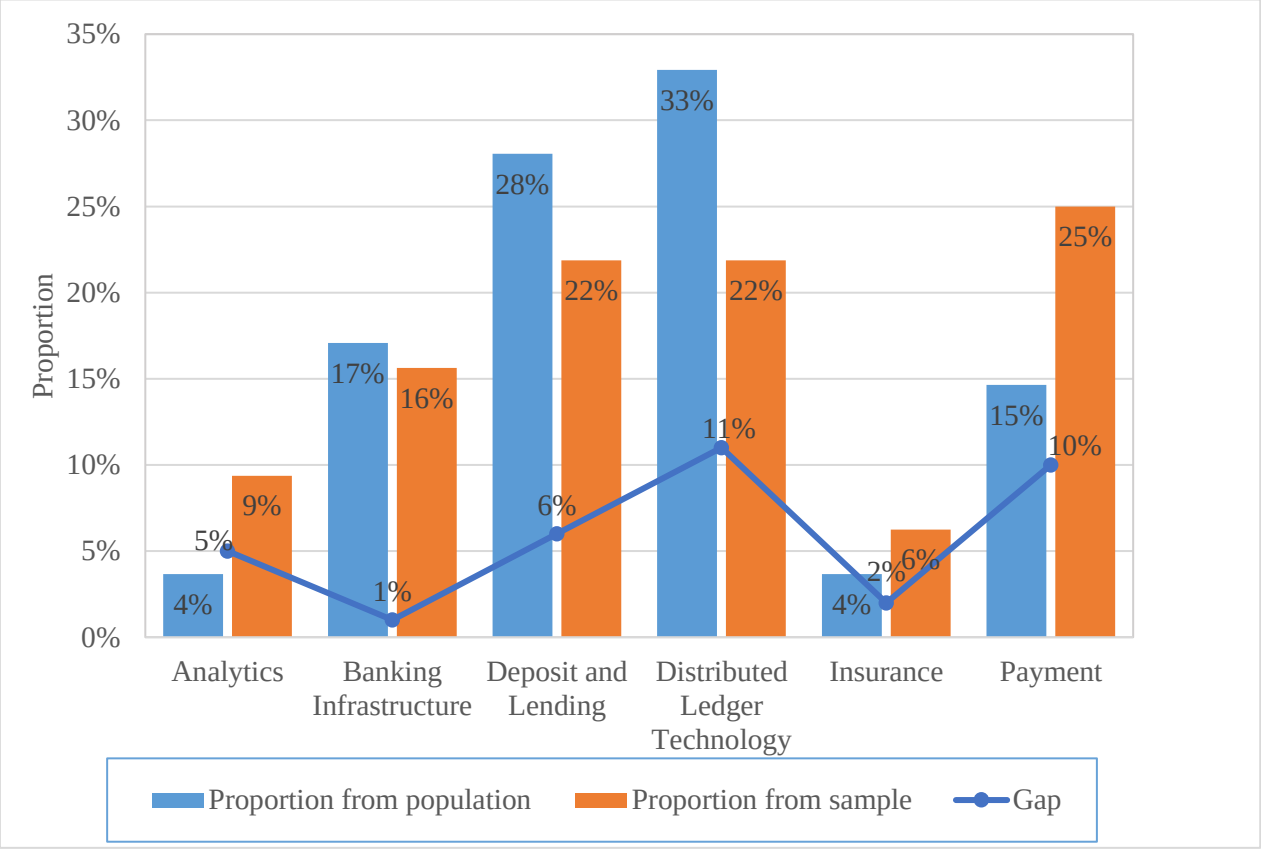

Figure 4. Proportion from sample and total population of survey by company type
Source: Author of this thesis based on the outcome of survey

The gap between the proportion of companies from the sample and the proportion from the population is smallest for banking infrastructure and insurance. The negative gap is the highest for distributed ledger technology. This group forms 33% of the total population, but only 22% from the sample. However, as the group is biggest in total numbers, their opinions are still well

represented sharing 2nd and 3rd place in terms of proportion from the sample with deposit and lending FinTechs. During the period for survey, distributed ledger technology FinTechs were also the most difficult to reach over the phone, thus the means for reaching those companies are limited. The positive gap is considerable for payment FinTechs. Payment FinTechs form 15% of the total population, but 25% of the sample due to the high response rate in this group. One of reasons might be that most of those companies have operated more than 5 years. Thus, they have already formed their opinion about the Estonian FinTech ecosystem and are willing to share it. Due to the high response rate and the highest proportion in the sample, the opinions of this group are slightly better represented in the study than other groups. The gap was also positive for analytics companies, however, the number of FinTechs in this group is only 3 and they all took part in the survey. To measure the representativeness of the sample, the Pearson Chi2 statistic was calculated in Stata. It provides a Chi2 11.93 and p-value of 0.036 meaning that the frequencies of responses do differ from that of the population. This indicates that the presence of representation bias has to be considered while interpreting the survey responses.

2.2. Methodology

This thesis will utilise case methodology for finding answers to the research questions. Case study is a favoured research method when (Yin 2009, 2-14):

1) "how" or "why" questions are raised,
2) the researcher does not control and manipulate the ones involved in the study and
3) the focus is on a contemporary phenomenon in real-life.

This thesis concentrates on FinTech ecosystem development in Estonia that is indeed a contemporary event. In addition, due to the use of multiple methods the risk of manipulation is low and the aim of the study is built on "how" and "why" questions. Therefore, the case study is suitable for the empirical research of current thesis.

All empirical researches should have a research design, which is a logical plan that connects research questions with conclusions. In between, there are several steps including data collection and analysis of that data. However, the important step before data collection is theory development. (Yin 2009, 26, 35) The first paragraph of this thesis is forming the theory development. It is possible to use several methods in the case study for following the research design. (Yin 2009, 13) The thesis utilises within the case study a survey to gather information from Estonian FinTechs.

In addition to the survey, the interviews with the representatives of FinTech companies, traditional bank, Ministry of Finance, Financial Supervision Authority, and the Central Bank of Estonia are carried out. For analysing the regulatory environment of the Estonian FinTech landscape, also the document analysis is used. For analysing the gathered information, the thesis utilised PEST approach. All employed methods are discussed in greater detail in the following sub-sections. These methods fall under the category of qualitative research. Qualitative data refers to a data collection technique or data analysis procedure that uses non-numerical data (Saunders 2011, 151).

Case study design maximises its quality through construct validity, internal validity, external validity, and reliability. Construct validity means using multiple sources of evidence (Yin 2009, 41). The current thesis does not solely rely on the opinions of FinTechs, but also discusses the same topics with regulators and incumbents. Also, the use of documents broadens the evidence base. Therefore, it can be concluded that the construct validity criteria is met. Internal validity means establishing a causal relationship between certain conditions. (Yin 2009, 41). This can be ensured through the interviews which allow asking "why" and "how" questions. In addition, using pattern matching helps to strengthen the internal validity. In this thesis, the observations from the literature review are compared with the information received during the research. The case study improves the external validity of generalizing the findings. (Yin 2009, 40-45). In the current thesis, the results received during the study and interviews have been generalized to the population of Estonian FinTechs by comparing the findings and establishing common features of the information received from different players of the ecosystem. For achieving reliability, it is important to document the steps takes so that the same procedures could be repeated by external parties. (Yin 2009, 40-45). The documentation of steps is provided in the following sub-sections. The survey template is presented in Appendix 2 and the interview topics are mentioned in section 2.2.2.

2.2.1. Survey

A survey is popular and used strategy in business and management research, because it enables to obtain data about opinion, behaviours and attributes. They enable collections of big amount of data from a sizeable population in a sensible way. Also, the data collected using a survey is usually quite standardized. (Saunders 2011, 144, 401) Although a survey could be used as the only data collection method, it is advised to be linked with other methods. The survey can be used for example to receive initial information and could be followed by in-depth interviews to explore and understand the opinions. (Saunders 2011, 362) This thesis also utilises in addition to the web-based survey interviews with the participants in the survey.

The survey questions used in this thesis are based on the IFZ FinTech Study 2018 questionnaire (Ankenbrand, Bieri, Dietrich 2018) and have been modified[1] to evaluate the Estonian FinTech development (for a survey template see Appendix 2). The survey is built around Osterwalder and Pigneur business model canvas. Osterwalder and Pigneur (2010) business model canvas is a strategic management tool tested around the world that allows to describe the company's business model. Osterwalder and Pigneur model comprises of nine blocks which constitute important parts of any business. These blocks are: key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, revenue streams, and cost structure. (Osterwalder, Pigneur 2010, 14-17)

Customers are the core of any business model as without customer, the company is not able to survive. Customer segment building block determines the groups of people or organizations the company wishes to reach in order to sell them company's services or products. Customers segment is connected with the value proposition building block. The value proposition includes the characteristics that should differentiate the company from its competitors. The created value can be quantitative (price, speed of services) or qualitative (appearance, customer experience, usability, status). Value propositions can be innovative and constitute a new or disruptive offer. (Osterwalder, Pigneur 2010, 20) FinTechs achieve the differentiation by using technology-enabled solutions to established services and products (Ankenbrand et al. 2018, 5). The channel building block explains how the company communicates with its customers. The customer relationship building block describes the relationships a company has with specific customer segments. (Osterwalder, Pigneur 2010, 26-28) In Fintech, the channels to reach clients can be digital, personal or a mix of the two (Ankenbrand et al. 2018, 5). The revenue streams building block describes the income company generates from its business activities (Osterwalder, Pigneur 2010, 30-31). FinTech companies have some revenue streams similar to the banks, such as interest, commission or trading, some similar to the software industry, such as licensing fees or software as a service (SaaS), or some new models like selling advertising space or data (Ankenbrand et al. 2018, 6). The key resources building block analyses the assets required to operate. The key resources depend on the type of the business model and can be physical, financial, intellectual or human. The key activities building block refers to the activities a company must undertake to make its business model work. Key activities depend on the business model type and stage of the business cycle.

[1] The questionnaire is modified by Laivi Laidroo, Mari-Liis Kukk, Liina Voolma and author of this thesis. The questionnaire will also be used for preparing the report of Estonian FinTechs.

The key partnership building block concentrates on the supplier and partner that make the business model work. The cost structure focuses on the costs that occur during the operations. There are two main cost structures – cost-driven and value driven. Cost-driven models are aiming to minimize the costs, but the value-driven models are more focused on value creation and do not care so much about the cost implications. (Osterwalder, Pigneur 2010, 34-40)

As the current thesis concentrates on the FinTech ecosystem in Estonia, but the survey covered a broader base, not all the questions asked in the survey are used for answering the research questions of this thesis. However, the purpose of having additional questions, was to make this survey usable for future research.

One part of the survey is the sentiment analysis. Sentiment analysis is also known as opinion mining. Opinions can be expressed on anything, e.g. a company, a service, a product, a topic. (Liu 2010, 1, 32) An essential part of information-gathering behaviour is to understand what other people think. With the rising availability and popularity of opinion-based resources such as online review sites, blogs, new possibilities, and challenges emerge as people actively reach out to understand the opinions of others. (Pang, Lee 2008, 6) In the sentiment analysis, the companies were asked to rate how pressing certain challenges are for their business on a scale from 1 (not pressing) to 10 (extremely pressing). The challenges include finding customers, access to finance, costs of production or labour, availability of skilled staff or experienced managers, regulation, and expansion to international markets. The sentiment analysis is based on the survey carried out by the European Central Bank with the addition of expansion to international markets (European Central Bank 2018).

The survey has been carried out electronically using Google Forms platform. The questionnaire was distributed to the participants in two languages: English and Estonian. The full questionnaire in English is available in Appendix 2. The questionnaire in Estonian is identical to the one in English. The survey was sent to the FinTech representatives first time on 18 February 2019 and the second time as a reminder on 7 March 2019. The deadline for providing answers was 12 March 2019. After 12 March 2019 the number of received responses was approximately 20. To increase the amount of participants, the companies that had not yet provided their answers, those FinTech representatives were called to remind them the survey. Some of the companies were also approached via LinkedIn and Facebook. After the personal contact, about 10 more companies participated in the survey. Thus, the total amount of received answers is 32 Estonian FinTechs.

From these responses, 18 were to the Estonian language version and 14 to the English language version of the survey.

2.2.2. Interview

In addition to the survey, selected participants of the survey were interviewed to get more insights on the Estonian FinTech landscape. The semi-structured interviews were held in the form of the meeting or over the phone. Four of the five interviews were held in Estonian, one in English. FinTech representatives were selected amongst those who agreed to be interviewed in the course of the survey. The interviews were done with representatives of five different companies. During the interviews with FinTech representatives the following topics were covered:

1) the background of the company;
2) triggers behind Estonian FinTech landscape development;
3) pros and cons of establishing a FinTech is Estonia;
4) pressing issues in Estonia for FinTechs;
5) cooperation possibilities between banks and FinTechs;
6) future of banks and FinTechs coexistence.

Table 2. FinTech companies interviewed for the thesis

Code of the person interviewed	Field of activity of the company	Position in the company
Interviewee A	Insurance	COO
Interviewee B	Analytics	CEO
Interviewee C	Distributed Ledger Technology	CCO
Interviewee D	Banking Infrastructure	CEO
Interviewee E	Deposit and Lending	COO

In addition to the interviews with FinTech companies, also the representatives of the regulators – the Ministry of Finance, the Financial Supervision Authority, and the Central Bank of Estonia were interviewed with the purpose of understanding their view on the following topics:

1) the need for improving and changing the regulations to the emergence of FinTechs
2) increase of supervision
3) regulatory sandboxes
4) cooperation between regulators and FinTechs
5) disruptive nature of FinTechs

Interviews were carried out in Estonian.

Table 3. Regulators interviewed for the thesis

Code of the person interviewed	Regulator
Interviewee F	Ministry of Finance
Interviewee G	Financial Supervision Authority
Interviewee H	Central Bank of Estonia

As a third important element of FinTech ecosystem, the representative of the traditional financial institution (Interviewee I)– AS SEB Pank – was interviewed to get insights about cooperation and competition between FinTechs and banks. The interview was carried out in Estonian.

As some of the interviewees did not wish to publish the full interviews, some of the transcriptions do not include the full content of interviews. In addition, the transcription of interview with the Central Bank of Estonia is not disclosed on the request of interviewee. To maintain the anonymity of the interviewees, their names have been replaced with codes listed in Table 2 and 3. The same codes are used in chapter 3 when referring to the specific person. Transcriptions of all interviews are available in the external electronic Appendix that is accessible in Google Drive: https://drive.google.com/open?id=1k6iOIp8Vg_hJdLzO9hkX_QSR6glsSaSq.

In terms of interviews, it is important to consider interpretive validity which refers to the accurate understanding of participants' opinions by the researchers. It is important that the researcher understands the information from the participants perspective. For achieving interpretative validity, it is important to verify the provided insights. (Johnson 1997) In the course of interviews, where appropriate and necessary, the received information was rephrased and crosschecked with the interviewee.

2.2.3. Document Analysis

Document analysis is a method that systematically reviews and evaluates documents. It covers printed and electronic materials. Documents provide background information, historical insights, supplementary research data and means of tracking change and development. Document analysis involves content analysis, which means organising the information into the categories related to the questions of the research. (Bowen 2009) The current thesis utilizes the document analysis for analysing the survey results, different laws and regulations applicable to FinTech sector. The laws analysed included Credit Institutions Act, Creditors and Credit Intermediaries Act, Financial Supervision Authority Act, Money Laundering and Terrorist Financing Prevention Act. In

addition, the guidelines published by the regulators have been analysed. The guidelines include several topical overviews on the Financial Supervision Authority webpage, but also Communication from the European Commission on FinTech Action plan. From these documents, the items linked to FinTechs were identified and are used in the discussion in chapter 3.

2.2.4. PEST Analysis

The PEST analysis is commonly used for considering the external business environment. PEST is an acronym for political, economic, social and technological factors. Political factors include legislation, fiscal policy etc. (Gupta 2013) Economic factors comprise of availability of financing, taxation, economic trends, interest rates. Social factors include the level of education, availability of labour, talent environment, and technological factors include technological innovations affecting the companies. (Sammut-Bonnici and Galea 2015). The underlying idea of PEST analysis is that companies need to react to changes in its external environment and are affected by those changes (Gupta 2013). In the current thesis, the PEST analysis is used for examining the Estonian FinTech ecosystem characteristics by analysing the datasets provided by the World Bank, OECD and other sources.

3. THE ESTONIAN FINTECH ENVIRONMENT

3.1. Regulatory framework

Understanding the regulatory framework is essential for FinTechs for comprehending which activities need regulatory authorisations or licenses. There are two sides of the regulatory framework. One is that some of the FinTechs are created because of the opportunities given by the regulatory framework and the other side is the compliance with regulations. According to Interviewee H, in the EU the regulatory arbitrage is one of the reasons for the growth of FinTechs. As the banks in Estonia and more broadly in EU already offer a wide range of financial services, the actual need for services provided by the FinTechs is much smaller than in developing countries. At the same time, if FinTechs go pass from certain regulations, there are risks involved. Interviewee H mentions the same risks that are highlighted by Interviewee F as reasons triggering the need for regulations. According to Interviewee F, the main reasons that trigger the need for regulations are investors and consumer protection. The second reasons is to ensure equal treatment for all market participants.

As Estonia is part of the EU, the regulations start from the EU level. According to the Interviewee F, in most cases, it is not reasonable to start with new regulations on the state level before the EU has introduced EU wide regulations in this area. However, sometimes the problem is that the legislative processes at the EU level take too much time. Therefore, in certain areas, Estonian legislative bodies have felt that it is necessary to proceed with regulations on a national level for consumer protection purposes. One of those areas was crowdfunding: providing P2P consumer loans was regulated by Creditors and Credit Intermediaries Act at 2015 and it was under discussion whether the regulation should involve also other types of crowdfunding. As the European Commission as presented the draft of regulation on crowdfunding, the additional local regulation is not needed and the regulator will focus on other areas of FinTech.

In March 2018, the European Commission introduced its action plan on FinTech to foster a more competitive and innovative European financial sector. The purpose of the action plan is to (European Commission 2018):

1) Allow innovative business models to scale up.
2) Support the uptake of new technologies like blockchain, AI etc.
3) Deepen cybersecurity and the integrity of the financial system.

The aim of those initiatives is to enhance the supervisory approach toward technological innovation and prepare the EU financial sector for taking advantage of the opportunities created by the new technologies. Another important change in the EU level is the new version of the payment services directive, known as PSD2. The purpose of this directive is to create a level playing field for competition for different companies engaged in payment services. In this way, it also encourages innovation. At the same, it is designed in the way that the security risks are minimised and consumers' rights are protected. (Financial Supervision Authority 2019a)

In Estonia, the main regulator supervising the financial market is the Financial Supervision Authority. Its regulatory powers are based on the Financial Supervision Authority Act. (Financial Supervision Authority Act §1) Financial Supervision Authority supervises and issues licenses to banks, insurance companies, insurance intermediaries, investment firms, fund managers, investment funds, pension funds, payment and e-money institutions, creditors, credit intermediaries, and securities market. (Financial Supervision Authority 2019b) In some of the areas not covered by the Financial Supervision Authorit,y the activity licenses are granted by the Financial Intelligence Unit. Those areas of activity include (Money Laundering and Terrorist Financing Prevention Act § 70)

1) operating as a financial institution (unless authorisation has been granted by the Financial Supervision Authority);
2) providing services of exchanging a virtual currency against a fiat currency;
3) providing virtual currency wallet services.

According to the Estonian regulators, Estonian laws are technologically neutral. This means that important is the content of the financial service, not the means of providing the service. There is no FinTech specific regulation. Therefore, there are many different laws that can be applicable to FinTech.

Banks and creditors are regulated with The Credit Institutions Act and The Creditors and Credit Intermediaries Act. The main activity of a bank is to receive money from the public in the form of deposits and to issue loans. To operate a credit institution, an activity license has to be applied from the Financial Supervision Authority. (Credit Institutions Act §4, §6, §13) The creditor is an institution that provides credit to private persons, provides payment deadline extension for a fee, leasing or similar financial help. If the creditor is providing all those services in its own name, the credit intermediary does it on behalf and on the account of the creditor. For operating as a bank, creditor or credit intermediary, the company has to apply for an activity license granted by the Financial Supervision Authority. (Financial Supervision Authority 2018a). For avoiding the obligation to apply for the credit institution license, the FinTechs should be very careful not to receive deposits from the public.

Investment firms, fund managers and investment and pension funds are regulated with the Investment Funds Act. Investment services include (Financial Supervision Authority 2018b):

1) buying and selling securities on the client's account;
2) receiving orders for securities transactions from clients and forwarding them or carrying them out on the client's account;
3) trading in securities;
4) managing client's security portfolios;
5) underwriting the issue of securities;
6) organising the issuance of securities, public offers.

The main tasks of a fund manager are to manage a fund or securities portfolio, including the issuance of fund shares, deciding the investment policy, accounts keeping. For operating as an investment firm or manage investment and pensions funds, the company needs to apply for a license from the Financial Supervision Authority. (Financial Supervision Authority 2018b)

Insurance companies are regulated with the Insurance Activities Act. An insurance company's main activity is to take on the risks of the policyholder under an insurance contract and if an insured event occurs to pay out compensation. Insurance is divided into non-life and life insurance. An insurance intermediary is a company specialising in an intermediating insurance contract by earning a broker fee or agent fee. The insurance broker represents the interest of the policyholder while the agent represents the interests of the insurance company. (Financial Supervision Authority 2018c)

The companies engaged in payment and e-money services are regulated by the Payment Institutions and E-money Institutions Act. A payment company is a company engaged in providing payment services. An e-money company is engaged in issuing electronic money (an instrument like card or computer memory that allows monetary units to be stored electronically) its own name. The activity license for such activities is issued by the Financial Supervision Authority. (Financial Supervision Authority 2018d)

Another important regulatory aspect in relation to financial services is countering money laundering. The main act regulating this area is The Money Laundering and Terrorist Financing Prevention Act. The main institutions leading the fight against money laundering are the Estonian Financial Intelligence Unit, Financial Supervision Authority, and investigatory bodies. (Financial Supervision Authority 2019c) In addition to the other functions, the Estonian Financial Intelligence Unit is also responsible for issuing authorizations for companies engaged in services of exchanging a virtual currency against fiat currency and providing a virtual currency wallet services (Money Laundering and Terrorist Financing Prevention Act § 70). However, according to the Interviewee F and Interviewee G, the only control related to issuing those activity licenses, is making sure that the persons related to the company are not under money laundering suspicions. There is no comprehensive supervision about the companies with the license. At the same time, the activity license gives those companies an opportunity to present themselves as trustworthy partners. Thus, it is worth considering moving the issuance and supervision of cryptocurrencies related licenses under the Financial Supervision Authority. The proposals for amendments of the Money Laundering and Terrorist Financing Prevention Act are presented to the Parliament of Estonia and its aim is to increase the control over the seat (location) and management board of the companies related to virtual currency activities.

In terms of regulation, it is also important to discuss initial coin offerings (ICO). Cryptocurrencies offering provide new opportunities for raising capital, however, several questions have arisen about the legal framework. There is no specific law in Estonia that regulates ICOs, however, the Financial Supervisory Authority has provided some guidance about the regulatory side of ICOs. According to the Financial Supervision Authority, the token offering depending on their structure might be considered as securities subject to the Securities Market Act. As every ICO is unique, they should be assessed based on their characteristics. If the tokens give investors certain rights in issuer company or if tokens value is connected to the future profits or revenue of a business, they could be considered as securities in the meaning on Securities Market Act. In this case, organising

ICO of such tokens may require the prospectus according to the Regulation on the prospectus. In addition, the ICO may be governed by the Credit Institutions Act if the main activity of the business is providing loans on its own name and the financing of such activities is by funds received in the form of an ICO. As mentioned above, some of the activities related to the cryptocurrencies are subject to the Money Laundering and Terrorist Financing Prevention Act. (Financial Supervision Authority 2018e) According to Interviewee F, in case of ICOs, it is necessary to understand the content of the offer – if it has all the characteristics of a security, it should fall under the legislation applicable for securities. The Financial Supervision Authority is applying this approach when checking ICOs. In terms of ICOs, there are some companies that are approaching the Financial Supervision Authority for guidance already before executing the ICO, but there are also companies that try to avoid the regulator. According to Interviewee F, there is a plan for working paper that discusses the need for improving the legislation in relation to ICOs. In addition, there is a need of harmonizing the requirements for information that should be presented to the ordinary investors to ensure investor protection. It is also in the interest of the market participant, that there is a better legislation. Based on the regulation they could make sure that they are not convicting a fraud. However, at the same time, the market participants itself are not sure how the regulation should look like. Therefore, it can be concluded that there is room for improvement in the legislation related to the blockchain technologies and cryptocurrencies and there is a need for clearer guidance from the regulator.

Based on the survey, it appears that many of the Estonian FinTechs (13 respondent from 32) feel that the regulatory requirements do not restrict their activities at all, however, at the same time regulations was ranked as the most pressing issue in the sentiment analysis. Some of the respondents highlighted that the regulations are necessary for fraud prevention and it is important to cooperate and grow with regulators. Although the regulations might not directly restrict FinTech activities, keeping up with the regulatory and licensing requirements is time consuming as the applicable legislation is spread across different laws. At the same time, some of the FinTechs feel that the Estonian Financial Supervision Authority applies the regulations in the strictest way being ultraconservative and not cooperative. According to the Interviewee G, the Financial Supervision Authority sees as their main task to ensure the stability of the financial sector, reliability, transparency, and protection of investors and they can act on the basis of those targets. However, Interviewee G considers cooperation important as well for understanding the market trends and developments. In their view, the supervision does not exclude cooperation.

In addition, in relation to the regulation, several survey respondents mentioned the need for a regulatory sandbox. As described in section 1.3. the main aim of the sandboxes is to allow FinTechs to test their innovative solutions without fear of regulatory consequences. According to Interviewee D, the regulatory sandboxes would be good for FinTechs, but also for regulators as this gives them an opportunity to understand what the company in the sandbox is actually doing. Regulators do not always recognise the modern business models. The sandbox would allow better understanding of the company's activity. In the opinion of Interviewee B, Estonia could be itself a sandbox as the market is small enough, the risks in case of failure are not so big. There could be a forum, a regular roundtable for communication between government, including Consumer Protection Authority, banks, FinTechs to share ideas to develop good practices. It would enable to be active in the ecosystem. Estonia has a unique opportunity to be highly innovative as Estonia is small enough. The risk that something goes wrong is smaller and if it happens, the consequences are not so substantial and the correction of mistakes can be very quick. Interviewee H is in the opinion that Estonia could be considered as regulatory sandbox already now without taking any extra steps. The reason is that Estonia is so small that when starting a new business in Estonia, the company already receives extra attention from regulators and this gives the company certainty that their business is legitimate. In addition, due the smallness, Estonia could be flexible in terms of amending the regulations when it is clear that the regulations stop businesses for developing their business. In addition, the common view of regulators is that the FinTechs might not fully understand that sandbox is not something that allows the company engage in business without any licenses or supervision. In reality, operating in the sandbox usually means more reporting, compliance obligations and tighter communication with authorities.

Based on the information received from Interviewee F and Interviewee G, there is a project for analysing how to open the Estonian regulatory framework more for innovation and FinTechs. The idea is to find the best solution for Estonia- it could be a regulatory sandbox or something else. According to Interviewee G, the financial Supervision Authority already has an innovation hub. However, this hub is not widely known and there is not much public information and guidelines. Improving the hub is in progress.

Based on the discussions around regulations, Estonian regulatory framework does not restrict the activities of FinTechs on a larger scale, however, due to the lack of guidelines and public information, the regulatory framework neither supports the FinTech Development. In order to be

supportive in relation to the financial innovation, the Supervision Authority should improve its innovation hub and provide more publicly available guidance to the FinTechs.

3.2. Sentiment Analysis of Estonian FinTechs

Sentiment analysis is based on responses of 32 FinTechs provided in the survey. It focuses on the challenges faced by the Estonian FinTechs. Figure 4 below shows the results from the survey.

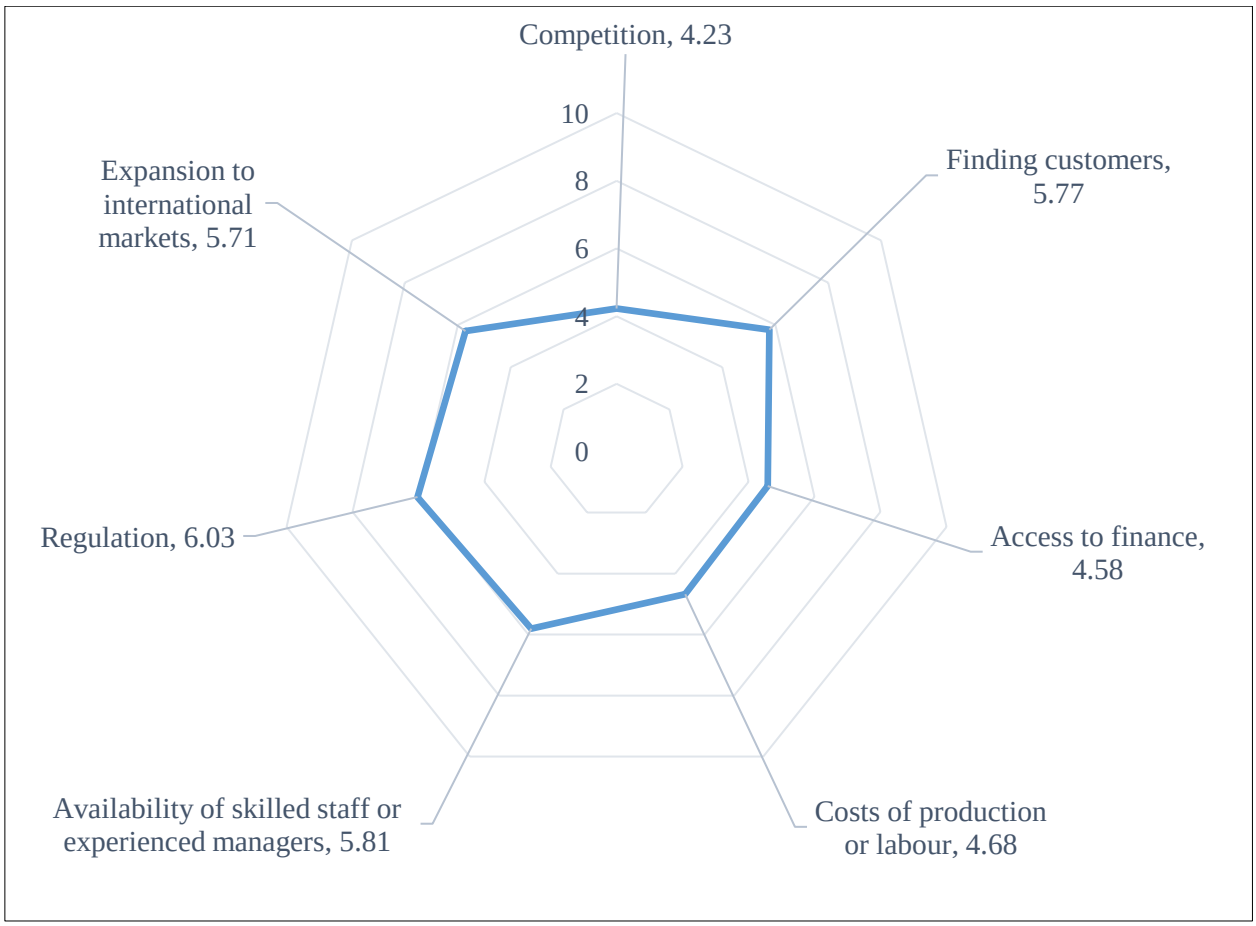

Figure 5. Sentiment analysis of Estonian FinTechs
Source: compiled by the author of thesis based on the survey results

The most pressing issue among Estonian FinTechs is regulation with an average score of 6.03. It is one of the most pressing issues across all the FinTech types. It is followed by the availability of skilled staff or experienced managers (5.81), finding customers (5.77), expansion to international markets (5.71), costs of production or labour (4.86), access to finance (4.58) and competition (4.23). When analysing the average scores by the FinTech type, it appears that finding customers

is the most pressing issue for analytics, banking infrastructure and insurance companies. Customer management is one of the six main challenges mentioned by Lee and Shin (2018). For deposit and lending companies the most challenges is finding skilled staff and for payment sector it is difficult to expand to international markets. Distributed ledger technology companies find regulation the most challenging issue. As discussed in section 3.1, the regulations and supervision in relation to the blockchain enabled services are divided between the Estonian Financial Intelligence Unit and Financial Supervision Authority. Thus, it can be challenging for those companies to follow all the regulatory requirements.

If the results of Estonia are compared to the sentiment analysis of Swiss FinTech Study (Ankenbrand et al. 2019), it can be observed, that in Switzerland the most pressing issue across different types of companies is finding customers. One of the reasons mentioned in the Swiss FinTech Study is the difficulty of finding customers in the B2B segment due to the unwillingness of cooperation from traditional financial institutions. In terms of Estonia, the cooperation between banks and FinTechs is discussed further in section 3.4. Regulations are not so pressing issue in Switzerland, as these are only on the fourth place. This could be explained by the fact that Switzerland has FinTech specific regulations that comprise of so-called FinTech license, regulatory sandbox, and the settlement account exemption.

3.3. Estonian FinTech Environment Characteristics

An important factor of a country is the favourability of its business environment. The annual Doing Business Report by The World Bank is a well-used publication in this regard. The report consolidates multiple business factors such as the ease of starting a business, getting credit or paying taxes into a ranking of 190 countries. In the report for 2019, Estonia ranked on the 16th position among 190 countries. (The World Bank, 2019) At the same time According to the Global Financial Centres Index Tallinn ranks only in 94th position. However, this index covers cities, not countries. The index was compiled based on the quantitative measures provided by World Bank, The Economist Intelligence Unit, OECD and the United Nations. (Yeandle, Wardle 2019, 2, 5).

The ease of doing business in Estonia was also mentioned as one of the reasons for establishing FinTech in Estonia during the interviews. According to Interviewee D Estonia is very entrepreneurial friendly. In terms of the health of the entrepreneurship ecosystem of Estonia, in the

Global Entrepreneurship Index Estonia holds the 23rd place. The Global Entrepreneurship Index measures the quality of entrepreneurship and also the extent and depth of the supporting entrepreneurial ecosystem based on 14 components. Estonia had the highest score in opportunity perception and lowest in risk capital. The score was also high in start-up skills. (Acs et al. 2017)

In terms of the social environment for the FinTech ecosystem, the availability of skilled labour is essential. The survey participants have highlighted as one of the triggers behind Estonian FinTech development the talented human resources. According to the IMD World Talent Ranking, growing a skilled and educated workforce is highly important for competitiveness. The performance of the countries in the IMD World Talent Ranking includes three factors. The "Investment and Development" factor measures the resources engaged in increasing the home-grown workforce. The "Appeal" measures the attractiveness of local and foreign talent. The "Readiness" measures the quality and competencies of human resources. In the IMD World Talent Raking 2018, Estonia ranks in 16th position in Investment and Development, in 33rd position in Appeal and in 31st position in Readiness. There has been progress compared to the previous years due to improvements in worker motivation, attractiveness for highly skilled foreign labour, availability of finance skills, competent workforce of the managerial level, language skills, and effective education system. Overall Estonia holds 28th position, while the top three of the countries is Switzerland, Denmark and Norway. At the same time, Latvia and Lithuania are behind Estonia holding 35th and 36th position respectively. (IMD World Competitiveness Center 2018, 3, 15, 24, 50) In relation to the labour, FinTechs mentioned in the survey that Estonian governmental institutions could contribute to the FinTech Development by lowering the employment taxes.

In relation to the highly skilled foreign labour, an important initiative in Estonia is a start-up visa. A start-up visa allows foreign entrepreneurs to settle in Estonia for up to 18 months to establish their company. The person who wishes to benefit from this visa has to be engaged in the start-up business. (Startup Estonia 2019). The persons interviewed for the thesis also highlighted the importance of a start-up visa. Many FinTechs have used the opportunities provide by the start-up visa and consider it as an important measure for attracting foreign labour. In addition to the start-up visa, the convenience of the e-Residency program has been highlighted. In relation to the e-Residency as the negative aspect, the obstacles opening a bank account in Estonia were raised. Therefore, FinTechs suggested that opening a bank account for Estonian e-residents should be simplified to a certain extent. According to the Interviewee I, for banks it is important to protect

their reputation, thus they are taking the requirements of client identification very seriously. It is not in their interest to indulge on the requirements for a few extra clients.

In terms of the customer base for FinTech companies, the main restriction comes from the smallness of Estonia. In terms of B2B services (mainly incumbents), there are banks in Estonia 9 (Financial Supervision Authority 2019d) compared to the more than 200 banks in Switzerland that is considered as globally leading financial sector (Ankenbrand 2019). Thus, the base for B2B services in Estonia is limited. In terms of B2C services, the population of Estonia sets its limits. Therefore, FinTechs need to consider expanding to foreign markets. Interviewee B and Interviewee D have highlighted this as a positive aspect. Doing business in a small country means that you are building an international company from start, as otherwise the market would be too small. In the survey, only one company said that they focus their business on the Estonian market. The rest of the companies consider their activities at least to some extent international.

In terms of technology, Estonia is one of the highest-ranking countries in terms of internet access (90.5%) and high-speed fibre in fixed broadband Internet connections (37.36% are fibre connections in total fixed broadband) (OECD 2019a). Estonians are considered tech savvy and this is supported by OECD study "Measuring the Digital Transformation". According to the study, Estonia ranks first in the average time spent on the Internet daily that is more than 4 hours. In terms of mobile penetration, Estonia is ranking in the top three in terms of mobile broadband subscriptions as well as average monthly mobile data usage. (OECD 2019b) Although the B2C segment in Estonia is not very big due to the population of Estonia, it can be expected that the innovative services are used willingly.

According to Interviewee A, generally Estonian FinTech ecosystem is already very good. The reasons for the strong FinTech environment are historical as Estonia was already in Soviet times in the forefront with its Cybernetics Institute that was one of the competence centres for cybernetics. The Estonian government contributes to the kick-start of the development with its e-state and procurements for development of it. The state and private companies have worked together as partners. In Swiss FinTech Study, the lack of e-government services was mentioned as one of the drawback of Swiss FinTech Ecosystem (Ankenbrand et al. 2019). In case of Estonia, the e-state solutions the opposite, support FinTech development.

Ankenbrand et al. (2019) compiled on Swiss FinTech study FinTech Hub Comparison based on PEST approach using 66 performance indicators. In 2019 study, Tallinn is in 21st position appearing in the ranking for the first time. The first place in the ranking belongs to Singapore, second and third positions to Swiss cities Zurich and Geneva respectively. It is worth mentioning that Riga and Vilnius are not in top 33 that is officially disclosed. Therefore, in this sense based on those indicators, Estonian FinTech ecosystem could be considered more appealing.

According to Interviewee B, Estonia currently does not have a big vision in relation to the FinTech ecosystem development. Estonia should follow Lithuania that is challenging London in terms of issued e-money licenses. Estonia should change its attitude- not only controlling the FinTechs, but also contributing to the development of FinTechs. Important factors that could enable FinTech development are the good business environment, availability of skilled labour, and Estonians language skills.

3.4. Banks and FinTechs

During the interviews with FinTech representatives, the advantages of FinTechs over banks were discussed. Interviewee C highlighted that banks have bigger structures that do not allow quick changes. A similar opinion was also expressed by Interviewee B. FinTechs advantages in front of banks is the speed of doing changes, creating and implementing interfaces etc. However, the banks have bigger organisational structures that do not allow quick changes. In addition, the banks cannot afford to fail with application because they are conscious about their brand, name, and reputation. Based on the survey and interviews banks and FinTechs cooperate in many ways by providing services to each other. Some FinTechs cooperate with banks and provide them with developed services and products, some just use regular services of banks like a bank account, payments etcIn some areas the banks and FinTechs are also competitors and drive the development of financial services in this way.

The below figure gives an overview of the main areas how FinTechs cooperate with banks.

Figure 6. FinTech-Bank cooperation models
Source: Based on the survey

Based on the interview with Interviewee I from SEB, SEB is contributing to the bank-FinTech cooperation in several ways through different programs that include investment and cooperation opportunities. In addition to contributing to the cooperation between bank and FinTech, those programs also provide chances for collaboration with other FinTech companies. SEB is already working together with different FinTech companies. The main idea behind cooperation is to find a new value proposition for SEB clients. In return, it is a good opportunity for FinTechs to grow its client base. In addition, the cooperation with banks gives FinTech company a certain quality mark. The banks choose carefully its partners due to the regulations and reputation risks. The most challenging aspect for banks in cooperation with FinTechs is the experimenting phase and how to do it as fast as possible. For banks there is more to lose than win. It might be difficult to find

reasons for taking such risks and spending resources. Another challenge for banks is the long decision-making process, where the opinion of many people needs to be considered.

The survey carried out among Estonian FinTechs included the question about FinTechs view on the future of banks and FinTechs. The respondents were provided with the scenarios described by the BCBS in section 1.5. The outcome of this question is shown in the below figure 6.

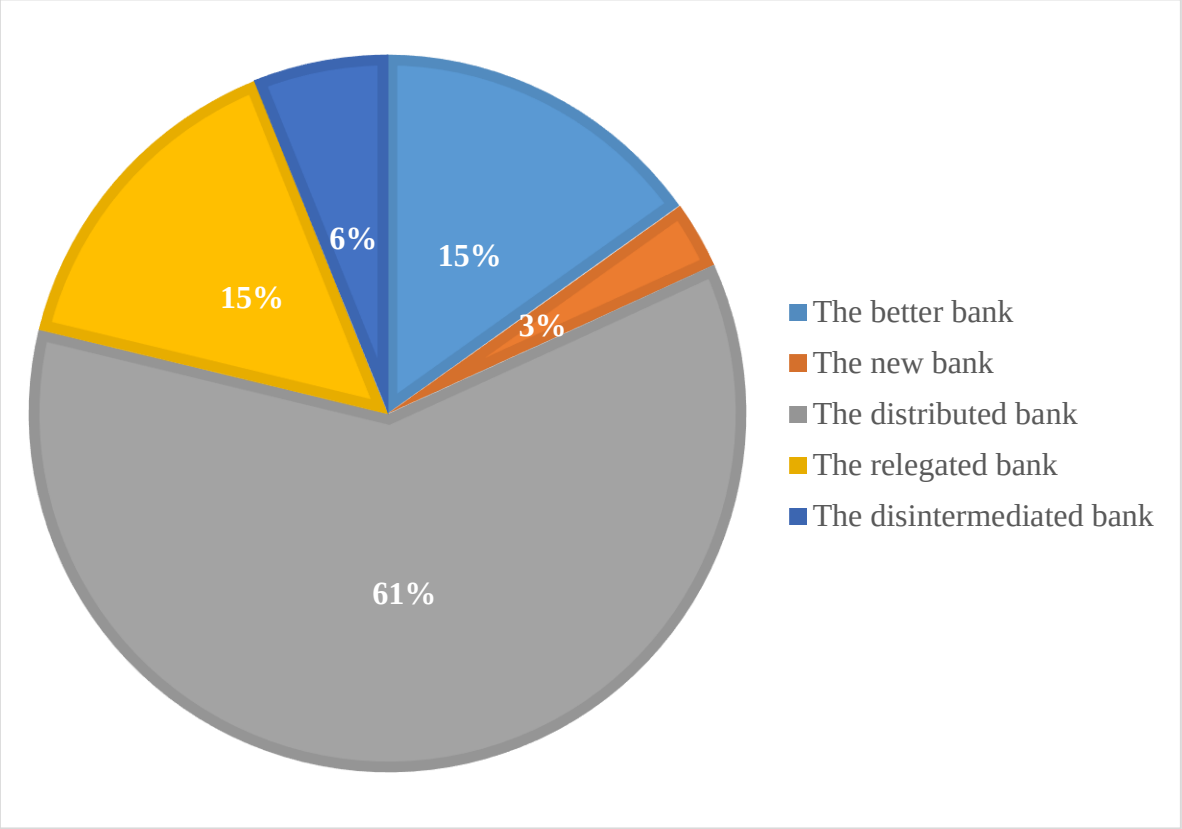

Figure 7. The future of banks and FinTechs
Source: compiled by the author of thesis based on the survey results

As can be seen from the figure, major of the of respondents (61%) think that the future is the distributed bank. This means that Estonian FinTechs believe that banks and FinTech companies will operate as partners and there will be numerous new businesses providing specialized services without an attempt to be universal banks. 15% of the respondents believe the future scenario is the better bank, which means that traditional banks will adopt new technologies, modernize and digitalize. However, 15% of the respondents have the opposite view that the future is the relegated bank. The relegated bank means that traditional banks become commoditized service providers and direct customer relationships are handled by FinTechs. Some of the respondents (6%) think that the future scenario is the disintermediated bank - banks become irrelevant as customers

interact directly with individual financial services providers. Only one respondent is in the opinion that the traditional banks will not survive and will be replaced by FinTechs. During the interviews, the participants also were in the opinion that most likely future scenario is cooperation between banks and FinTechs. It was also mentioned that if FinTech grows to a certain extent it will probably acquire a banking license.

Based on the surveys and interviews, it can be concluded that the current cooperation model between banks and FinTechs will most likely continue in the future and the banks do not disappear. There are already several FinTech-bank cooperations on the market and attitude from the banks is supporting the continuation of such model.

3.5. Implications of the case study

Based on the study, the regulators have the biggest role in developing the Estonian FinTech ecosystem. One the one hand regulatory framework gives opportunities to the FinTech development, but on the other side is the compliance with regulations. Regulation was identified as the most pressing issue in the sentiment analysis. Based on the discussions with FinTech companies and traditional financial institution, the regulations are necessary. However, the regulations should provide some leeway to companies starting its business. Many FinTechs expect from Estonian regulators the introduction of the regulatory sandbox. In their view, this is essential for Estonian FinTech ecosystem development. Another important aspect, in relation to the regulations, is transparency and clearness of laws. In terms of regulation, the first suggestions to the regulators and supervision authorities would be improving the innovation hub that is already established by publishing guidelines that would help FinTechs to manage the compliance requirements. In addition, Estonian regulators should consider introducing the regulatory sandbox to compete with UK and Lithuania.

In terms of general ecosystem characteristics, ease of doing business was mentioned as the reason for establishing FinTech in Estonia. Estonia is considered entrepreneurial friendly. This is supported by the relatively high place in the annual Doing Business Report by World Bank. Therefore, FinTechs should take advantage of the openness of the Estonian ecosystem. Another important factor of the ecosystem, is the availability of skilled labour. In sentiment analysis, it was mentioned as second pressing issue. Estonian governmental organisations have contributed to the

development of this factor by start-up visa and e-residency programs. Both of these initiatives are highly appreciated by the FinTechs. As a negative aspect, FinTechs mentioned the difficulties in relation to the opening a bank account by e-resident. Therefore, in terms of human capital, Estonia should continue with start-up visa program and provide simplifications for e-resident for opening a bank account. As the identification of the customer is important in the financial sector, the regulators should carefully consider the measures how to simplify the process.

In terms of the customer base for FinTech companies, the main restriction comes from the smallness of Estonia. However, FinTech companies see it as a positive aspect as due to the smallness of the Estonian market, the company needs to focus on international markets from the start. From the technological side, Estonian FinTech development is supported by the good technological connections. In addition, one of the factors supporting the technological development is highly developed e-government, mainly through public procurements.

In relation to the disruptive nature of FinTechs, Estonian incumbents to not see it as much as disruption, but more as complementation. The same idea has been highlighted by the FinTechs. Based on the survey, the preferred future FinTech-bank cooperation scenario is the distributed bank. This means that FinTechs and banks operate as partners. This scenario is also already happening. According to the traditional financial institution, they are working together with several FinTechs and exploring more cooperation ways. Moreover, they have established a program that should support FinTech development in terms of financing. The main issue with such cooperations is related to the slowness of internal decision-making procedures of banks. Thus, banks could contribute to the cooperation with FinTechs by taking over some of their procedures in terms of decision-making processes. As the developments in FinTech world are happening at high speed, the slowness of banks could become an obstacle for cooperation.

CONCLUSION

The aim of the thesis is to determine the status of the Estonian FinTech ecosystem and to understand the main factors influencing its development. Previous research has shown that the main impulses why FinTechs are created include regulatory changes and the availability of technologies. Based on the previous research, for analysing the factors affecting FinTech development, it is necessary to analyse the ecosystem and its players. FinTech ecosystem players include in addition to FinTech, regulators, technology developers, government, customers and traditional financial institutions. In terms of regulations, the previous research has shown that it is one of the main challenges for FinTechs and FinTech specific regulation in the form of sandboxes supports the development of the FinTech sector. In relation to the disruptive nature of FinTech, the research indicates the future of FinTechs and banks lays in cooperation.

For achieving the objectives of the thesis, the author uses a case study methodology that encompasses a survey among Estonian FinTech companies, 9 interviews with representatives of the FinTech companies, a traditional bank, the Ministry of Finance, the Financial Supervision Authority and the Central Bank of Estonia. It also covers document and PEST analysis. The population of Estonian FinTechs covers 82 firms and 32 FinTechs responded to the survey.

Based on the study, the regulators have the biggest role in developing the Estonian FinTech ecosystem. On the one hand, the regulatory framework gives opportunities to the FinTech development, but on the other side compliance with regulations. Regulation was identified as the most pressing issue in the sentiment analysis. Based on the discussions with FinTech companies and traditional financial institution, the regulations are considered necessary. However, the regulations should provide some leeway to companies starting its business. Many FinTechs expect from Estonian regulators the introduction of the regulatory sandbox. In their view, this is essential for Estonian FinTech ecosystem development. Another important aspect in relation to the regulations is the transparency and clearness of laws.

In terms of general ecosystem characteristics Estonian business environment, social environment, customer base, technological development and Estonian's ranking based on the PEST approach were discussed. Ease of doing business was mentioned as one of the important reasons for establishing FinTech in Estonia. Estonia is considered entrepreneurial friendly. This is supported by the relatively high place in the annual Doing Business Report by World Bank. Another important factor of the ecosystem is the availability of skilled labour. In sentiment analysis, it was mentioned as the second pressing issue. Estonian governmental organisations have contributed to the development of this factor by start-up visa and e-residency programs. Both of these initiatives are highly appreciated by the FinTechs. As a negative aspect, FinTechs mentioned the difficulties in relation to the opening a bank account by e-resident. In terms of the customer base for FinTech companies, the main restriction comes from the smallness of Estonia. However, FinTech companies see it as a positive aspect as due the smallness of Estonian market, the company needs to focus on international markets from the start.

In relation to the disruptive nature of FinTechs, Estonian incumbents do not see it as much as disruption, but more as complementation. The same idea has been highlighted by the FinTechs. Based on the survey, the preferred future FinTech-bank cooperation scenario is the distributed bank. This means that FinTechs and banks operate as partners. The main issue with such cooperations is related to the slowness of internal decision-making procedures of banks.

Based on the study, the following suggestions for ecosystem players have been compiled:

- The first suggestion to the regulators and supervision authorities would be improving the innovation hub that is already established by publishing guidelines that would help FinTechs to manage the compliance requirements.
- Secondly, Estonian regulators should consider introducing the regulatory sandbox to compete with UK and Lithuania.
- Estonia should continue with start-up visa program and provide simplifications for e-residents for opening a bank account. As the identification of a customer is important in the financial sector, the regulators should carefully consider the measures how to simplify the process.
- Banks could contribute to the cooperation with FinTechs by accelerating their decision-making processes. As the development in FinTech world is happening at high speed, the slowness of banks could come an obstacle for cooperation.

- The suggestion for FinTechs is to take advantage of the openness of the Estonian ecosystem.

Based on the research of the current thesis, Estonian FinTech ecosystem in general is supporting the development of FinTech companies. However, there is room for improvement in certain areas covered with suggestions above. Due to the size of the sample of the current thesis and indication of representation bias, it is necessary to make further research on the topic.

KOKKUVÕTE

FINTECH ÖKOSÜSTEEMI ARENG EESTIS

Kersti Tirmaste

FinTech ettevõtted, kui ettevõtted, kes pakuvad uudseid tehnoloogiapõhiseid finantsteenuseid, põhjustavad märgatavaid muudatusi finantssektoris ja majanduses laiemalt. Käesoleva töö eesmärgiks on välja selgitada Eesti FinTech ökosüsteemi olukord ja kaardistada ökosüsteemi arengut mõjutavad tegurid. Eesmärgi täitmiseks on töö autor püstitanud järgmised uurimisküsimused:

1) Kes on Eesti FinTech ettevõtete ökosüsteemi peamised osalised?
2) Millised peamised tegurid mõjutavad Eesti FinTech ettevõtete arengut?
3) Kuidas mõjutab FinTech ettevõtete arengut Eesti regulatiivne keskkond?
4) Kuidas mõjutab FinTech ettevõtete areng traditsioonilist pangandussüsteemi?

Eelnevad uurimused on näidanud, et peamised FinTech ettevõtete tekkepõhjused on regulatsioonide muudatused ja tehnoloogia kättesaadavus. FinTech ettevõtete arengut mõjutavate tegurite analüüsimiseks on vajalik kaardistada ökosüsteem ja selle osalised. FinTech ökosüsteemi osalisteks on lisaks FinTech ettevõtetele seadusandlikud ja järelevalveorganid, tehnoloogiaettevõtted, riik, kliendid ja traditsioonilised finantsasutused. Eelnevad uurimused on näidanud, et regulatsioonid on üheks peamiseks väljakutseks FinTech ettevõtete jaoks. Mis puudutab FinTech ettevõete ja pankade koostööd, siis eeldatav tulevikustsenaarium on koostöö.

Töö eesmärkide saavutamiseks kasutab autor juhtumiuurinut. Juhtumiuuringu raames kasutatakse küsitlust, intervjuusid, dokumendianalüüsi ja PEST-analüüsi. Elektrooniline küsitlus viidi läbi 82 Eesti FinTEch ettevõtte seas. Nendest 32 vastas küsitlusele. Küsitlusele järgnesid 9 intervjuud FinTech ettevõtete esindajatega, Rahandusministeeriumi, Finantsinspektsiooni, Eesti Panga ja ühe traditsioonilise panga esindajaga eesmärgiga saada rohkem teavet Eesti FinTech maastiku kohta.

Töö empiirilise uurimuse tulemusel selgub, et kõige suurem roll Eesti FinTech ökosüsteemis on regulatsioonidel. Ühest küljest pakuvad regulatsioonid FinTech ettevõtetele võimalusi, aga teisest

küljest on oluline vastavus regulatsioonidele. Vastavalt küsitlusele ja intervjuudele FinTech ettevõete esindajatega, peavad FinTech ettevõtted regulatsioone vajalikuks, aga samas peaks seadusandja pakkuma alustavatele ettevõtetele teatud leevendusi. Mitmed Eesti Fintech ettevõtted ootaksid Eestis regulatiivse liivakasti kehtestamist. Nende hinnangul on see ökosüsteemi arenguks äärmiselt vajalik.

Rääkides üldistest ökosüsteemi omadustest, peetakse oluliseks Eesti ettevõtluskeskkonda. FinTech ettevõtted on maininud ühe olulise tegurina Eestis FinTech ettevõtte asutamiseks ettevõtlussõbralikkust. Seda väidet toetab Maailmapanga vastav raport, kus Eesti on saavutanud küllaltki kõrge koha. Teine oluline ökosüsteemi tegur on haritud ja oskusliku tööjõu kättesaadavus. FinTech ettevõtted hindavad kõrgelt Eesti valituse initsiatiive, mis puudutavad start-up viisat ja e-residentsuse programme. Negatiivse asjaoluna on e-residentsuse programmi juures välja toodud raskused pangakonto avamisel. Ökosüsteemi osaks on ka kliendibaas. Kuna Eesti on väike riik, siis on võimalik FinTech ettevõtete kliendibaas piiratud. Sellest hoolimata peavad ettevõtted ise seda pigem positiivseks teguriks. Tulenevalt väikesest kliendibaasist Eestis, seavad FinTech ettevõtted juba äritegevust alustades eesmärgiks laienemise rahvusvahelistele turgudele.

Mis puudutab FinTech ettevõtete ja pankade kooseksisteerimist, siis pangad näevad FinTech ettevõetes pigem koostöövõimalusi kui nende äritegevust segavat faktorit. Ka FinTech ettevõete hinnangul on oluline koos töötamine partneritena. Peamiseks koostööd piiravaks asjaoluks peetakse pankade aeglaseid otsustusprotsesse.

Uurimistöö tulemusel on töö autor koostanud järgmised soovituste ökosüsteemi osalistele:

- Esimese soovitusena seadusandjatele ja järelevalveorganitele, soovitab töö autor innovatsioonikeskuse arendamist ja täiendavate juhendmaterjalide avaldamist, et aidata FinTech ettevõetel regulatsioonidega toime tulla.
- Teiseks võiks Eesti seadusandjad kaaluda regulatiivse liivakasti loomist, et püsida konkurentsis riikidega, kes seda teinud on.
- Eesti peaks jätkama start-up visa ja e-residentsuse programmidega. E-residentsuse programmi täiustamiseks, peaks kaaluma e-residentidele lihtsustusi pangakonto avamisel.
- Soovitus pankadele oleks panustada FinTech ettevõete koostöösse kiirendades pankade otsustusprotsesse, kuna need võivad koostööle takistuseks saada.

- Soovitus FinTech ettevõtetele oleks kasutada ära Eesti avatud ökosüsteemi avatust ja ettevõtjasõbralikkust.

Käesoleva magistritöö uuringu põhjal võib öelda, et Eesti FinTech ökosüsteem toetab FinTech ettevõtete arengut. Sellest hoolimata on valdkondi, mis vajaksid arendamist. Need valdkonnad on välja toodud ülal soovituste all. Tulenevalt käesoleva töö valimi piiratusest, oleks antud valdkonnas vaja jätkata edasiste uuringutega.

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APPENDICES

Appendix 1. Estonian FinTech Companies

ID	Full name	Registry code	The date of the first entry in Commercial Register	FinTech Type	Response to the survey
1	AS Aasa Global	12204475	12.12.2011	Deposit and Lending	Yes
2	Bondora AS	11483929	11.03.2008	Deposit and Lending	Yes
3	Brokeree Solutions OÜ	12543852	27.09.2013	Banking Infrastructure	No
4	ExFinance OÜ	14453478	21.03.2018	Deposit and Lending	No
5	CoinMetro OÜ	14448371	14.03.2018	Distributed Ledger Technology	No
6	Cratech OÜ	14301030	26.07.2017	Banking Infrastructure	Yes
7	Crowdestate OÜ	12595820	09.01.2014	Deposit and Lending	Yes
8	Crypterium OÜ	14352837	16.10.2017	Distributed Ledger Technology	No
9	OÜ Ccuber Technology	12794962	4.02.2015	Payment	No
10	Currencii OÜ	14451670	19.03.2018	Banking Infrastructure	Yes
11	Dagcoin OÜ	14256401	9.05.2017	Distributed Ledger Technology	No
12	DeCrypto OÜ	12403520	11.01.2013	Banking Infrastructure	No
13	Estateguru OÜ	12558919	24.10.2013	Deposit and Lending	Yes
14	etherecash Technologies OÜ	14352174	13.10.2017	Distributed Ledger Technology	No
15	Custodia OÜ	14398644	2.01.2018	Deposit and Lending	No
16	Fiizy OÜ	12694462	23.07.2014	Deposit and Lending	No
17	Funderbeam Markets OÜ	12917885	22.09.2015	Deposit and Lending	No
18	Fundwise OÜ	12678440	20.06.2014	Deposit and Lending	No
19	SupplierPlus OÜ	12871059	29.06.2015	Deposit and Lending	Yes
20	IUVO GROUP OÜ	14063375	8.06.2016	Deposit and Lending	No
21	LEXIT Technologies OÜ	14401889	5.01.2018	Distributed Ledger Technology	Yes
22	Tammetoru Kaubandus OÜ	12264023	10.04.2012	Distributed Ledger Technology	Yes
23	MOBASSURANCE OÜ	11595781	2.03.2009	Insurance	No
24	Paype Solutions OÜ	12609597	5.02.2014	Payment	No
25	Payzoff OÜ	12715328	4.09.2014	Payment	No
26	Paytailor OÜ	12778710	8.01.2015	Payment	Yes
27	PlanetZiggurat Osaühing	11290001	3.11.2006	Deposit and Lending	No
28	Autoproceeding OÜ	14237332	10.04.2017	Banking Infrastructure	No
29	BitOfProperty OÜ	12844051	4.05.2015	Distributed Ledger Technology	No

Appendix 1. Continued

ID	Full name	Registry code	The date of the first entry in Commercial Register	FinTech Type	Response to the survey
30	ByteBot OÜ	14436451	26.02.2018	Distributed Ledger Technology	No
31	xChange AS	14428150	12.02.2018	Distributed Ledger Technology	Yes
32	Citowise Developments OÜ	14383944	5.12.2017	Distributed Ledger Technology	No
33	CrowdCoinage OÜ	14342282	29.09.2017	Payment	Yes
34	Crpoltech OÜ	14393865	20.12.2017	Banking Infrastructure	No
35	Coins Marketplace Technologies OÜ	14394876	21.12.2017	Distributed Ledger Technology	No
36	EveryPay AS	12280690	8.05.2012	Payment	Yes
37	Exscudo OÜ	14172383	20.12.2016	Distributed Ledger Technology	No
38	AS Finora Capital	12324050	6.08.2012	Deposit and Lending	No
39	Investly Technologies OÜ	12710066	27.08.2014	Deposit and Lending	Yes
40	Maksekeskus AS	12268475	17.04.2012	Payment	yes
41	Mothership Foundation OÜ	14284254	28.06.2017	Distributed Ledger Technology	Yes
42	Payster Group OÜ	14446337	12.03.2018	Distributed Ledger Technology	Yes
43	Baltic International Group OÜ	14016884	18.03.2016	Distributed Ledger Technology	Yes
44	AS PocoSys	12963672	15.12.2015	Banking Infrastructure	Yes
45	Polybius Tech OÜ	14420450	1.02.2018	Distributed Ledger Technology	No
46	RSN Finance OÜ	14369967	13.11.2017	Distributed Ledger Technology	No
47	ReSys OÜ	12859733	2.06.2015	Banking Infrastructure	Yes
48	Shareswall Eesti OÜ	14131154	11.10.2016	Banking Infrastructure	No
49	Zantepay OÜ	14374253	20.11.2017	Payment	Yes
50	Ternion OÜ	14473720	20.04.2018	Distributed Ledger Technology	No
51	TransferFast OÜ	12819053	19.03.2015	Payment	Yes
52	WePower Network OÜ	14328922	8.09.2017	Distributed Ledger Technology	No
53	Yes Finance Estonia OÜ	12353590	28.09.2012	Deposit and Lending	No
54	AS Bankish	14251833	2.05.2017	Banking Infrastructure	Yes
55	Aktsiaselts Big Data Scoring	12418058	7.02.2013	Analytics	Yes
56	Black Foundation OÜ	14349717	10.10.2017	Insurance	Yes
57	Bondkick AS	12748650	6.11.2014	Distributed Ledger Technology	No
58	Creditstar Estonia AS	11251314	2.05.2006	Deposit and Lending	Yes
59	Crowdana OÜ	12791811	30.01.2015	Deposit and Lending	No
60	DataMe OÜ	12818421	19.03.2015	Analytics	Yes
61	Fortumo OÜ	11378397	5.06.2007	Payment	Yes
62	Friendly Finance OÜ	12167550	27.09.2011	Banking Infrastructure	No
63	GFC Good Finance Company AS	12423254	18.02.2013	Payment	No
64	HashCoins OÜ	12490015	13.06.2013	Distributed Ledger Technology	No

Appendix 1. Continued

ID	Full name	Registry code	The date of the first entry in Commercial Register	FinTech Type	Response to the survey
65	Osaühing Icefire	10885324	1.08.2002	Banking Infrastructure	No
66	IPF Digital Estonia OÜ	11034137	30.04.2004	Deposit and Lending	No
67	Monestro P2P OÜ	12651582	24.04.2014	Deposit and Lending	No
68	Omaraha OÜ	12045597	20.01.2011	Deposit and Lending	No
69	Veriff OÜ	12932944	20.10.2015	Banking Infrastructure	No
70	Intelligent Technologies OÜ	14192492	26.01.2017	Banking Infrastructure	No
71	Asicvault OÜ	14144085	1.11.2016	Distributed Ledger Technology	No
72	Compare Finance OÜ	14256559	9.05.2017	Analytics	Yes
73	Blockhive OÜ	14255442	8.05.2017	Distributed Ledger Technology	Yes
74	OÜ Bulkestate	14002296	25.02.2016	Deposit and Lending	No
75	Hooandja MTÜ	80341695	27.04.2012	Deposit and Lending	No
76	IuteCredit Europe AS	11551447	7.11.2008	Deposit and Lending	No
77	Wallester AS	11812882	15.12.2009	Payment	Yes
78	Aitrades-Global OÜ	14325734	04.09.2017	Distributed Ledger Technology	No
79	DeltaBox OÜ	14318326	24.08.2017	Distributed Ledger Technology	No
80	OÜ Baroque Street EU	14431293	16.02.2018	Distributed Ledger Technology	No
81	Unifox Group OÜ	14499871	01.06.2018	Distributed Ledger Technology	No
82	IIZI Kindlustusmaakler AS	10641929	08.02.2000	Insurance	Yes

Source: Compiled by Laivi Laidroo, Mari-Liis Kukk, Liina Voolma and author of this thesis based on Crunchbase, Funderbeam, Key Capital and Finance Estonia

Appendix 2. FinTech survey questionnaire

Question	**Drop-down list or text box**
drop-down list	text box
Name of the company	
***Person filling the questionnaire**	
*Name	
*E-Mail	
*Position in the company	
Company's Base Data	
Field of activity	*options*
	Analytics
	Banking Infrastructure
	Distributed Ledger
	Deposit & Lending
	Investment Management
	Payment
	Other (please specify
Maturity	*options*
	Live (already running)
	Under construction (testing/developing)
Country of registration	
Have you used Estonia's e-Residency program to set up your company?	*options*
	Yes
	No
Company's general e-mail	
Names of the Management Team	
Names of the Board Members	
Description of company's activity / Value proposition (2-3 sentences)	
List key & cooperation partners (helping to create product/service or offer it)	
*List biggest competitors	

Appendix 2. Continued

Company in numbers	
Number of employees	
… of which in Estonia	
*Expected change in workforce in 2019	*options*
	++ large growth
	+ moderate growth
	0 no growth
	– moderate decline
	– – large decline
*Actual (or expected) revenue 2018 (in thousands of euros)	
*...of which from export of goods/services (in thousands of euros)	
*Expected revenue 2019 (in thousands of euros)	
*...of which from export of goods/services (in thousands of euros)	
About the company	
Market	*multiple choice*
B2B or B2C	B2B (Your costumers are other businesses)
	B2C (Your customers are individuals)
Estonia or International	Estonia (You focus your business on Estonian market)
	International (You serve international clients)
If International, please specify countries, where you already do business	
Into which countries do you intend to expand your activities?	
What is the size of the global market in your relevant field (in thousands of euros)?	
Revenue Model	
	Interest income
	Commission income (from services or products you deliver)
	Trading income (from active trading in the financial markets)
	License Fee (from a product or software you licence)
	Centralized hosting of business applications (SaaS - software as a service)
	Advertising income (from sale of advertising space)
	Data (from gathering large amounts of data and/or selling analyzed data)
	Other (please specify)

Appendix 2. Continued

Key Activities (where you spend most of your time on)	*multiple choice*
	Programming & engineering (Setting up your website/platform/app)
	Marketing / Finding Clients
	Running daily business and serving existing clients
Communication with customers (Choose only one)	
	Digital only (platform, website, app)
	Digital & personal (some online, some via email, phone or face-to-face)
	Personal only
***Evaluating key success factors of your company**	
Please evaluate your company against competitors for the factors below on the scale 1 to 7.	
1	Profit Margin
2	Asset light (fixed costs related to assets)
3	Scalable (ability to scale)
4	Innovative
5	Ease of compliance
Capital (loans, equity etc)	
Total Funding (how much capital have you raised in all funding rounds) (in thousands of euros)	
*Funding 2018 (how much capital have you raised in 2018) (in thousands of euros)	
*Date of last funding (in thousands of euros)	
*State of last funding	*options*
	Seed
	Series A
	Series B
	Series C
	Other
* What is the current valuation of your company? (in thousands of euros)	

Appendix 2. Continued

Opinions	
***Sentiment Questionnaire**	
Please indicate how pressing a specific problem is for your business on a scale from 1 (not pressing) to 10 (extremely pressing).	
1	Competition
2	Finding customers
3	Access to finance
4	Costs of production or labour
5	Availability of skilled staff or experienced managers
6	Regulation
7	Expansion to international markets
8	Others (clarify in the box below)
Further Comments	
FinTech outlook	*options*
*How do you see that FinTechs change traditional banks?	The better bank - traditional banks will adopt new technologies, modernize and digitalize.
	The new bank - traditional banks will not survive and will be replaced by new technology-driven banks.
	The distributed bank - large number of new businesses providing specialized services without attempt to be universal banks (banks and FinTech companies as partners).
	The relegated bank - traditional banks become commoditized service providers and the direct customer relationships are handled by FinTechs.
	The disintermediated bank - banks become irrelevant as customers interact directly with individual financial services providers.
	Other (please specify)
*Which way has your FinTech cooperated with traditional banks?	
*What in your opinion are the main triggers behind FinTech development?	
*How could Estonian state organizations (government etc.) contribute to the FinTech sector development? (special regulations, regulatory sandboxes, tax reliefs etc.)	
*Which state organizations do you communicate with on a regular basis?	
*Do you feel that existing financial service regulations are restricting your activities? If yes, in what way?	

Appendix 2. Continued

Further Comments	
*Are you willing to participate in an interview for additional questions?	

* Will be kept anonymous. Used only on aggregated level where appropriate.