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MASTER'S THESIS

FINANCIAL TECHNOLOGIES EFFECT ON FINANCIAL SERVICES FROM AN OPEN INNOVATION PERSPECTIVE

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ABSTRACT

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The growth in financial technologies (Fintech) skyrocketed after 2008 and there are many reasons behind this happening. New entrants in financial services sector such as large cutting-edge technology companies and technology startups offer new innovations and technologies. They shape whole sector in terms of regulations which are made by authorities, customer habits and strategies. While new entrants are attracting customers with their new technologies and services, incumbents are being forced to collaborate with them and trying to adopt the new environment and protect their interests.

There are five purposes of this research. It aims to understand the triggers behind Fintech development. Then, it researches the role of Open Innovation methods in the field. It reveals advantages and disadvantages of incumbents and Fintechs. Then it examines the opportunities and threats in Fintech space. Finally it exposes the risks and the challenges in the field.

The study reflects the effect of economic crises in 2008, the developments in technology after 2008, changing business models of technology vendors and changes in the demographics as triggers behind Fintech development. It reveals that collaboration is a must and it offers myriad opportunities for the parties. It shows the importance of Open Innovation methods including acquisition of assets, partnerships, alliances and accelerators in the Fintech space. It highlights the importance of adopting new environment and investing technology. It exposes that while capital and customer base are the main advantages of incumbents, cutting-edge technologies and flexibility are main advantages of Fintechs. It emphasizes the importance of "Banking as a Service" notion with respect to new regulations. In addition, it reflects that political and regulatory ambiguities, overvaluation of Fintechs and hurdles in acquisitions are the main challenges in the market.

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ABBREVIATIONS

AI	Artificial Intelligence
AISP	Account Information Service Provider
API	Application Programming Interface
ATM	Automated Teller Machine
BTC	Bitcoin
CAPI	Computer-Assisted Personal Interviewing
CATI	Computer-Assisted Telephone Interviewing
EU	European Union
FED	Federal Reserve
FICO	Fair, Isaac and Company
GDP	Gross Domestic Product
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
IoT	Internet of Things
IP	Intellectual property
IT	Information Technology
KYC	Know Your Customer
KYD	Know Your Data
M&A	Mergers and Acquisitions
MiFID	Markets in Financial Instruments Directive
NFC	Near-field communications
OECD	Organizations for Economic Co-Operation and Development

PAN	Primary Account Number
PaaS	Platform as a Service
PC	Personal Computer
POS	Point of Sales
PISP	Payment Initiation Service Provider
PSD	Payment Services Directive
R&D	Research and Development
SaaS	Software as a Service
SE	Secure Element
SEPA	Single Euro Payments Area
SME	Small and Medium-Sized Enterprise
TSM	Trusted Service Manager
UK	United Kingdom
UPI	Unified Payment Interface
U.S	United States
VC	Venture Capital

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1 INTRODUCTION

1.1 Research Background

Financial markets witness a rapid change in 2016. As technology advances, it affects business models in financial sector and how people attain financial services. One term is on everybody's lips: Fintech. It stands for the dynamic industry in the intersection of finance and technology (Kim et al, 2015). It is also described as a new type financial service industry which combines information technology and financial services like payments, remittances and asset management (Lee and Kim, 2015).

This research entails firstly analyzing relevant theories with Fintech space and Open Innovation in a broad perspective and then focusing to specific points. In order to understand Open Innovation and its implementation in Fintech environment, researcher starts with theories behind Open Innovation, Open Innovation, Service Innovation and Open Innovation in services. Afterwards, researcher focuses to Open Innovation in financial services. The figure given below depicts the research background.

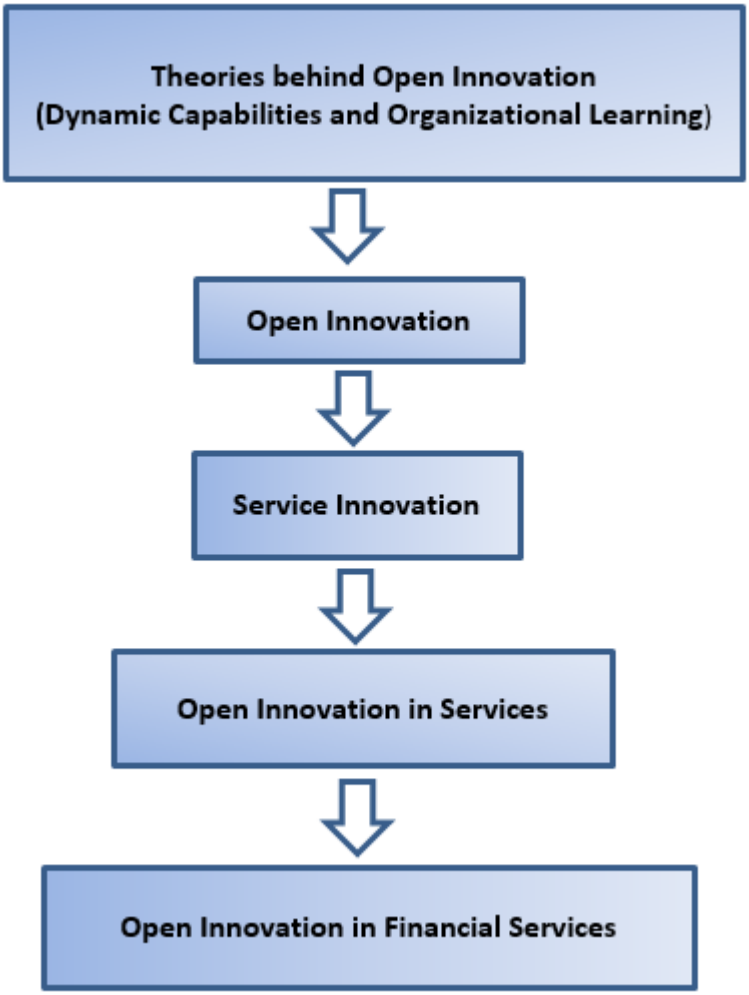

Figure 1: Flow of research background (Developed by the author)

Table 1. Summary of research background

Topics	Scholars	Contribution
Theories Behind Open Innovation	Barton (1992), Teece el al. (1997), Teece (2007), Cavuslugil et.al (2007)	Dynamic Capabilities
	Levinthal & March (1982, 1993), Nonaka (1994), Steensma (1996)	Organizational Learning
Open Innovation	Chesbrough (2003, 2006)	Open Innovation paradigm
	Gassmann & Enkel (2004)	Inbound, outbound, coupled processes
	Chesbrough et al. (2006)	Intellectual property management
	Huston & Sakkab (2006)	Case Study: P&G
	West and Gallagher (2006)	Challanges to apply Open Innovation
Service Innovation	Sundbo (1997), Vermuelen (2004), Hertog et al.(2010)	Management of innovation in services
	Vargo & Lush (2004, 2006, 2008), Lush et al. (2007)	Service-dominant logic
	Gebauer & Friedli (2005), Neu & Brown (2008)	Success factors for transition towards service-centric approach
	Chae (2012)	Strategic orientations of service innovation
	Reuver & Bouwman (2012)	Mobile service innovation
	Perks et al. (2012)	Radical service innovation
	Kindström et al. (2013)	Dynamic capabilities approach for service innovation
	Hidalgo & D'Alvano (2014)	Inward and outward activities in service innovation
Open Innovation in services	Ballon et al. (2008)	Service model for open services
	Chesbrough (2010)	Importance of platfoms
	Chesbrough (2010), Mina et al. (2014)	Open Innovation in services
Open Innovation in financial services	Vermeulen (2004)	Limitations of innovation in financial services
	Kousaridas et al. (2008)	Open financial services architecture
	Fasnacht (2009), Mention & Torkkeli (2014)	Open Innovation in financial services
	Martovoy et al (2012), Martovoy (2014)	Advantages and disadvantages of Open Innovation in financial services
	De Smet D et al. (2013)	Knowledge sourcing from customers for financial services
	Salampasis et al. (2014)	Role of trust in open innovation for financial services
	Mention et al. (2014)	External drivers for Open Innovation in financial services
	De Smet D et al. (2015)	Learning mechanisms of alliances in financial services

Many theories underpin Open Innovation paradigm. They involve Knowledge Based View of the Firm (Grant, 1996; Spender, 1996), Dynamic Capabilities (Teece et al., 1997; Teece 2007), Organizational Learning (March, 1991; Levinthal and March, 1993; Nonaka, 1994), Relational View (March, 1991; Levinthal and March, 1993; Nonaka, 1994), Resource Dependence Theory and Game Theory (Kutvonen, 2016). Here, we focus Dynamic Capabilities and Organizational Learning. They are distinguished from other theories since these theories can contribute to understand how organizations create information, trigger the change in their organizations and develop competencies in dynamically changing environments like financial services. This can facilitate the understanding Fintechs and incumbent organizations' stance for the fast pace changes in Fintech environment.

As Chesbrough (2003) successfully exposed the Open Innovation paradigm, the ways for generating knowledge, accessing and benefitting knowledge and intellectual property has been changed profoundly in the light of fast pace developments in technologies and markets. Companies redefine their boundaries to exploit knowledge and developments instead of investing only in internal R&D. This situation offers new collaboration opportunities between different actors and leads to new business models and value creations. This increases the dynamism and openness of the markets. In this sense, Open Innovation paradigm is the mainstay of this research to understand the changes in organizational boundaries, strategies to access and use of knowledge, business models and relationships between stakeholders.

Open Innovation field is contributed by many scholars in different aspects including absorptive capabilities (Laursen and Salter, 2004, 2005), complementary assets (Blonigen and Taylor, 2000; Berkovitch and Naryanan, 1993), network externalities (Chiesa and Toletti, 2003; Leiponen, 2006; West, 2006), learning strategy (Huston and Sakkab, 2006), reciprocal sharing of knowledge (Huston and Sakkab, 2006; Kogut, 1989) and scale of learning effects (Sakakibara, 2003; Torkkeli et al, 2008).

Service provision instead of goods becomes fundamental for economic exchange (Vargo and Lush, 2004). Every industry in the world increases its attention to service-centric models to cope with the changes in markets and increase their revenues. Financial services is one of the leading service sectors in terms of growth and revenues. It is beneficial to examine service-centric model before jumping to focal point. Especially, service-dominant logic (Vargo and Lush, 2004, 2006, 2008; Lush et al., 2007), management of innovation in services (Sundbo, 1997; Vermeulen, 2004; Hertog et al., 2010) and Dynamic Capabilities approach for service innovation (Kindstrom et al., 2013) are important for this research.

Studies for Open Innovation in services are extremely valuable. Chesbrough (2010) and Mina et al. (2014) have valuable contributions in this sense. They are elaborating how companies change their innovation strategies and embrace service-oriented approaches to break commodity trap (Chesbrough, 2010). In addition, Chesbrough (2010) emphasizes the importance of building platforms for being more service-oriented organizations.

Researches focusing Open Innovation in financial services are the last chapter of research background. These valuable resources are directly correlated to the scope of this research. Books of Mention and Torkkeli (2014) and Fasnacht (2009) give valuable information about financial services and Open Innovation in a broad sense. Fasnacht (2009) highlights open platforms in financial markets and their emergence with fund distribution. Eminent scholars also contribute in advantages and disadvantages of Open Innovations in financial services (Martovoy et al., 2012; Martovoy, 2014), limitations of innovation in financial services (Vermeulen, 2004), open financial services architecture (Kousaridas et al., 2008), role of trust in Open Innovation in financial services (Salampasis et al., 2014), knowledge sourcing from customers in financial services (De Smet D. et al., 2013), learning mechanisms of alliances in financial services (De Smet D. et al., 2015) and external drivers for Open Innovation in financial services (Mention et al., 2014).

1.2 Research Gap

All of the scholars mentioned above have valuable contribution to Open Innovation studies in financial services. They provide unique information for financial services from Open Innovation perspective. It can be said that, there is still a need for a qualitative study which combines different perspectives in Fintech space including incumbent financial organizations and Fintech start-ups. This can lead to examine the disruption in the financial markets in the eyes of the people who cause disruption and are trying to cope with these disruptions. They can share extremely valuable information regarding the triggers behind Fintech development, changes in technologies, business models, services, relationships, customer habits and advantages and disadvantages of parties, culture and possible chances and threats in Fintech space. While these changes may be threatening traditional models, they may also enhance the collaboration changes and new opportunities. All of these happenings fall into the space of Open Innovation paradigm. This study should examine the space from Open Innovation perspective to understand better the changes in organizational boundaries for reaching and assessing developments, new markets and customers.

1.3 Research Questions and Objectives

This research aims to fill the Research Gap and tries to shed some light on Fintech space from and Open Innovation perspective. In this respect, main research question is:

RQ: *What are the underlying drivers behind Fintech development and opportunities, threats, risks and challenges in Fintech space from an Open Innovation perspective?*

In order to facilitate answering this question, it is divided into five research questions. These questions and their objectives are given in the table below.

Table 2. Research questions and objectives

Research Questions	Research Objectives
RQ1: What are the triggers behind Fintech development?	To understand the triggers behind Fintech development
RQ2: What is the role of Open Innovation in Fintech space?	To understand role of Open Innovation in Fintech space
RQ3: What are the advantages and disadvantages of Fintechs and incumbents?	To understand advantages and disadvantages of incumbents and Fintechs
RQ4: What are the opportunities and threats in Fintech space?	To understand the opportunities and threats in Fintech space
RQ5: What are the risks and challenges in Fintech space?	To understand the risks and challanges in Fintech space

Firstly, understanding the triggers behind Fintech development is the mainstay of the research. It can give insight for the whole environment. There is a fast-pace changing sector and respondents can share valuable information about it.

Secondly, the focus of this research is reaching the conclusions from Open Innovation perspective. In this regard, understanding the role of Open Innovation and its implementations in Fintech space are crucial.

Thirdly, both parties, incumbents and Fintechs, may possess different capabilities and these may lead to different strategies and engagements in the sector. Therefore, understanding their advantages and disadvantages will be useful.

Fourthly, these new strategies and engagements may offer new opportunities and threats for the stakeholders. This also falls into scope of this research.

Lastly, understanding the risks and challenges in Fintech space may contribute to understanding the future of the industry and possible new roles of the actors.

1.4 Thesis Structure

Structure of master's thesis is represented in Figure 2 in the next page. In order to introduce relevant literature and the findings profoundly, this thesis consists of six chapters. Introduction involves research background, research gap, research objectives and thesis structure. While research background is providing the basis for the research, research

gap is identifying the reasons to conduct this research. Research focus, objectives and questions are clearly provided in research objectives chapter. Lastly, thesis structure gives information about the framework of the thesis.

Second chapter, Literature Review has two objectives. Firstly, it depicts theories behind Open Innovation, Open Innovation paradigm, service innovation, Open Innovation in services and Open Innovation in financial services with valuable sources written by eminent scholars in the field. Secondly, it handles Fintech space in a broad perspective including emergence of new technologies, business models, investments, technology acquisition and collaboration and regulations in the field.

Methodology consists of research design and data collection and analysis in order to enlighten the reader for the methods used and the quality of the research.

Fourth chapter, Results, relies on the qualitative data collected from the semi-structured interviews. It involves subchapters in accordance with the research questions. It also includes anonymous quotations to support the findings.

Results chapter is followed by Discussions chapter. Results are linked to the literature review and interpretations are introduced in this chapter.

Sixth chapter is “Discussions”. It consists of general conclusions, theoretical contribution, managerial implications, limitations and further research implications.

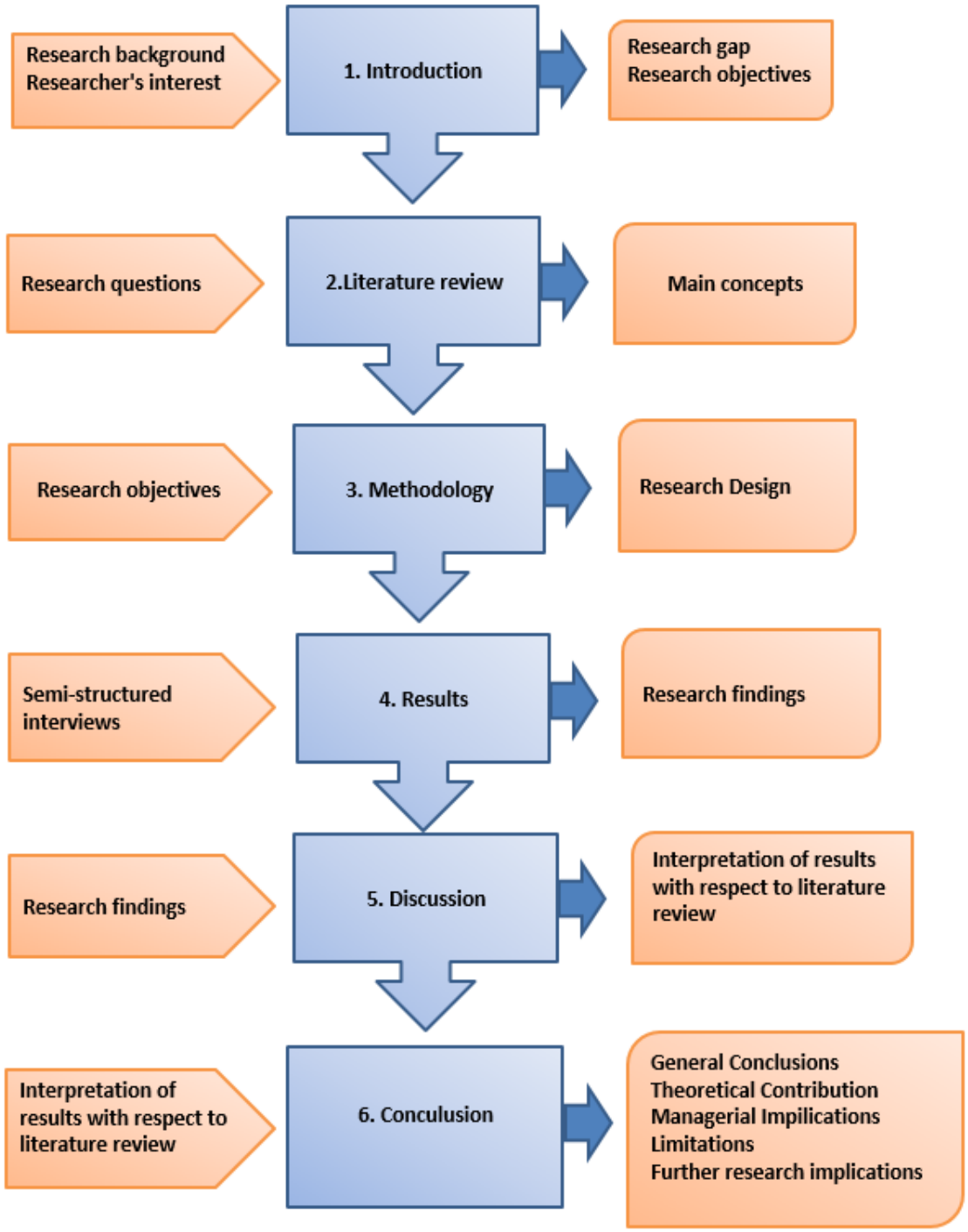

Figure 2. Thesis structure (Developed by the author)

2 LITERATURE REVIEW

Existing literature on a research can provide a basis for the importance of that research and its objectives (Bryman and Bell, 2011). Second chapter, Literature Review, handles Fintech studies in a broad perspective from theories behind Open Innovation to Open Innovation in financial services in addition to the new technologies, business models, investments, collaboration strategies and new regulations in Fintech space.

The literature review is based on mostly peer-reviewed articles in the fields mentioned above. These articles are supported by some world-wide known consulting company reports which have high reputation especially in market figures. Lappeenranta Academic Library and academic databases including LUT Finna, Nelli Portal, EBSCO, Scopus, Science Direct and Google Scholar are the main resources to access these publications. Main keywords used in research are "Fintech", "Financial Technology", "Open Innovation", "Financial Innovation", "Open Innovation" AND "Finance", "Open Innovation" AND "Service, "Service Innovation" AND Finance, "Dynamic Capabilities", "Organizational Learning", "Digital Banking", "Mobile Banking", "Blockchain", "API", "Cloud", "P2P", "Crowdfunding", "Regulations" AND "Finance", "Regulations" AND "Fintech" and "Regtech".

2.1 Theories behind Open Innovation

As Kutvonen (2016) mentioned, there are several theories behind Open Innovation paradigm. These theories include Knowledge-Based View of the Firm (Grant, 1996; Spender, 1996), Dynamic Capabilities (Teece et al., 1997; Teece, 2007), Organizational Learning (March, 1991; Levinthal and March, 1993; Nonaka, 1994), Relational View, Resource Dependence Theory and Game Theory. This study handles Dynamic Capabilities and Organizational Learning theories since the ways how companies create information and trigger transformation in their organizations to build dynamic capabilities in rapidly changing environments have special importance for the happenings in Fintech space. Therefore, these theories are distinguished from other theories behind Open Innovation in this thesis.

Dynamic Capabilities

Dynamic Capabilities focuses on private enterprises in rapidly changing environments and explains wealth creation in these environments (Teece et al., 1997). It advocates that firms' specific processes, assets including knowledge assets and complementary assets and adopted or inherited evolution paths shape competitive advantage of firms (Teece et al., 1997). It is built on Resource Based View. In addition, it fills the gap how to create

sustainable competitive advantage in Resource Based View (Cavusgil et al., 2007). By building dynamic capabilities, organizations can support their superior long-term business performances (Teece, 2007). In this sense, Dynamic Capabilities approach tries to find the answers for the ways to create wealth creation. It is worth to deliberate on why some firms are able to build competitive advantage better than others.

Old-fashioned strategies of well-known companies led them to lose their market share and competitive advantages. They were heavily relying on resourced based strategies and accumulating technology assets. In contrast, competitor companies which were able to respond market changes timely and manage their internal and external competences better became more successful in various markets (Teece et al., 1997). These kinds of abilities are referred as "Dynamic Capabilities" of the firm. They require the ability to build new competences in rapidly changing business environments. In this sense, the ability to use technology, timing, nature of competition, strategic management, rapid adaptation to new environments and capabilities to integrate internal and external resources become more of an issue. According to Leonard-Barton (1992), the ability to build new innovative forms for competitive advantage is the mainstay of Dynamic Capabilities.

Innovative activities are sources for technological opportunities and organizational structures make difference in recognizing these opportunities. In this regard, collaboration and engagement in basic research mainly are done by universities. On the other hand, acquiring these abilities is not possible. Organizations should build them by themselves (Teece et al., 1997). This also means that these organizations should possess entrepreneurial skills to build dynamic capabilities (Teece, 2007). Moreover, assets which are difficult to replicate such as knowledge become important than other assets. Fast moving open markets, global competition and changes in technologies incite the requirement for ownership of this type of assets to adopt technology requirements and customer needs. In addition, new players in markets are jeopardizing revenues of incumbent organizations. Relationship between organizations and their customers, suppliers and government can affect the opportunities in the market. In addition, their dynamic capabilities can be limited by the rules including laws and regulations (Teece, 2007).

While building dynamic capabilities, enterprises may face with many issues. First of all, innovations appear often as threatening existing models and systems. Organizations tend to avoid radical innovations with layers of procedures, complimentary assets and routines in favour of incremental innovation. On the other hand, they should find the balance for benefitting innovations without cannibalizing their own products. Moreover, prior investments for existing models mostly deter them to invest for radical innovations. Innovations require investments Excessive optimism may lead to failures in investments regarding new projects. Small enterprises are mostly more vulnerable to failures while incumbents have more resources to survive. Building a business model around an innovation is not straightforward and involves various difficulties which are specific to the

innovation and market. Organizations should possess the ability to use information from different resources such as customers, suppliers and competitors. In this sense, defining boundaries and leveraging outsourcing and economies of scale are crucial (Teece, 2007).

Customers demand the integration of products, services and networks. Different information channels and respondents involve in many products. For instance, a video console has no use without the game or a credit card without the merchant to accept it. Interfaces and decision rules change rapidly in dynamic markets. In "cumulative" industries, there is a requirement to build "platforms". It may require the participation of other incentives (Teece, 2007).

New problems may require new perspectives to solve them. Incumbent organizations have an inclination to solve new problems with existing mindsets and knowledge bases. This can lead managers not to fully understand new opportunities. In addition, controlling excessive assets may make it difficult to build dynamic capabilities. On the other hand, managers who accomplish building dynamic capabilities despite of legacies of the organization can make big differences (Teece, 2007). In order to make this kind of transformation, leaning activities and transferring of competences become extremely important (Cavusgil et al., 2007).

Dynamic capabilities theory can help to understand how organizations build new capabilities and their wealth creation in Fintech space as a rapidly changing environment.

Organizational Learning

Companies which are dealing with rapidly changing environments and trying to build dynamic capabilities should be able to create information in addition to process it. A part of organization which possess skills for creating information can affect whole organization and trigger it to transform into an innovative organization. It is important to note that individual mindsets and skills are crucial to establish an organizational knowledge creation (Nonaka, 1994).

When it comes to successes or failures in an organization, organizations learn from their experiences in an experimental way. Success of an organization is partly dependent on its technology. In technology sense, organizations include three types of strategies to learn. These are respectively adoption of search strategies, improving search competences and adopting their aspirations to learn what to hope for (Levinthal and March, 1981).

According to Ford (1988) (cited by Steensma, 1996) external acquisition of collaboration through inter-organizational collaboration is crucial for technology strategy. Acquired technology should be compatible to the desired competencies in the organization. There might be a learning gap between the complexity of the technology and knowledge of the firm. By improving its organizational learning capabilities and decreasing systematic shift, organizations can benefit more in a collaboration. There are various types of including research contracts, licensing agreements, minority investments, joint ventures and equity

acquisitions (Steensma, 1996). Organizations might have to overcome many roadblocks for better learning through these activities. In this regard, their attempts through simplification and specialization may lead to failures in predictions. Firstly, organizations are impatient and focused on short run activities. Most of the exploratory experiments fail in the short run. Moreover, most of the new ideas fail. The success is dependent on the experience of these organizations. Experimentation in the long run gives the chance to accumulate knowledge and turn innovations into success. Secondly, they are likely to underestimate failures and over-sample successes (Levinthal and March, 1993).

There are many traps for resourceful organizations. Their abundant resources are beneficial in the short run, but they can be described as "liabilities" in the long run. They can hamper to engage environment and building a learning organization and lead organizations to use their resources to impose their strategies on others. In the long run, it is likely to result in failures. On the other hand, they tend to solve the problem in the wrong time. They are likely not to build capabilities for solution between anticipation and identification of the problem. As a solution, enhancing collaboration activities can increase knowledge base of the organization (Levinthal and March, 1993).

Organizational learning theory contributes to understand how enterprises create information and trigger the transformation and implementation of Open Innovation methods in Fintech space better.

2.2. Open Innovation

A change is being observed in the way that companies obtain and value information and create commercial value out of it. In this regard, "Closed Innovation" and "Open Innovation" terms are promoted (Chesbrough, 2013). In a nutshell, "Closed Innovation" defines innovation strategies assuming that companies should generate value only from their own ideas and they should develop, finance and control them on their own without involvement of any other parties. In contrast, "Open Innovation" posits that companies should utilize external ideas and external ways to the market as well as internal ideas and internal ways for generating value (Chesbrough et al., 2006; Chesbrough, 2013). This notion affect strategies in many aspects including R&D, intellectual property protection, investments and venture capital. It addresses R&D as an open system. Venture capital, mergers and acquisitions, co-developments, spin-offs, in-licensing, out-licensing, participation of employees in partners are some methods to nurture and exploit Open Innovation opportunities for the organizations (Chesbrough et al., 2006).

Open Innovation notion consists of three different types of core processes. These are respectively outside-in processes, inside-out processes and coupled processes. "Outside-in" process is the enhancement of knowledge in a company by leveraging external sources (Gassmann and Enkel, 2004). These external resources can involve suppliers, customers, competitors, universities and other nations (Chesbrough et al., 2006). "Inside-out" process

is the share of knowledge which is generated inside company boundaries to external parties. Lastly, both of outside-in and inside-out methods can be employed simultaneously as "Coupled" processes (Gassmann and Enkel, 2004).

Open Innovation advocates a proactive IP strategy (Chesbrough et al., 2006; Arora et al., 2001). IP is regarded as an asset for generating value. While companies may prefer to sell or out-license their IP, instead of benefitting them in their own products or keeping idle for possible future uses, in-licensing or acquisitions are also quite possible, instead of investing to build internal R&D capabilities and waiting for the results (Arora et al., 2011). All these decisions are relevant to the transaction costs and market strategies of the company. Company might find out-licensing internal technology more profitable than using it in its own products. Qualcomm exemplifies well this situation. The company shifted its strategy from producing its own devices and using CDMA technology in these products to out-licensing its CDMA technology to phone manufactures since licensing generates more revenues (Arora et al., 2001). In the light of Open Innovation strategy, such markets hold tremendous potential for possible partnerships.

There are many examples of companies losing market share and revenues due to their Closed Innovation strategies. For instance, Xerox is known for not being able to commercialize its many groundbreaking advancements such as graphical user interface (GUI), object oriented programming and Ethernet. The company couldn't prevent others such as Apple and Microsoft to exploit its innovations (Moy and Terregrossa, 2009). From 1979 through 1998, there are 24 spin-offs founded by departed Xerox researchers and funded by other venture capitals. Adobe is a significant example among these companies (Chesbrough et al., 2006). Studies conclude that a more proactive IP management offers companies additional revenues and reduction in R&D costs. In this respect, P&G managed to enhance its R&D productivity by nearly 60% through its Connect and Develop program. Company built a department for technology outsourcing and established a goal for outsourcing as 50% of its innovations. Moreover, if an innovation developed in-house isn't utilized in three years from its inception, company starts looking for external customers to sell or out-license the IP (Huston and Sakkab, 2006; Chesbrough, 2006).

Consequences of the direct competition between Cisco and Lucent can be regarded as a success of Cisco's Open Innovation strategy. Although Lucent was investing heavily to internal development of new materials and state-art-systems, Cisco achieved enormous success and growth ratios by scanning new technologies in the market, partnering and investing to start-ups which many of them were founded by ex- Lucent, Nortel and AT&T researchers (Chesbrough, 2013). Nowadays, even large institutions backed by powerful governments such as NASA employ Open Innovation methods to reduce costs and contribute to R&D efficiencies. The organization which is known as pioneer of space research seeks external contribution in a wide-range including coding, asteroid mining and cargo delivery to space. Its collaboration with Space X and Top Coder Open source coding competition are some examples for its Open Innovation activities (NASA, 2010; ISU, 2014).

On the other hand, IBM is a good example of transition from a Closed Innovation mindset to Open Innovation strategy and it is important to examine the company to understand the underlying drivers for this transition. From 1945 through 1980, R&D labs of the company had tremendous success with discoveries including five Nobel Prizes. Company was investing heavily for promising fields from materials physics for alternate materials to silicon and semiconductors research. Besides, they accomplished to innovate groundbreaking products such as System 360 family computers, first-high level programming language FORTRAN, RAMAC disk drive and magnetic tape. Despite of these successes, company couldn't prevent losing market share and finding itself in the brink of economic crises. Although company was the inventor of relational database and largest investor of semiconductor researches, it lost market share to Oracle and smaller semiconductor companies (Chesbrough, 2013). In this sense, Open innovation paradigm posits that a better business plan is more important than entering the market first (Chesbrough, 2006). IBM's large R&D expenditures and old-fashioned management turned it into a slow and bureaucratic company. Subsequently, they realized that really small portion of their spending was a part of their customers; value chain. Customers were demanding better system integration capabilities and services for their businesses. Consequently, company reorganized its core R&D organization, split it into smaller and more focused groups and started collaborations with their customers. For example, they co-operated with one of their largest customer, Citigroup, to integrate better information access, data mining and processing solutions for their complex services (Chesbrough, 2013). Company also built focused business units to facilitate the use of external developments. Company's Industry Solution Lab in Zurich is one of the mainstays of its Open Innovation strategy to benefit innovations developed outside of the company (Gassmann and Enkel, 2004).

Transition from a Closed Innovation strategy to an Open Innovation strategy requires particular capabilities (PwC, 2014). There is a need for compatible mindset to digest external knowledge and not to face "Not Invented Here" syndrome (Chesbrough, 2013). Organizations should possess the capabilities of assessing the values of external developments, maintaining absorptive capacity to understand them and integrating to their solutions for unique products and services. For this purposes, companies need maximization, incorporation and motivation (West and Gallagher, 2006).

Open Innovation paradigm has special importance for service sector and financial services. It can contribute to understand the relationships between incumbents and Fintechs and how they reach innovations, new customers and markets in Fintech space better. Its implications in services and Fintech space are analysed in the following chapters in detail.

2.3 Service Innovation

According to Oxford Dictionary (2016), service refers to "The action of helping or doing work for someone". It is also defined as a subset of product (Fasnacht, 2009). Disruptive forces including increased competition, unsustainable high debt levels and stagnation change the markets (Chesbrough, 2010). Services became the backbone of economies although they were underestimated by traditional classificatory systems. Moreover, they are becoming more apparent and important as specialization increases (Vargo and Lusch, 2004). Rate of services in economy is about 60% in top forty economies and 80% in US (OECD, cited by Chesbrough, 2010). In this sense, productivity is highly dependent on service activities in developed countries (Chae, 2012).

Economic activities are moving towards service-dominant logic from goods-dominant logic. In goods-dominant logic, units of outputs are regarded as components of exchange. While goods-dominant logic highlights efficiency of production and distribution, it fails in assessing the knowledge and skills of the people using and developing these goods. On the other hand, a service-dominant logic advocates that resources are configured dynamically in service systems and network actors are integrating these dynamics resources and participate in the creation of services (Perks et al., 2012). Many scholars believe that service-dominant approach is overtaking goods-dominant approach in many aspects (Vargo and Lusch, 2004). Chesbrough (2010) also states that companies should change their product focused thinking towards service-centred view to be successful and sustainable.

According to service-centred view, service is the fundamental basis of exchange and all economies are regarded as service economies. In addition, service-centred view puts the customers in the centre and see them as co-creators of the value. The reason behind rise of services is increased specialization and outsourcing (Vargo and Lusch, 2008). There are also conceptual transitions in the service-dominant logic. Services, offerings, benefit, co-creation and value-creation terms are promoted instead of goods, products, feature, value-added and supply chain (Lusch and Vargo, 2006).

Service-dominant approach also emphasizes that the ability for integrating specialized capabilities to services increases competitive advantage. This competitive advantage differs from adding value to products. It requires support of different disciplines including human resources, operation management, finance and IT (Lusch et al., 2007). In this respect, service innovation has to integrate various methods and techniques from different stakeholders such as internal units, key suppliers, universities and customers in complex and dynamic networks (Chae, 2012; Reuver and Bouwman, 2012).

Successful service providers build a complex network instead of a linear chain (Hidalgo and D'Alvano, 2014). These networks are governed by power, contracts and trust (Reuver and Bouwman, 2012).

As technology and capabilities advance, demand for better services on customer side increases. Therefore, innovation is a must in services for providing better services to the markets at the right time (Hidalgo and D'Alvano, 2014). Innovation in services happens in four steps. These steps are respectively idea generation, transformation to a project, development of innovation and the implementation of innovation (Sundbo, 1997; Vermeulen, 2004).

Services sector is far ahead of manufacturing in terms of leveraging human capital for creating innovation (Mina et al., 2014). Value is mostly created through experiences and interactions with customers and other actors in the networks (Perks et al., 2012). Traditionally, product-centric approach gives importance to product leadership and patents. There is a need to give special importance for dynamic capabilities approach since the dynamic nature of services in complex networks (Kindström et al., 2013). Actually, various factors play important role in developing service innovation since services are dynamic organisms. These organisms keep evolving continuously (Chae, 2012). According to Lusch et al. (2007), there are three aspects of service innovation. These are supply-side, customer-side and geographical/institutional-side.

Many scholars have valuable contribution for service innovations. With respect to the scope of this research, contributions in capability development (Den Hertog et al., 2010; Fisher et al., 2010), organizational adaption (Neu and Brown, 2008) and culture (Gebauer and Friedl, 2005) are valuable (Kindström et al., 2013).

Den Hertog et al. (2010) puts forwards six dynamic service innovation capabilities. These are signalling user needs and technological options, conceptualizing, (un)-bundling, co-operating and orchestrating, scaling and stretching and learning and adopting. Better execution of these capabilities can offer companies to overtake their competitors (Hertog et al., 2010). Signalling user needs and technological options refers to understanding needs of customers through deep interactions. Methods such as client profiling, joint experimentation and prototyping, dialogues with lead users, account management systems and trend analysis can facilitate service innovation. In addition, signalling technological options can create new ways for increasing customer engagement, expanding and enrichment of services. On the other hand, the ways for service innovation are quite different than traditional manufacturing. In many cases, it is not possible to research, develop, prototype and test service innovations similar to manufactured goods. Service innovations are substantially new ideas and combinations of existing ideas. In this respect, conceptualizing intangible new ideas is a specific ability for organizations (Hertog et al., 2010).

Many new services relies on existing elements. They are newly (un)bundled, modified or enriched. Combinations with a "one stop shopping" character and customization are beneficial for service innovations. On the other hand, service innovations are dependent on the actors outside of the company boundaries. Alliances, co-designing and co-producing

activities are common for developing service innovations. In this regard, co-producing and orchestrating these actors is crucial for successful service innovations (Hertog et al., 2010).

Mass production techniques are invalid for services. This brings challenges to execute the same service in different locations. A customer may demand the service quality from the same fashion brand in different stores located in different cities. In this sense, scaling the service innovations successfully firm-wide is another factor for successful service innovation. This also requires learning and adapting capabilities. Learning is a dynamic capability and it spreads the knowledge which are mostly outcomes of experimentations as well as it increases efficiency (Hertog et al., 2010).

Fisher et al. (2010) also manifests that service innovation requires dynamic capabilities. They are essential to reach a service-oriented strategy. In addition, it is highlighted that separating service businesses from product businesses creates side effects which evolve service business development.

Transforming a traditional business to a service-oriented business also requires organizational adaptation. Managers have various responsibilities to align internal factors to market conditions. It is clear that transforming a product-focused company to a service-focused organization involves many challenges including strategy change, encouraging collaboration and retaining human resources. Moreover, a customer-centric approach should be embraced. All of these require leadership of managers (Neu and Brown, 2008).

Gebauer and Friedl (2005) addressed success factors and seven behavioural processes for a successful transition towards a service-centric business. The study shows that companies which possess highly risk averse, do not believe in the economic potential, just pushing employees to extend service business and don't overcome the negative short and long-term effects of quality erosion mostly fail in transition. On the other hand, managerial service awareness, managerial role understanding, employee service awareness and employee role understanding are the most important behavioural processes for transition. The study emphasizes that managerial service awareness and role understanding are the most important factors for triggering the change towards a service-centric model (Gebauer and Friedli, 2005).

Understanding innovations in service economy as a whole can contribute to understand the happenings in financial services better since financial services is an important part of global service economy. Topics covered in this chapter are also important for the Fintech sector.

2.4. Open Innovation in Services

Fast pace developments in technology and the explosion of mobile technologies shortened product life spans. Thanks to the new information technologies, reaching information

became extremely easy and this led the emergence of new entrants in various industries. Because of the high competition, companies are developing tailor made products in shorter periods. Even the most famous companies are struggling in competition and fulfilling customer demands. They try to find new ways to change this situation (Chesbrough, 2010). According to Chesbrough (2010), distributed knowledge and manufacturing, very low cost transportation of manufactured goods around the world, the reduction in time for a product to stay in the market create a commodity trap for product focused companies. Once a company produces a competitive product, it is easy for others to learn how to develop a similar one. This situation forces companies to change their product focused strategies (Chesbrough, 2010).

Open service innovation is a beneficial way to break this commodity trap. It consists of four steps. Firstly, companies should assess their products or services as open businesses for creating differentiation. This view requires a change in organizations. Innovation process can be separated as innovation in back-end processes and innovation in front-offices (Silva, 2014). Some companies are separating their front-end and back-end organizations since they require execution of different strategies. While front-end organizations are facing with customers and require customized solutions, back-end systems are more cost and efficiency focused. Secondly, they should include their customers for the creation process. Thirdly, companies should employ Open Innovation methods for enhancing service innovation. This can reduce the required time and costs for transformation. Lastly, creating a platform will make it possible to benefit innovations developed by other organizations (Chesbrough, 2010).

There are two important terms for companies to expand their businesses and increase their revenues. These are economies of scale and economies of scope. Economies of scale refers to the reduction of costs as the volume of production increases. On the other hand, economies of scope reflects the increase in efficiency when various products and services are offered to customers from a single source. This decreases the costs for additional offerings. For instance, cross-selling banking services are examples for economies of scope. This has great importance for open service innovations since customers play critical roles in services. Economies of scope also relies on the specialization of companies in different fields. In this sense, Chesbrough (2010) brings up modern farming. In contrast to traditional farming, modern farmers give importance to specialization and they focus on one or very few crops since different crops require different machinery and production methods. Platforms which aggregate these specialized producers offer best products and services to their customers.

Chesbrough (2010) brings up changing automobile ownership through service platforms. According to his example, customers can be freed from ownership of a vehicle and wide-variety types of vehicles can be provided through platforms. This disruptive model can enhance customer satisfaction since customers won't be limited with ownership of a car and providers can expand their business models with collaboration and creation of different services. Instead of assessing the car as a transaction, new approach see it as a delivery

method for services. In addition, smartphone-based vehicle sharing systems reflects that there is such a transition in automobile industry (Alli et al., 2012).

iTunes is also another good example for developing a service platform. Apple succeeded in offering value added services through its iTunes platform by attracting contribution of third parties. Initially, the company developed the platform for offering wide-range of music for iPod users. It became a one stop shop for listeners. Users have access to books, games, movies and many other things through the platform. It is also open to many types of contributors including resellers, partners and commentators. As company's technology advances and its flagship product iPhone is shaping markets, Apple App Store became the most important platform for engaging third party developers and customers (Chesbrough, 2010).

Biggest change in open services value chain occurs in internal support functions. Although inputs, outputs and processes remain the same, there is no interaction of internal support functions. In contrast, their interaction with customers and third party actors in co-creation is enhanced. The services are presented to the market in a wide platform instead of a single point by combining offerings of different third parties. Open Innovation underpins platform-based model (Chesbrough, 2010).

Platform business model changes the traditional view towards value chains. When it comes to mobile service delivery, there are various types of platforms to offer services. Telco-centric model, device-centric model, aggregator-centric model and service-centric model are the leading platform-based business models in mobile service delivery. Telco-centric model is used widely in mobile industry and telecom companies performs as service aggregators, platform operators, portal providers and network operators.

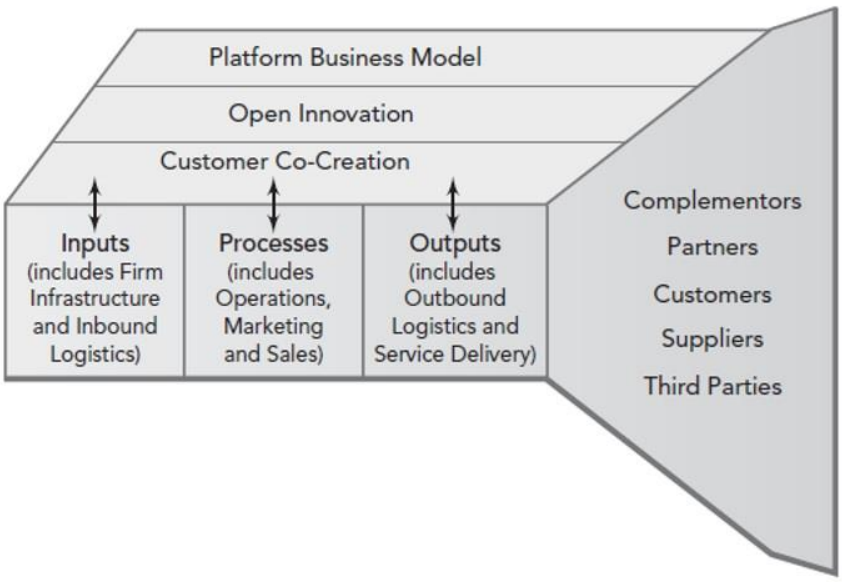

Figure 3. Open services value chain (Chesbrough, 2010, p.35)

Device centric model is tied to mobile devices and iPhone based services exemplify well this model. In aggregator-centric model, services are combined in a single service portal, but a service aggregator which is independent of mobile network operator takes responsibility. Facebook Mobile Platform is a good example for aggregator-centric model (Ballon et al., 2008).

A service based model is based on open APIs and exploits also social network applications. The service portal aggregates and facilitates the access for the services. There are various specific sub-platforms for different service providers. It can be possible for developers to access and contribute to services through a meta-platform. Services can be delivered directly to end users as well as through a platform. Anyone can contribute to service creation and this expands the businesses enormously (Ballon et al., 2008).

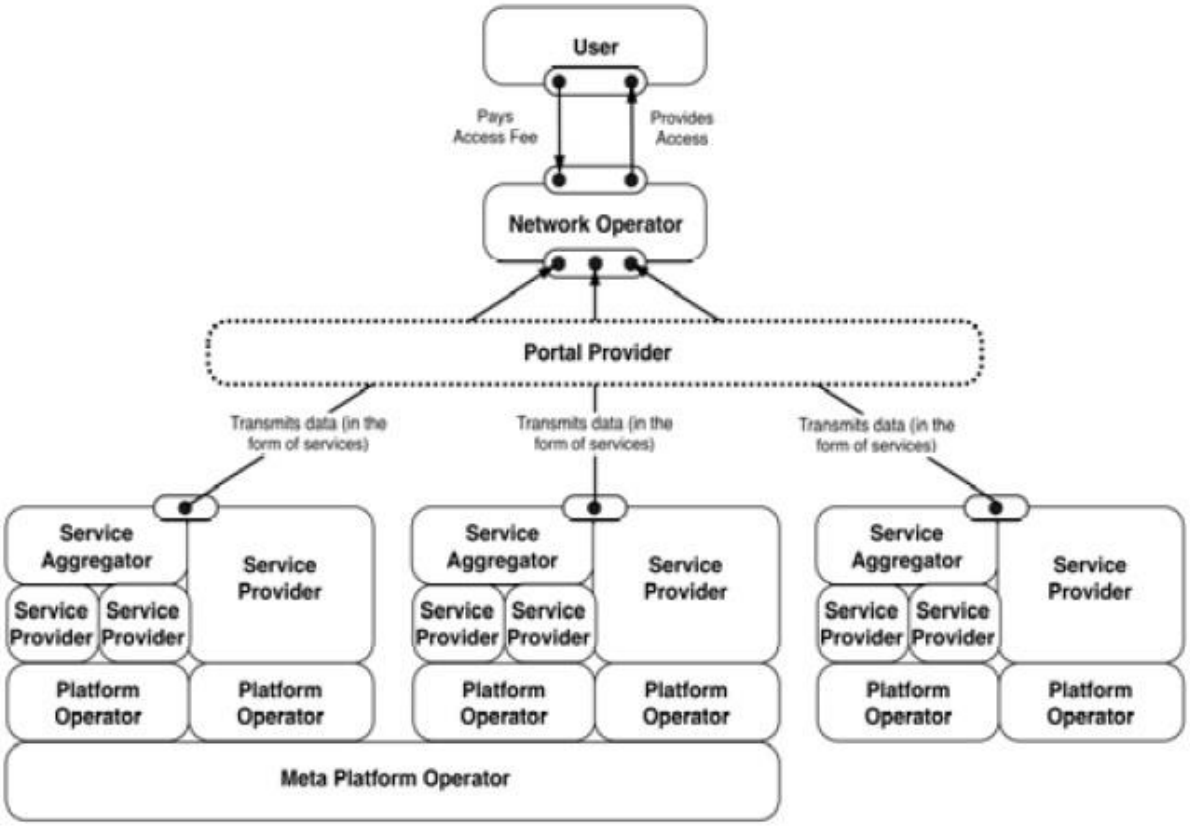

Figure 4. Service-centric model (Ballon et al., 2008, p.4)

Changing business model for a company entails to overcome many roadblocks. One of these roadblocks is business model inertia. Factors such as organizational structure, mindset of managers, investors of the company, traditional business mindset can create inertia and hamper the change. Especially incumbent organizations which execute their

successful models without changes for many years are struggling in changing towards service-focused companies. Changing business models require many experiments and analysing the results. However, this is quite challenging for large traditional organizations. In this sense, they can use start-ups as case companies and benefit from their experiences since they are more eager and tolerable to changes (Chesbrough, 2010).

Open Innovation methods implemented in services are important for Fintech space since financial sector is a part of service economy. It can contribute to understand Open Innovations in financial services better.

2.5. Open Innovation in Financial Services

Financial sector has a special importance for the health of entire economy as well as its contribution to Gross Domestic Product (GDP) of a country (Mention and Torkkeli, 2014). It was considered as a conservative industry with its stable structure, business models and defined boundaries. However, this traditional structure began to change in the beginning of 90s. Actually, major chances in customers' essential needs such as depositing, sending and withdrawing money or financial advising didn't occur. The way to execute these activities and developing innovations have radically changed. Unstable nature of markets, new technologies and changes in demographics are some reasons lying behind this situation. Changes in customer demographics and their requirements triggered a new trend for innovation and new business opportunities (Fasnacht, 2009).

Mentioned conditions fostered financial innovation and many new products and services were offered to customers after 2008. Services in financial sector are not based on physical goods. In this sense, innovations in financial sector are substantially intangible (Mention and Torkkeli, 2014). Innovation in financial services can be defined as innovation in products or organizational structures which result in cost or risk reduction and improve financial services (Arnaboldi and Claeys, 2014). These innovations also altered and modified roles of financial institutions. Financial institutions are not the only organizations developing innovations in financial sector. They also benefit developments in other industries, especially in information technologies. In this respect, they often build partnerships or alliances with software companies (Arnaboldi and Claeys, 2014). In the eyes of financial institutions, primary reasons behind these collaboration are reaching expertise and reducing costs. However, rigid form of their organizations, cultural differences and alignment of different goals can hamper these collaborations (Martovoy, 2014).

A wide range of financial products of services were introduced between 1960 and 2007. They include bonds, derivatives, mortgage-back securities, debit cards, risk management systems, automated voice respond systems, telephone banking, ATMs, internet banking and open architecture (Fasnacht, 2009). It is also important to keep in mind that financial

innovations should contribute to society as well as they increase the revenues and efficiency of financial institutions (Mention and Torkkeli, 2014).

Banking institutions have the lion's share regarding using innovations in financial sector. They possess large assets for exploiting and nurturing financial innovations. Many financial institutions regard innovation as a tool for reaching their strategic goals (Hydle et al., 2014). On the other hand, patenting is still in its infancy and this brings difficulties for turning financial innovations to revenues (Arnaboldi and Claeys, 2014). In addition, conservative culture, constraints of existing systems, different goals of departments and limited use of New Development Tools can limit the scope of product innovation in financial services (Vermeulen, 2004).

Banking institutions consist of different units and each unit has different character for developing and using innovations. Whole banking industry can be classified as retail banking, private banking, commercial banking, investment banking and asset management. Their business models, structures and offerings differ in many ways. While retail banking is serving for end users instead of companies, commercial banking is dealing with companies and corporations. Both of them are carrying out routine daily transactions and few radical innovations happened in these space. High competition and cost pressures forced them to focus their back-end systems and increase their efficiencies. On the other hand, private banking is more customer focused and it is more personal than mass market retail banking. Investment banks work closely with companies or governments for financial advisory and investment solutions. Mortgage-back securitizations developed in 70s can be seen as a financial innovation in investment banking. Investment banking was driven by hundreds of incremental innovations. Innovations in advisory and client segmentation emerged in wealth management (Fasnacht, 2009).

Bank of America built a new organizations to test new ideas in the beginning of 2000. Five stages of their service innovation are respectively assessing internal and external ideas, trial design and development, prototype development, creating an environment to test new ideas and experimentation of innovations in test market (Fasnacht, 2009).

On the other hand, there are many unsuccessful experiences in turning financial innovation into revenues. While Citi was expecting high revenues from its emerging markets division, it had to close Germany operations. Main reasons behind this failure were underestimating local needs, fierce competition with local banks and low quality of innovations. In addition, being largest bank in the world doesn't mean that it would be easy to innovate and such a huge organization brought many burdens and hampered its agility (Fasnacht, 2009).

Most of the innovations developed between 1970s and 1980s were directly related to product innovations. In addition, financial institutions enjoyed exclusivity provided by legislations. As this situation changes, imitation of these products became easier and increased variety resulted in reduction in revenues. In the beginning of 2000s, "Open Architecture" term was promoted regarding opening boundaries of financial institutions. In

this sense, most of the banking institutions changed their structure to exploit benefits of Open Architecture and offer wide variety of products (Fasnacht, 2009).

Open Architecture was first implemented in fund distribution. Credit Suisse is one of the first examples of financial institutions which offered third-party products to its customers. Banks started to provide funds of their competitors with their own funds. Many large banks enjoyed this new idea since it allowed them to act as providers and buyers of products. This contributed to their competitive position in the market. It also enabled them to offer best products to their customers. Moreover, they became one-stop shops for their customers giving importance to unbiased advice for all fund categories with standardized price. On the other hand, banks which refused to embrace this new business model lost their customer base and had to implement Open Architecture to their models (Fasnacht, 2009). Fasnacht (2009) also puts forward that every banking institution will embrace radical changes as manufacturing companies did in 80s.

(Kousaridas et al., 2008) brings up Open Financial Services Architecture (OFSA). It refers to a system which manages financial services through mobile devices. These financial services include mobile payments and system implements Universal Mobile Payment System (UMPS). Open Architecture enables to a flexible and scalable application. In addition, integration of payment and banking systems enables simplicity, usability, security, privacy, trust, universality and integration of legacy applications. Trust factor between user and banking organization and between user and mobile device is regarded as the primary principle in this system. Salampasis et al. (2014) also gives special importance to trust factor in Open Innovation activities in financial sector. Kousaridas et al. (2008) posits that integration of payment and banking systems is a necessity especially for ubiquitous devices. Big data transfer takes place between these systems and core banking systems. Therefore, security is an important issue in OFSA. Every transaction requires security for authentication, integrity, confidentiality and authorization (Kousaridas et al., 2008).

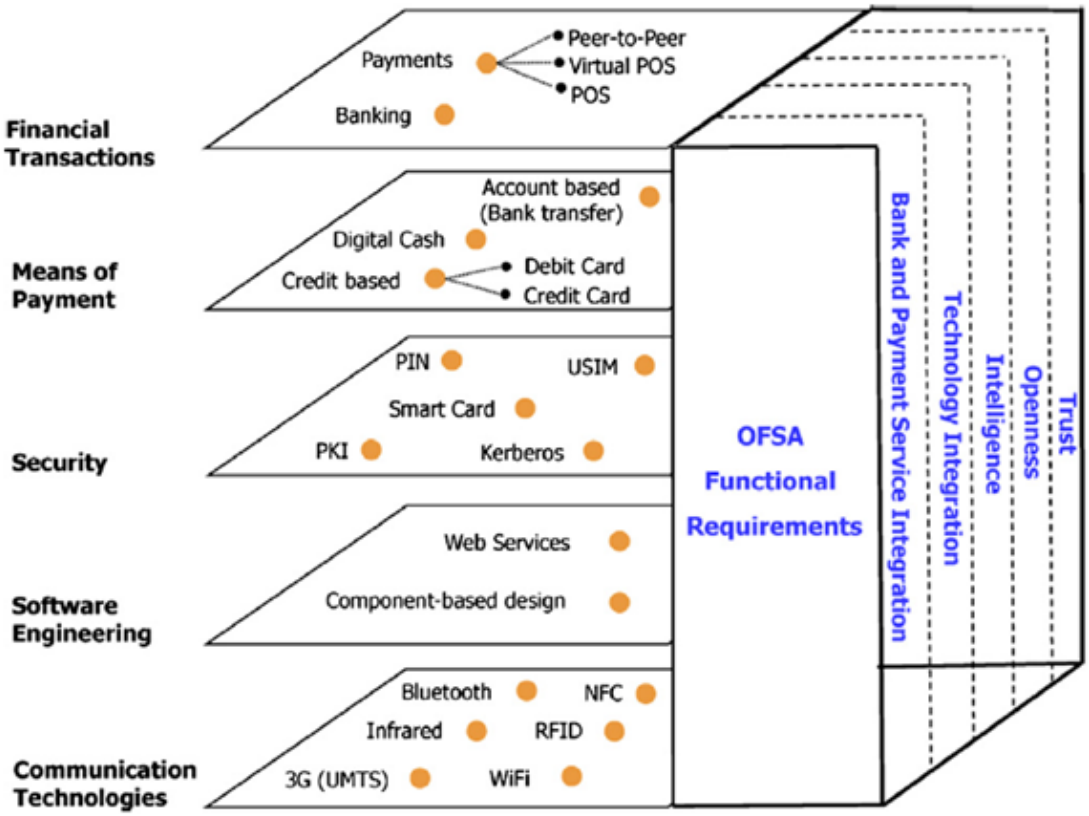

Figure 5. Mobile financial services context and Open Financial Services Architecture (OFSA) requirements (Kousaridas et al., 2008, p.3)

When it comes to the innovations in financial sector, the findings show that innovations outside from the industry has profound influence. In this respect, financial institutions are bound to the innovations developed by others, especially information and communications technologies companies (Salampasis et al., 2014). As a result, adoptions of these innovations to financial sector and knowledge inflow are more prevalent than internal development and knowledge outflow from financial sector (Martovoy et al., 2012). Even largest banking institutions are collaborating with IT companies to exploit their expertise regarding software and hardware solutions. By doing so, this also minimizes their costs when it is compared to in-house development. Collaboration and partnerships also can lead to shorter time-to-market periods. However, parties may face with some problems due to different organizational cultures and adoption of new solutions to existing systems (Martovoy et al., 2012).

A study proves that share of companies with innovation activities are directly proportional to the mobile phone usage in Europe (Mention et al., 2014). It exemplifies well the relationship between mobile applications and innovation activities of firms.

2.6. Emergence of New Technologies in Fintech scene

Emergence of new technologies and innovations shape Fintech space. In this sense, important developments are handled in this chapter.

Adoption of Near-Field Communications (NFC) and Tokenization to Mobile Payment Solutions

Adoption of Near-field communications (NFC) to smartphones is necessary for mobile proximity payments (Mainetti et al., 2012). By doing so, customers can use their smartphones as digital wallets (Pham and Ho, 2015). It enables cards and terminals to "speak" each other without any physical contact. It offers easier, faster and more convenient cashless transactions both for the consumer and merchant while it reduces costs. It enables smartphones to be used as digital wallets. It attracts many technology giants and customers. Product-related factors, personal-related factors, attractiveness of other alternatives and perceived risk by the customers affect the intention to adopt this technology (Pham and Ho, 2015).

NFC technology facilitates the purchasing process and security of information. It is user-friendly since it eliminates the need for cash. In addition, it speeds up the payment process. Mobile network operators and banks are heavily invest in NFC payments through collaboration. However, there is a lot to do to increase customer attraction (Pham and Ho, 2015).

Various parties take responsibilities in NFC payments. NFC chip and Secure Element (SE) are equipped to devices by technology vendors and mobile network operators. Issue specialized cards and payment terminals are controlled by the banks. In addition, new NFC enabled point-of-sale (POS) terminals have to be installed by the merchants. Moreover, gateway service providers and trusted service managers (TSMs) provide services for transmission, process and security of the payment transactions (Reuver et al., 2015).

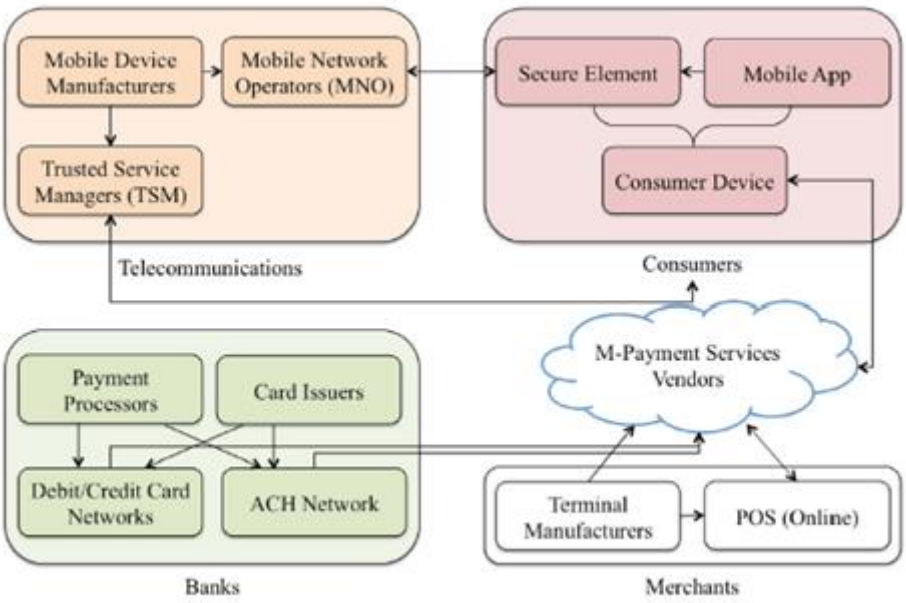

Figure 6. NFC-enabled mobile payments platform (Liu et al., 2015, p.8)

Big Data

The amount of information created everyday has enormously increased. The lion's share lying behind this happening belongs to the advancements in information technologies and the explosion of mobile device usage. These data include structured, semi-structured and unstructured textual to multimedia content on many platforms including social media sites, Internet of Things (IoT) and cyber-physical systems (Sivarajah et al., 2016). 2.5 quintillion bytes of data (1 quintillion bytes = 1 billion gigabytes) is being produced everyday (Dobre and Xhafa, 2014). In 2013. Silicon Valley Bank declared that 90% of world's data was created in last two years. Therefore, "big data" notion has been commonly expressed since early 2010s and it became a hot topic for researchers and companies in short notice. It describes the new technologies and methods for data management.

Big data analytics is the way to manage, process and analyse of huge amount of data. It became a differentiator between high-performing and low-performing companies (Wamba et al., 2016). Germann et al. (2014) puts forward that there is a positive correlation between firm performance and deployment of customer analytics.

Deployment of data standards and electronic data interchange formats facilitated the growth in this field as well as the development of ultra-fast global connections, advanced databases and information systems (Chen et al., 2012). On the other hand, researchers have to overcome challenges regarding data' volume (large datasets of data), variety (multiple data formats), veracity (complex structure and anonymities), velocity (high rate of data

flow), variability (change in meaning of data), visualization and value. Data acquisition and warehousing, data mining, data aggregation and integration, data analysis and modelling and data interpretation are the process challenges. Lastly, privacy, security, sharing, ownership and cost of data are management challenges (Sivarajah et al., 2016).

Leading e-commerce vendors and their highly scalable commerce platforms have contributed to development of big data analytics. Personalized purchase recommendations which were created through consumer data analyses were 35% of all purchases in Amazon.com (Wamba et al., 2016; Chen et al., 2012)

In financial services, big data focused methods enable devising tailor made products by semantic analyses of personal data. Mobile devices and applications facilitate understanding real time behavioural data of customers by collecting and analysing data in online conversations, transactions, check-ins, likes in Facebook or many other platforms. Analysis of driving data including driver's daily habits facilitates offering a better insurance policy. On the other hand, advanced statistical methods in risk management services offer a better understanding for the correlation between factors and risks in finance sector. Data-driven technologies certainly enhance the efficiency and business performance (Chishti and Barberis, 2016).

Due to the fact that banks possess largest servers and customer base, there is a huge demand for better implementation of data-driven technologies in banking sector. There are various methods especially to analyse big data created in social networks and mobile service. However, there are some hurdles to overcome for direct implementation of internet big data methods to banking organizations. In this regard, solution entails the participation of software enterprises. These obstacles include the requirement for new people who has the ability to fully understand new data driven technologies as well as complicated and unwieldy old back end systems of banking institutions. The easiest areas for implementation are marketing, know your customer (KYC) process and fraud detection. In addition, there is a need for evaluating data consistently and in real time to fulfil regulatory requirements in compliance. Traditional back end systems have limited capabilities to manage data. Unlimited storage, unlimited processing capabilities and unlimited caching capabilities are essential to obtain and analyse real-time and consistent data. Data for compliance systems are obtained both from internal and external systems including trading systems, market, CRM, external financial system, real time and historical news and government (Chishti and Barberis, 2016).

Operation time of vehicles, covered distance, engine diagnostics, driving behaviour, weight of load and the terrain driven are the valuable data in fleet vehicle leasing. These valuable data can be utilized as a warning for a required maintenance and it also allows a better understanding for vehicle's present value regarding financial services linked to the vehicle. In real estate, data regarding environmental factors, pollution, temperature, flooding, water damage, interior decay and local economic trends such as transport usage or shopping patterns can be used to provide information on the value of the house for valuation and

insurance. On the other hand, smart data in commodities regarding their temperature, moisture level, weight, vibrations, location or speed of transportation is valuable to monitor their conditions (Santander, 2015). Analyses of smart data offers myriad opportunities and leads to offer better services for the customers. A blend of transactional, locational, communications and social media data will make it possible to contact with the customer in most suitable and profitable way. Besides, some Fintechs such as Red Owl Analytics helps banks to track the influencers in data networks. It is beneficial for relating data and understanding the patterns in different resources such as transactions, communications and physical access. By doing so, banks can employ better fraud and market manipulation services. Analysing customer spending behaviour and supplier performance data is beneficial for providing real-time credit to customers, managing SMEs' cash flow and credit line requirements. Lastly, customer spending and income patterns can be understood by analysing historical data in their bank accounts. This can be utilized for offering budgeting advice for customers (Santander, 2015).

Cloud Services

Cloud computing refers to the delivery of different IT resources and services over Internet with ubiquitous and on-demand access model. In this model, users don't have to own data-centres, IT infrastructure and software services. In addition, payment structures are more flexible than other services. "Cloud" term became popular after the announcement of IBM's Blue Cloud. Cloud computing offers business-focused, dynamic and scalable services over internet with a shared pool of computer resources. It offers easy to use Web services which provide storage, computing power and other functions. It lowers the costs enormously by leveraging economies of scale (Cai et al., 2009; Mell and Grance, 2011).

Cloud computing relies on the developments in distributed computing, grid computing, utility computing and Web services. The transition from Web 1.0 to Web 2.0 introduced "low-touch, low-margin and low-commitment" self-services. This facilitated the use of Web services and online payments both for consumers and merchants. It also reduces red tape and need for customer relationship management. For instance, Amazon Web Services started providing pay-as-you-go computing with no contract. Moreover, individuals started to use Google AdSense to gain revenues from ads without building a relationship with an ad placement company (Armbrust et al., 2009).

Individuals and companies can use these services without investing heavily to IT infrastructure. Required hardware and software are accessible over internet. Overprovisioning is no longer an issue and they can use the required amount of space and computational power anytime. It is important to note that cost of using 1000 servers for one hour is more than using one server for 1000 hours. In this sense, cloud computing brings efficiency, flexibility and reduction in IT costs (Armbrust et al., 2009).

On-demand self-service, broad network access, resource pooling, rapid elasticity and measured service are essential characteristics of cloud computing (Mell and Grance, 2011). In hardware sense, availability of infinite online computing resources, optimization of resources with respect to requirements and pay-for-use models even for short-term basis are prominent features (Armbrust et al., 2009).

There are three type of service models offered by cloud computing. These are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). SaaS refers to the deployment of software applications to consumers on a cloud infrastructure. Users don't control and manage infrastructure and software issues such as operating system and configuration settings. On the other hand, PaaS refers to deployment of cloud infrastructure and applications supported by the provider such as programming languages and libraries. While users don't manage and control underlying infrastructure and hardware, they have the control for applications and configurations. Lastly, IaaS refers to the deployment of services which users can't manage and control infrastructure, but they have the ability to control over storage, operating systems and limited networking components (Mell and Grance, 2011).

These models can be deployed over private cloud, community cloud and hybrid cloud infrastructures. Private cloud networks are controlled by a single group or entity. Most of the paid software operating in cloud fall to this category. One or more organizations in a community can access and control community cloud networks with permission. On the other hand, public clouds are open networks which can be owned and managed by anyone. Lastly, hybrid cloud networks combine more than one of these three models (Cai et al., 2009; Mell and Grance, 2011).

While pay-per-use model is the most popular billing policy, different policies such as revenue sharing or charging monthly standard fees are also common in the market. It depends on the type and scale of the service and scarcity of resources (Cai et al., 2009).

Cloud technology offers myriad opportunities especially for banks due to their huge customer bases and database requirements. They are investing heavily to cloud technology for increasing cost effectiveness. Private cloud deployments are accounted for almost 70% of banks' cloud initiatives in 2014. It is estimated that public cloud market will grow at CAGR (compound annual growth rate) of 17.7% to $191 billion in 2020 from $72 billion in 2014.Key drivers lying behind this fact are lower investment needs, infrastructure flexibility and scalability, shortened time to market for their products and services and gaining agility for facilitating multi-entity environment transactions (Capgemini, 2016).

Application Programming Interface (API)

API (Application Programming Interface) is a set of procedures and tools enabling different software systems to communicate each other efficiently. While they are being

used to facilitate the engagement of Fintech companies as innovation suppliers with finance institutions by building blocks of flexible services, they are also used for combining different services and creating additional value (Chishti and Barberis, 2016).

They offer secure, controlled and cost-effective access to data and functionality by third parties (EBA, 2016). It is clear that companies such as Google, Twitter, Facebook or Salesforce couldn't have grown so fast without exploiting the opportunities of API technology (EBA, 2016). Google Maps API, YouTube APIs, Twitter APIs or Amazon Product Advertising APIs are well known examples in this sense. For instance, developers can embed Google Maps in their webpages by using Google Maps API. On the other hand, Twitter offers two APIs for developers. First one, The Rest API, enables developers to use Twitter's core data. The second one, Search API, allows developers to use Twitter search and trends data. Similarly, many incumbent organization and Fintech start-ups APIs communicate and link core financial operations with other services. Key technical concepts lying behind API are respectively data transmission, data exchange, data access and API design. Data transmission should guarantee the security of the process. Most of the APIs employ HTTP/HTTPS as a transport layer since they are quite simple and compatible. Data exchange represents the format and XML and JSON are the most common formats. Data access organizes who can access which data and how it is performed. Most common standards are SAML and OAuth 2.0. Lastly, most common design principles for APIs are REST (Representational State Transfer) and SOAP (Simple Object Access Protocol). While REST is more focused on solving performance, scalability, modifiability, portability and reliability related problems and it is more popular, SOAP is regarded as a solution for enterprise environments and it is more complex than REST for implementation (EBA, 2016).

Boundaries can be established for the access of APIs. While "Closed APIs" or "Private APIs" can only be accessed in an organization, it is possible for third parties to access "Open APIs". However, it doesn't signify that anyone can access to a bank's open API. There is always a control mechanism regarding security and privacy concerns (EBA, 2016).

In terms of the openness of API, it can be classified as Private APIs, Partner APIs, Member APIs, Acquaintance APIs and Public APIs. Private APIs are closed and accessed exclusively by the members of the organization. Partner APIs are opened only to partners who made bilateral agreements with the organization. Data exchange between an Enterprise Resource Planning (ERP) software supplier and a bank exemplifies well the use of Partner APIs. Member APIs are open to anyone who is a member of the community or organization. Future PSD II-mandated Account Information and Payment Initiation services is a good example. Registered Third Party Providers (TPPs) can have access to API. Acquaintance APIs can be accessed by everyone, but they should fulfil the requirements. Merchant access to point-of-sale (POS) falls into this category. Lastly, anyone can access to Public APIs after a registration process (EBA, 2016).

Financial information systems consist of three layers. They are respectively user layer, user contract layer and financial system layer. While user account layer represents platforms such as internet banking, financial system layer represents financial systems such as account or data system. Data flow between user layer and user contract layer is possible with APIs. Due to the complexity and inflexibility of the systems behind user contract layers, they require an additional layer for answering new configurations and changes. In this sense, API-based open service architectures are being delivered (Kim et al., 2016).

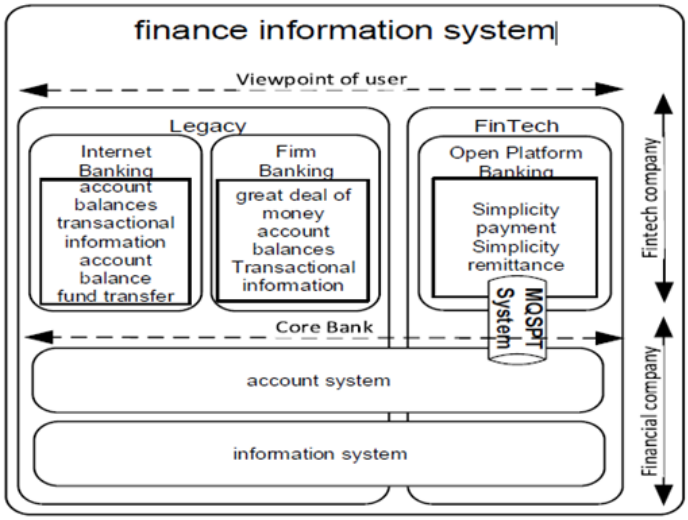

Figure 7. Financial information system process (Kim et al., 2016, p.2)

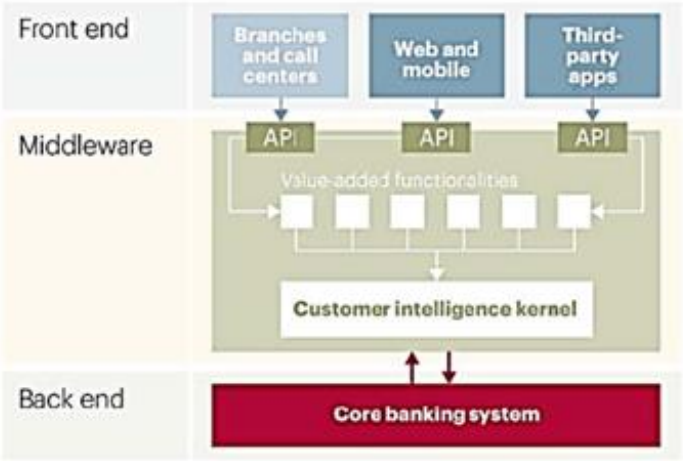

Figure 8. Communication between different layers in banking (Padmaavathy and Adalarasu, 2015, p.5)

Blockchain and Bitcoin (as a well-known example of blockchain technology)

Blockchain term represents a distributed database or public ledger which is executed and shared among participators. Majority of the respondents reach a consensus to verify each transaction in the public ledger. It is impossible to erase the information. Marc Andersen, a famous investor and entrepreneur in Silicon Valley stated that blockchain technology is the most important invention since invention of Internet. Blockchain technology relies on the white paper, Bitcoin: A Peer-to-Peer Electronic Cash System, published by an individual or a group under the name of Satoshi Nakamoto in 2008 (Crosby et al, 2015).

Blockchain technology is being widely applied in financial and non-financial services for many years without a flaw. The most popular example of blockchain technology is Bitcoin. It enables anonymous transactions without any governmental control. In traditional finance, we need a third entity as a certain trusted authority to secure our assets. Money's value is under control of central banks and government. Also we need banks to keep and transfer digital assets. Bitcoin defies this control mechanism and enables frictionless movement of digital currencies without involvement of any intermediaries. On the other hand, we also need third parties for non-financial purposes. For instance, an e-mail service providers notifies us for the delivery status of our e-mails or we need certification authority for verification of a digital certificate. In this sense, blockchain technology can revolutionize digital world through distributed consensus for every transaction. It is also possible to verify any digital assets in any time in the future. It enables this without any involvement of third parties. Main features of blockchain technology are distributed consensus and anonymity (Crosby et al, 2015).

Third trusted parties are employed in traditional online finance for validating entries, safeguard entries and preserving historical record in transactions. Fraud risk brings the requirement for third party involvement and this increases the cost of transactions. However, cryptographic proof is used in Bitcoin instead of a third party involvement (Crosby et al, 2015). Satoshi Nakamoto states that an electronic payment system leveraging cryptography should replace trust in financial services. Bitcoin is based on this idea and guidelines are explained first in the paper mentioned above. An electronic coin represents a chain of digital signatures. Each coin is transferred to next owner by digitally signing a hash of previous transaction (Nakamoto, 2008). Digital signatures protects record of each transaction. Each transaction is signed by digital signature, "private key", of the sender and the receiver receives it by using a "public key". Owner of the cryptocurrency should prove the ownership of "private key". The receiver verifies the ownership of "private key" by the "public key". Every node in the network receives and records every transaction after verification in a public ledger. Two things are necessary for verification. Firstly, prove of ownership of the cryptocurrency (digital signature verification). Secondly, prove of sufficient cryptocurrency in the spender's account (checking every transaction) (Crosby et al., 2015).

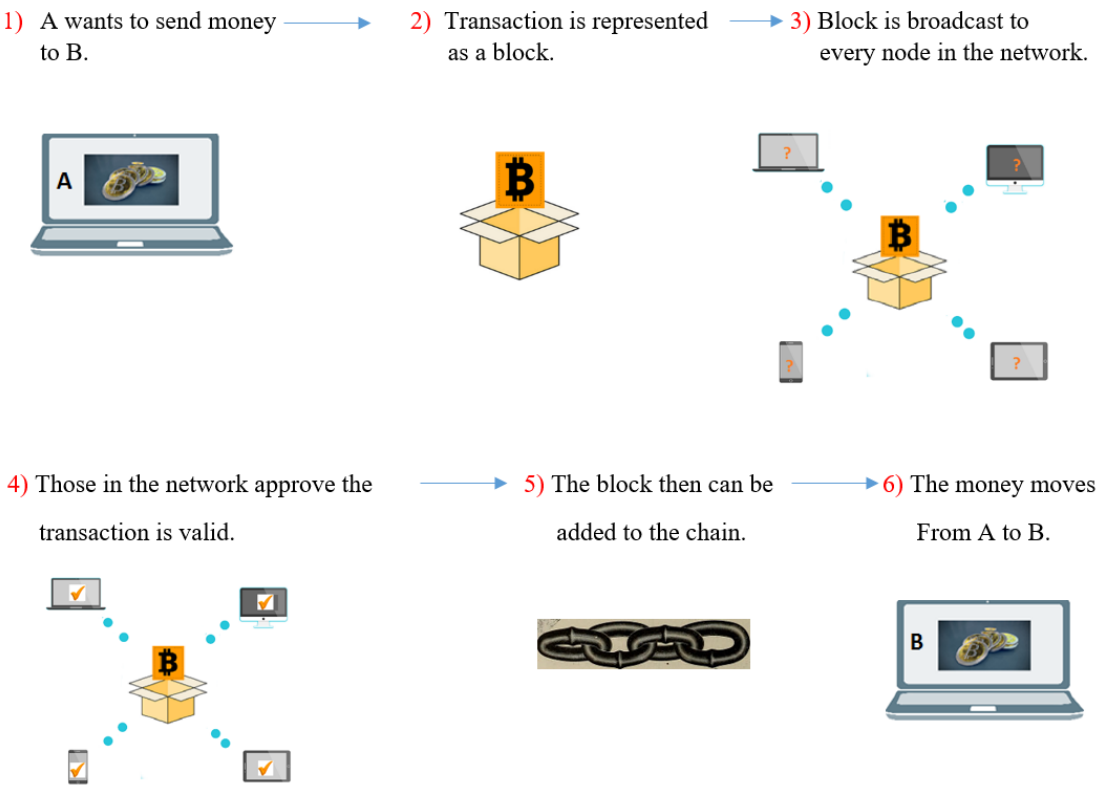

Figure 9. How a blockchain works (Developed by the author based on Crosby et al., 2015, p.7)

One of the most critical point in this system is maintaining the order of transactions. Therefore, it is necessary to devise a mechanism to keep the transactions in order. Blockchain technology solves also this problem. Transactions are placed in groups called blocks and they are linked to each other. Transactions happened at the same time are placed in the same block. These blocks are linked to each other in a linear and chronological order. Every block contains the hash of previous block. At this point, a second problem occurs. How is it possible to prevent to build a block of unverified transactions and broadcast it to other nodes? A mathematical puzzle is introduced to solve this problem. Each block should contain an answer to a special mathematical problem to be accepted. Node which generates the block needs sufficient computing resources to solve this puzzle. The solution is also called "proof of work". It takes about ten minutes for a node to solve the puzzle and generate a single block. Nodes generating blocks are called "miners" and they are financially awarded. As the block is generated, it is broadcasted to other nodes. Mathematical models behind this system is complicated and it stabilizes the order of the blocks. Only the longest blockchain is valid in the network. Therefore, an

attacker should build the longest blockchain in the network to disrupt the system. In the light of required power and effort, it makes any fraud impossible (Crosby et al., 2015).

Satoshi Nakamoto's work solves famous double-spending problem which is also known as Byzantium Problem. Malfunctioning components disrupting the communication in a system with conflicting information can be liken to a group of generals of Byzantine army who are preparing for an attack to the enemy front. Only the messenger enables communication and there is need for agreement on the battle plan by the generals. Unfortunately, one or more of the generals can be traitors and this results in a confusion in the plan and communication. In this respect, the problem is generating an algorithm to enable loyal generals reach an agreement. It is proved that, only if oral methods are applied, more than two thirds of the generals should be royal to solve the problem. Otherwise, unforgettable written messages should be used (Lamport et al., 1982).

Public keys allow respondents to see that someone is sending an amount to someone else, but it doesn't link the detailed information of the transaction to anyone. It is similar to the transactions in stock exchanges. Nobody can understand who is making the transaction. In this way, privacy is guaranteed (Nakamoto, 2008).

Bitcoin aims to overthrow fiat-based currencies. There are mathematical models behind its supply and growth rate. Its supply reaches to its peak with 21 million units in 2140 (Yermack, 2013). Bitcoin is not the only decentralized cryptocurrency. These alternative coins are called "Altcoin" and they are based on the technology Bitcoin based on. They have minor changes in transactions speed, distribution method or hashing algorithm. Except Litecoin, few of these altcoins achieve to survive for long and they disappear after a while. However, they function as "cryptocurrency laboratories" and play important role in innovation and contribution for decentralization.

Since its inception in 2008, Bitcoin made rapid progress. First transaction with Bitcoin is carried out in 2009. In 2010, Laszlo Hanyecz made the first "real" financial transaction. He bought a pizza for 10.000 BTC. Each Bitcoin's value was around $0.0025. In 2011, one Bitcoin's value reached around $10. Its value is around $580 in 2016. Afterwards, Bitcoin Foundation was formed in 2012 (Forbes, 2013). It is oldest and largest group in Bitcoin industry and its target is fostering education, increasing adoption and encouraging Bitcoin and blockchain technology worldwide. In the same year, first Bitcoin exchange was licensed as a bank in EU. Department of exchange in U.S called Bitcoin a "legal means of exchange" in 2013. In the same year, Bitcoin ATMs were introduced in Canada and Slovakia. In 2014, Canada and Bank of France declared that Bitcoin wasn't a legal tender (PwC, 2014)

According to an Oliver Wyman report (2015), systems for peer-to-peer transactions work near-certain correctly and distributed ledgers eliminate supervision and IT infrastructure costs. Their analysis suggests that distributed ledger technology can reduce banks' infrastructure costs by between $15 – 20 billion per annum by 2022 (Santander, 2015). In

EU-sixth trend report (2016), same reduction in costs was estimated as EUR 13.8 to 18.4 billion per annum by 2022 (EU Commission, 2016).

Better understanding of new technologies can contribute to comprehend the investment movements, new business models, collaboration and relationships between parties in Fintech space. In this sense, they are covered in this thesis.

2.7. Investments in Fintech

Investments in Fintech sector exploded in recent years. According to Accenture analysis on CB Insights data (2016), investments skyrocketed to $22.2 billion in 2015 from 1.7 billion in 2010. Moreover, while 338 deals were made in 2010, number of deals in 2015 was 1108 (Accenture, 2016). These figures are far beyond expectations. In 2014, Accenture estimated that global Fintech investments would rise to $6-8 billion for 2018 (Accenture, 2014). However, the actual investments in 2014 nearly tripled and reached around $12 billion in 2014 (Accenture, 2016). It is clear that this growth will continue in foreseeable future and more investors will participate in this environment.

According to Ernst & Young (2016), California, New York, London, Singapore, Hong Kong are among leading Fintech ecosystems. There are different rankings in terms of talent, capital, policy and demand among these countries. UK, California and New York seem the best ecosystems for Fintech companies (Ernst & Young, 2016). On the other hand, UK's Brexit decision may negatively affect its competitive advantage. The country is an attraction centre for Fintech start-ups due to the easiness of communication between the financial institutions located in the country, the access to talent, funding and country's flexible regulatory regime. However, the uncertainties and risks jeopardize these advantages after the referendum. Firstly, Ireland has an opportunity for becoming the only English-speaking country in EU and threatens UK's advantageous position in terms of talent. Secondly, regulatory advantages of EU may also contribute to Ireland's rise to attract investments. Lastly, new global data protection regulations were approved by EU and they will enter into force in 2018. This includes a new framework for transatlantic data flow. Leaving the bargaining table also jeopardize UK's attractive position in Europe (PwC, 2016).

All the Fintech ecosystems have different advantages and characteristics. Significant characteristics of California is its expertise, well-established connections and large VC funds in Fintech environment. The proximity for customers is more distinctive in New York when it is compared to California. In addition, high number of incubators and accelerators in New York contributes its success. UK is currently the Fintech centre in Europe. Its proximity to wealth and expertise, proactive regulatory regime and effective networks play important role in this sense. Banking and payments is the leading subsector for investments in UK. It is respectively followed by credit and lending, investment

management wholesale banking and capital markets, retail investments and pensions and insurance. On the other hand, Asia offers myriad opportunities for Fintech start-ups and investors. Shanghai, Beijing and Shenzhen are main Fintech clusters in China. Seven companies from China are in Fintech unicorns list and four of them were founded in last five years. Internet giants such as Alibaba has tremendous potential due to large and highly digital consumer base in the country. Country is in the second place for investments after California. Singapore distinguishes itself with its progressive regulatory regime. It is the preferred gateway to Asia due to the easiness to do business and English language proficiency. Moreover, Monetary Authority of Singapore plays important role in building public and private partnerships. Hong Kong is also a promising and developing market. Market size and investment amounts were close to Singapore in the same period, but it is certain that it has more potential (Ernst & Young, 2016).

APAC region including India, Singapore, Hong Kong, China, Japan and Australia is seen as the second biggest investment region behind after North America. The amount of investment in this region increased four-fold in 2015 and reached to $4.3 billion. China has the lion's share by attracting 45% of this amount. Most popular segment for investment in this region is payments by 38% of the total (Accenture, 2016). Apart from these countries, there are notable regions focused on particular fields. In this sense, Israel's expertise in cybersecurity, Vienna's expertise in mobile payments, Johannesburg's focus on Bitcoin development, Benelux's success in payments, Dublin's expertise in fund administration and Estonia's focus on financial identity are some examples (Ernst & Young, 2016; Chishti and Barberis, 2016).

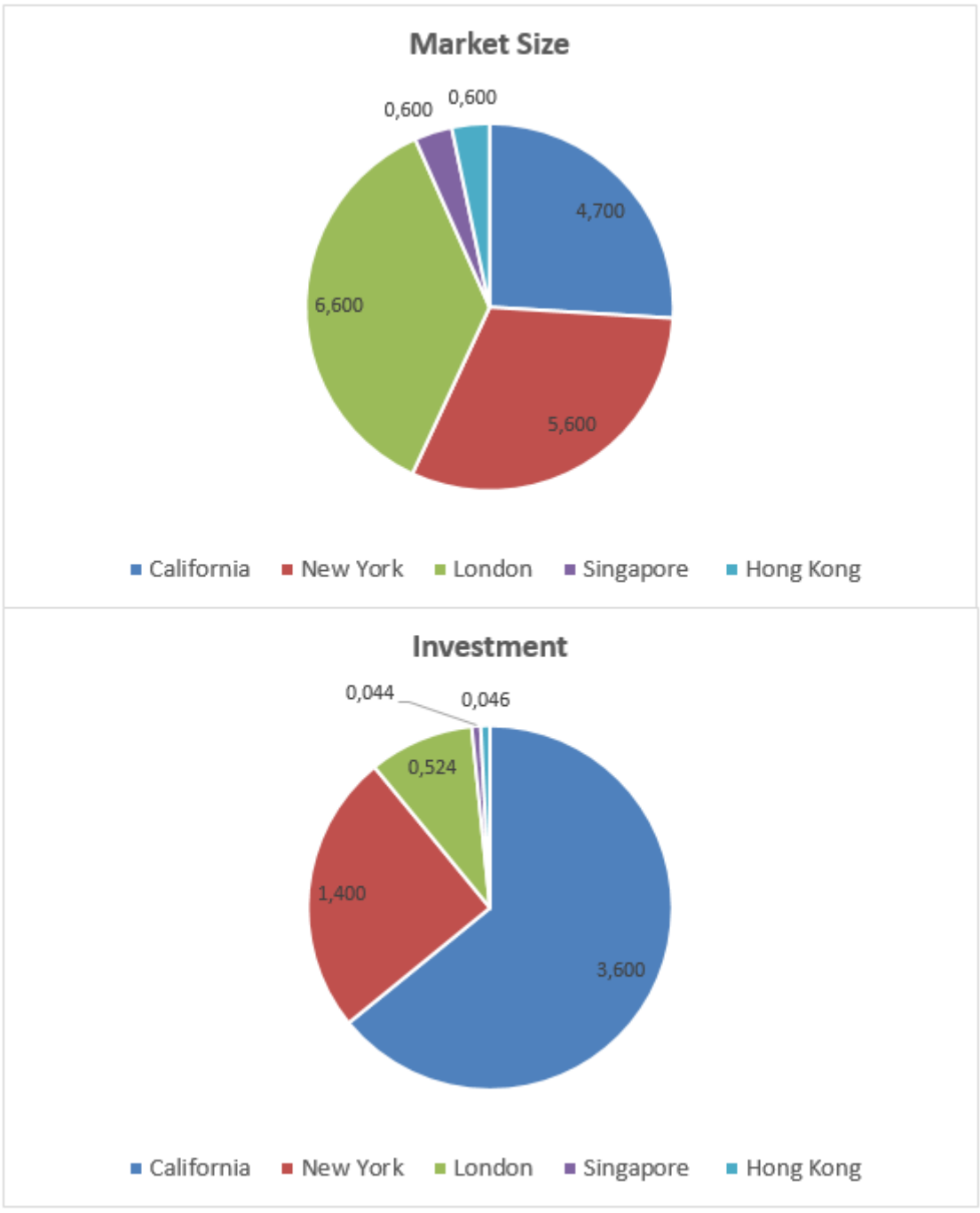

Figure 10. Fintech market overview in different countries between October 2014 and September 2015, values are in billion £ (Developed by the author based on Ernst & Young, 2016, p.8)

The rise in numbers of Corporate Venture Vehicles also reflects the development in Fintech space. Details in numbers and the leading organizations are given in the figures below:

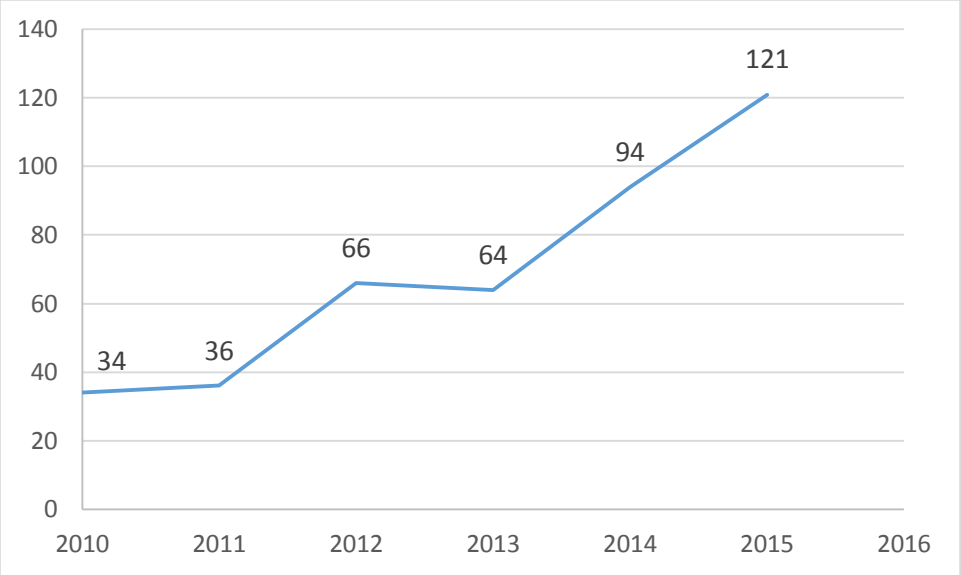

Figure 11. Number of Corporate Venture Vehicles (CVVs) globally between 2010 and 2015 (Developed by the author based on Ernst & Young, 2016, p.52)

Investments can deeply affect relationships and competition between incumbents and Fintechs. In addition, they are important for Open Innovation methods implemented in the Fintech space. Investors and the amount of the investments can shed some light for the importance and future of Fintech sector.

2.8. Business Models

Fintech start-ups' main distinguishing feature are their innovative business models leveraging advanced technology. By doing so, they eliminate intermediaries in financial system, focus on their primary objectives with their lean and agile organizations, reduce costs with technologies such as blockchain and cloud infrastructure and enhance user experience and assess it with complex big data and complex algorithms. Customer resources of technology and e-commerce giants enable them to be rivals of incumbent financial institutions overnight. Less regulatory burden and lack of organizational legacies also facilitate their agile movement in the sector (Chishti and Barberis, 2016).

Developments in Fintech space embrace both start-ups which are focused to specific areas and established e-commerce and technology companies (Arner et al., 2016). According to Douglas (2016), success of these companies is dependent on combining cutting-edge technology capabilities and flexibility in changing laws and regulations. Success factors of companies rely on their low profit margin, asset light, scalable, innovative and compliance easy business models. Users have low willingness to pay for services in a world of wide-spread internet access and most of the services are free. Companies which built their

critical mass easily can gain advantage with this business model easily and overtake their rivals. Their large customer base is a springboard to expand their financial services. On the other hand, organizations seek keeping their innovative advantage without incurring large fixed costs on assets. For instance, existing mobile phone infrastructure offers many profitable services built on this structure. At the same time, the need for physical outlets is reduced as more businesses start online services. Most of the Fintech start-ups are backed by the opportunities in online business in terms of scalability. Moreover, the explosion in smartphone usage and innovations in mobile technology are the main foundations of success in Fintech movement. Lastly, reduced costs due to operating in a lightly regulated environment empowers the ability to innovate (Chuen and Teo, 2015).

Payments, money transfer and peer-to-peer lending services are the most disruptive ones among Fintech environment. There are 14 unicorns in payments or lending businesses (KPMG, 2016).

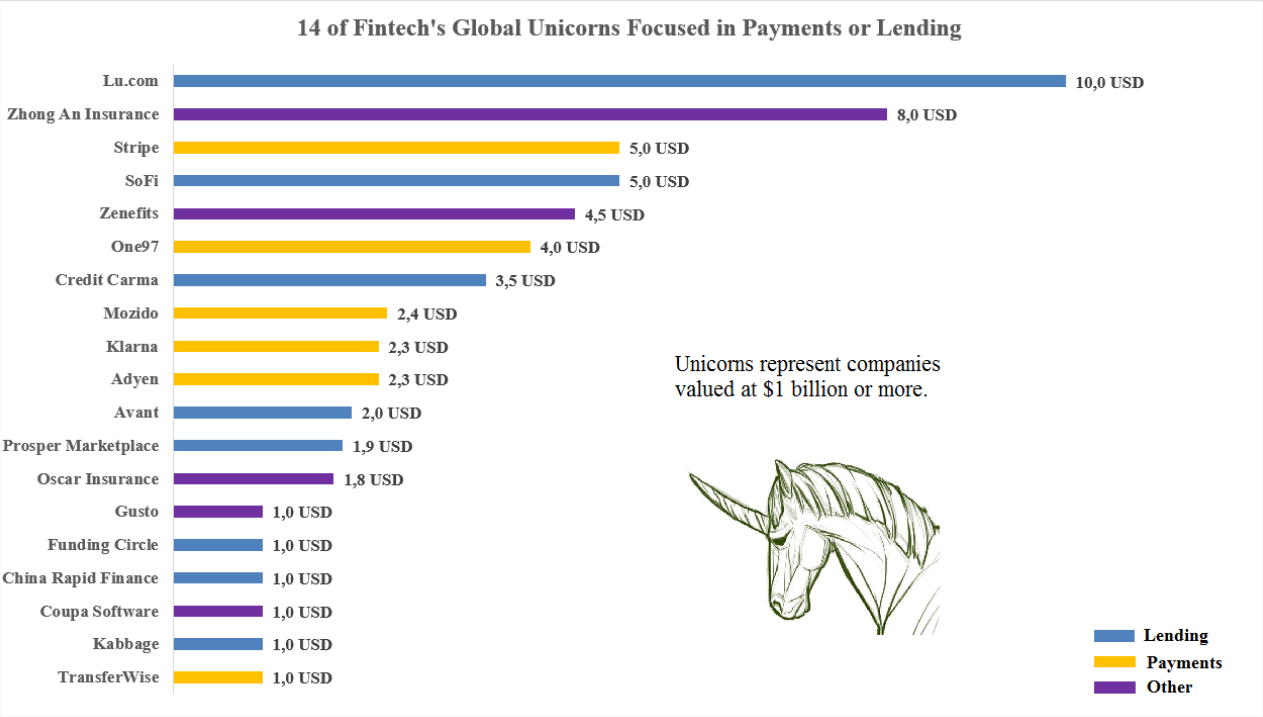

Figure 12. Fintech's global unicorns focused in payments or lending (Developed by the author based on KPMG, 2016, p.24)

Payments

Payments sector was regarded as a stable industry for decades. Parties such as acquirers, issuers had well-defined roles and business models were quite profitable. This situation started to change with the innovations in finance and emergence of new entrants (Staykova and Damsgaard, 2015). During 1994 to 2014, various new solutions were developed for

payments services in parallel with Microsoft's attempt to acquire Intuit. In the early 2000s, mobile services became more of an issue. However, many of the new services failed in this period (Dahlberg et al., 2008). Afterwards, a second wave took place with the emergence of new entrants after the economic downturn in 2008 (Liu et al., 2015). Customer demands and stance of legislators precipitated the disruptions in payments space (Sabri, 2012).

It is clear that technology developments play important role in the disruption of payments services. In this sense, invention of mobile devices enabled the development of mobile payment services. Mobile devices are known as ubiquitous IT items such as smartphones and tablets. Their features are fast approaching to PCs even though they are portable (Lee et al., 2014). Latest tablets and smartphones offer better user experience with their icon based user interfaces (Ondrus and Lyytinen, 2011). In this sense, the use of mobile devices for mobile payments and other financial services is one of the most important disruption in the field (Kousaridas et al., 2008; Kamouskos and Vilmos, 2004). Mobile payments refers to the use of any mobile device for initiation, authorization and confirmation of any payment in return for goods and services (Liu et al., 2015). It mostly relies on the advancements in smartphones and tokenization and it is regarded as the accelerator of mobile commerce (Raina et al., 2012). Customer-friendly and secure features of mobile payments which is supported by technologies such as NFC and tokenization contribute to peer-to-peer payments, sharing economy and growth of economies (Liu et al., 2015).

Mobile service providers, technology manufacturers, consumers and merchants are the primary actors in mobile payments. In addition, governments and regulators have profound effect on the market (Ondrus and Lyytinen, 2011; Dahlberg et al., 2008). Power and interests of these parties shape the markets. With the emergence of new entrants such as Fintech start-ups, there is a high competition in the market. Moreover, mobile payments integrate many parties from different industries which didn't have any interaction before. For instance, mobile network operators and financial institutions are working hand in hand (Ondrus and Lyytinen, 2011). New payments infrastructure and legislations opened the door for technology and e-commerce giants to participate in payments space and contribute to disintermediation (Arner et al., 2016; Sabri, 2012)

Mainly established non-payments technology giants and non-banking service providers usher disruption and disintermediation in lending space. Front-end innovation, contactless technologies such as near field communication, host card emulation and wearables are the leading developments. Application of these technologies in payments services are mobile wallets, peer-to-peer (P2P) apps, retailer-based closed loop applications and mobile money. Biggest change has been observed in P2P money transfers while business-to-business (B2B) segment is expected to catch up soon (Capgemini, 2016).

On the other hand, industry and organizational challenges remain in spite of the advancements in technology. Incumbents don't want to lose control although other actors aim to fully control end-user relationship. Customer bases and huge assets are still under control of banks despite of new entrants. They still issue credit cards and control customer

relationship. In addition, payment networks are still controlled by credit card companies. In addition, creating customer and merchant demand is another challenge for new actors. Many organizations try to educate their customers for increasing their engagement with innovations. This fragmented structure urges the collaboration between incumbent organizations and technology start-ups (Ondrus and Lyytinen, 2011).

According to Staykova and Damsgaard (2015), timing for entrance and expansion are equally important in mobile payments. While entry timing of the first mover also speeds up the early follower, the competitive advantage is lost if the expansion is not carried out at the right time. Parties are forced to launch their services as soon as possible due to the competitive dynamics. Staykova and Damsgaard (2015) also posits that strategic moves of pioneer are often imitated by the early follower. First credit card, Charg-It (1946), and its replication, Diners Club (1949, exemplifies well this strategy. The follower can be successful if the switching costs of pioneer service is low. On the other hand, follower has to offer an additional feature or platform in order to reach leading position (Staykova and Damsgaard, 2015).

Design of the digital platforms is important as the timing of entry in mobile payments. In this sense, the ability of the new digital platform to evolve is a significant contributor to its success. Staykova and Damsgaard (2015) classifies mobile payment platforms as one-sided, two-sided and multi-sided and posits that they are evolving to two-sided and multi-sided platforms. One-sided platforms are designed for specific groups and have limited features. In addition, they are easy to manage. Two-sided platforms aggregate different groups in the same platform. For instance, they can bring consumers and merchants simultaneously. Staykova and Damsgaard (2015) puts forward that one-sided platforms are more convenient for new services due to their low switching costs instead of two-sided platforms. Once they are launched and spread, they can be transformed to two-sided and multi-sided platforms (Staykova and Damsgaard, 2015).

Some Fintech Companies in Payment Space

Most of the leading companies in payments space build their solutions on the developments of mobile technology. Largest companies in this space are technology and e-commerce giants (Chishti and Barberis, 2016). Apple is a technology giant which triggered the explosion in mobile payments with the introduction of Apple Pay (Kim et al., 2016). On the other hand, e-commerce giant Alibaba dominates internet payments in China with Alipay. In addition to the opportunities in online payments, the potential of unbanked customers is still huge. Safaricom dominates this niche segment (Chishti and Barberis, 2016). In this respect, these companies are analysed in this chapter.

Apple Pay

It is a mobile payments system enabling users to utilize their phone as a contactless payment device. Only its first three days, one million users activated the application. The

technology lying behind is NFC contactless card payment technology. An internal NFC antenna is integrated to iPhone 6. Users verify their identity via Touch ID fingerprint scanner on the phone. In addition, many cards can be registered to user's phone. No sensitive information and card data is saved on the phone or Apple's servers. A one-time Device Account Number is provided by the payment network or issuer bank when the transaction is done. This code can't be traced back to real account. In this respect, identification with fingerprint and secure architecture features give important advantage to the company among its rivals in payments area. Apple Pay has some important rivals such as Google Wallet. However, Apple Pay's some important features such as using tokenization not storing card data and owning and controlling its own SE (Secure Element, a generic name for protected memory on a smart card) make it simpler. In addition, 83% of financial institutions in US have already integrated to Apple Pay. Moreover, around 800 million people who are currently members of iTunes will definitely affect positively the success of Apple Pay. On the other hand, role of regulatory bodies is crucial to adapt technologies such as Apple Pay to existing financial system (NCR, 2015).

Alibaba and Alipay

Alibaba started in China through Alibaba.com in 1999 as a B2B e-commerce platform. Subsequently, company expanded to B2C market and became an internet giant in such a short notice. In 2014, it raised a jaw dropping $25 billion at its Initial Public Offering on the New York Stock Exchange (Chishti and Barberis, 2016). The company founded its payment service, Alipay, to issue the trust between buyers and sellers in 2004. Even though the restrictions were imposed on foreign ownership in relation to payment systems in China in 2011, official owner of Alipay, Ant Financial Services Group, fetch a valuation of US$ 50 billion (Chuen and Teo, 2015). The service became the world's fourth largest money market fund in just 9 months (Chuen and Teo, 2015; Lee, 2015b). Massive network of customers and merchants of the service is backbone of its success. This enables company to structure a business model with low cost and low margin level from its inception. For instance, in Taobao.com (a subsidiary of Alibaba of e-commerce), any setup or transactions fees are not charged to merchants and customers. Revenue model is based on advertisements and other merchant services. Moreover, customers can order takeaways, buy insurance, online music or plane tickets and pay utility bills by using the service. After reaching critical mass, company initiated additional services such as Yu'e Bao, an online money market fund, and Zhao Cai Bao which is a crowdfunding service. On the other hand, working substantially online without any physical infrastructure investment enables an asset light and scalable business model to the company. Although the current legislation restricts the foreign ownership of internet businesses, this issue is circumvented through VIE (variable interest entity) structure. It is also known as "Sina-model" and employed by other internet giants such as Tencent and Baidu (Ernst & Young, 2015; Lee, 2015c). In this respect, Alibaba's operation can be regarded as compliance easy (Ernst & Young, 2015).

Safaricom and M-Pesa

While most of the Fintech start-ups focus on smartphone users, the potential of unbanked customers who also don't have internet access is huge. One way to leverage this potential is offering payment services via cell phone messaging. Mobile phone usage exploded in Africa over the last 15 years and number of subscribers is over 900 million. It is important to note that 500 million of these people have no regular access to electricity. In such a challenging environment, Africa became a springboard for telecom operators. Safaricom, a subsidiary of Vodafone, made a huge success with its first mobile money solution: M-Pesa. The service is installed on the SIM cards relying on a prepaid network infrastructure and entails no internet connection (Chishti and Barberis, 2016). The service became a monopoly in Kenya and it has penetrated to 90% of Safaricom users. By 2014, it has a customer base 21.5 million and accounted for 18% of Safaricom revenue. Afterwards, it started offering additional services including M-Shawari (a paperless banking platform for loan services), Lipa Na M-Pesa (cash payments for goods and services) and Lipa Kodi (rental payment service) (EY, 2015). In 2016, the service has more than 23 million customers and 100.000 M-Pesa Agent outlets globally (Safaricom, 2016). Success of M-Pesa relies on many aspects. Firstly, it is safe. It eliminates the risks related to handling cash. Secondly, it reduces losses associated with fake currency. Thirdly, it keeps the records of transactions. In addition, shorter settlement cycles with increased flexibility and acceptance of low value transactions with lower costs contribute the success of the service (Ernst & Young, 2015).

Remittances

"Transfer of money by a foreign worker to an individual in his or her home country" is the meaning of remittance (Chishti and Barberis, 2016). Annual amount of global remittances to developing countries was $431.6 billion in 2015. It is also important to note that cutting prices by at least 5% can save up to $16 billion. While banks remain the most expensive remittance sending provider by 11.32%, prepaid card services are the cheapest ones with average cost of 1.69%. Many new Fintech companies such as Transfer Wise and WorldRemit are becoming rivals against well-known incumbent institutions such as Western Union and Moneygram. These two companies operate in 99% and 92% of the countries around the world annually (World Bank, 2016). They are also responsible for the two-thirds of the money transfers to Africa (Chishti and Barberis, 2016). The transactions fees of remittances vary depending of the time, country and the form of money (cash of online). While Fintech start-ups don't expose their cost models, these two companies receive fees as transaction fee and FX mark-up (foreign exchange revenue). Although some Fintech start-ups such as TransferWise don't demand FX mark-up, Western Union and Moneygram can compete with them with their new online services. It can be inferred that these two giants adapt fast to the current Fintech environment. Moreover, only 10% of

remittance volume is sent online. Therefore, it is still challenging for Fintech start-ups to compete with these giants in current situation.

Crowdfunding

It is possible to utilize internet for collecting small amounts of funding from a large number of people especially for particular projects. Moreover, crowdfunding campaigns give the opportunity to set the fundraising period and cancel the campaign, if targeted amount of money isn't collected. Zopa.com from England initiated crowdfunding activities first in 2005 and subsequently Indiegogo used first "crowdfunding" term (Lee and Kim, 2015). Crowdfunding websites are open platforms to raise money and builds the interaction between fundraiser and the crowd. It is estimated that only in US the amount of investments managed by these platforms will reach $2 trillion by 2020 (Chishti and Barberis, 2016). $16.2B was raised through crowdfunding platforms in 2014 and it is estimated to set more than double in the end of 2015 (Fortune, 2016). According to European Commission (2016), only 41% of SMEs in EU perceive no limitations in their access to future financing. It is important to note that there is a need for strengthening alternative sources for finance include crowdfunding. In addition to raising money, crowdfunding can offer additional benefits such as project and idea validation to the project seeker. Moreover, it enables large number of individuals to be entrepreneurs (EU Commission, 2016).

Different business models are carried out in crowdfunding. Companies issue equity or debt instruments to investors in investment-based crowdfunding method. On the other hand, companies or individuals may also seek funding in the form of a loan agreement. This is called "crowdlending", "marketplace lending" or "peer-to-peer lending". This topic will be discussed in detail under a separate title. Online crowdfunding platforms also enable companies or individuals to sell their unpaid invoices or receivables to the investors. These platforms are called "Invoice trading platforms". In reward-based crowdfunding platforms, investors may receive returns for their investments as goods or services. It is also possible just to donate without receiving any return in donation-based crowdfunding platforms. Lastly, it is true that some platforms may combine various models in a single platform (EU Commission, 2016).

Peer-to-Peer (P2P) Lending

As it is mentioned above, P2P lending or marketplace lending is a type of crowdfunding. P2P refers to "peer-to peer" or "person-to-person". The users can be lenders and borrowers without any intermediation. It can be said that lending process is faster than traditional processes (Douglas, 2016; Kalmykova and Ryabova, 2016). On the other hand, risk may be higher than traditional processes since it is not possible to be sure of credit score of lender or borrower in most cases. It is common for creditors to lend many small loans in

order to decrease non-repayment risk (Kalmykova and Ryabova, 2016). These platforms aggregate various data sources and employs cutting-edge analysis for credit decisions. Documentation and servicing the loans and management of repayment process is lender's responsibility. It is possible to assess individual and banking institution funds. In addition, partnering with banks in loan origination is also possible to benefit legal protections. Underwriting and lending processes are automated differently than banks. This enables to take advantage of economies of scale (Douglas, 2016).

An explosion was seen in the growth of P2P lending market. Many of the companies started this business by focusing specific classes such as student loans and they reached significant growth. Total amount of loans generated in US in 2014 through P2P platforms reaches to $5.5 billion and there is potential to reach $150 billion by 2025 (Douglas, 2016).

It is important to note that many banks and institutional investors such as hedge funds and other business entities play active roles in P2P portals. Approximately 80% of funding is related to these entities. In order to match borrowers and lenders efficiently, P2P companies employ advanced credit modelling and underwriting skills. Moreover, they offer automated loan selections according to the criteria set by the investors (PwC, 2015).

Open Banking

Application Programming Interface (API) consists of functions and procedures which allow access to data or service for enhancing functionality of the application. It can set the functionality of data or service in these applications. Fingleton Associates report in autumn 2014, which was published alongside HM Treasury's Autumn Budget Statement recommends banks to create standardised APIs which are accessible to 3rd parties (Fintechs and developers) for improving competition (Payments UK, 2015). According to Group Chief Technology Officer at UBS, Stephan Murer, APIs offer new opportunities for banks in order to reach new customers and employ new services. By doing so, brand loyalty can also be enhanced (IBM, 2016).

Improving access to APIs and data offers different benefits. Firstly, development of new services such as comparison of current accounts and personal financial management tools is possible. Secondly, it offers improved access to credit for individuals and SMEs by sharing historical transaction data. Thirdly, necessary data for bookkeeping can be extracted from transaction information and prevents inputting manually. Lastly, monitoring data across multiple accounts offers better fraud detection (BBVA, 2016).

Technology companies and financial institutions employ different API strategies. Among technology companies, Salesforce employs API for delivering their CRM proposition and makes it easier for customers to integrate Salesforce CRM into their existing workflows. Its chief objective is syndicating products and services across different platforms. IBM Watson extends their machine learning and data processing platform to third parties. It is

estimated that 1 million users have signed for the service. Linkedin allows access to their large database for their customers to make better decisions regarding human resources and professional networking. Companies can automate and manage their activities with the support of Linkedin marketing, recruitment, public relations and sales features. On the other hand, VISA provide its customers new e-commerce based technologies in payment methods, general services, risk and fraud as well as trial. The company aims to be a global distribution platform instead of a network access point by employing its APIs. BBVA's APIs offer authorised 3rd parties to access money transfer, client profile, account data and other services on behalf of their customers. Moreover, intelligent consumer lifestyle choices such as timing of restaurant visits are included in the applications. SWIFT supports access to its core messaging services for worldwide funds transfer through its API. It is possible for SWIFT alliance members to develop custom code, retrieve financial data and access to other resources and services by these APIs (EBA, 2016).

Digital Banking

Online and Mobile Banking

Digital revolution is changing banking deeply as well as other aspects of life. Innovations revolve around smartphones. It is estimated that 80% of sold devices will be smartphones by 2020. In this new environment, key rules for retail banking are simplicity, relationship, traffic and speed of innovation. Banks should offer simple, visual and user-friendly products while reinforcing customer relationship through social media. Web and application traffic became a major concern while they are catching up fast-paced innovations such as smart watches and glasses. In this sense, banks should increase their flexibility to changes. Client centricity, Open Innovation and organizational flexibility became more of an issue for adopting digital banking in incumbent organizations. Top 10 digital trends in banking are customer analytics, digital delivery, mobile-first design, acceptance of mobile payments, security and authentication focus, industry consolidation, enhanced customer incentivization, investing to innovation and increased impact of digital disruptors (Padmaavathy and Adalarasu, 2015).

There are profound differences between traditional and digital banking models. While traditional model is branch-focused, customer demand access to banking services in anywhere anytime. The customer stays in the centre in digital banking. Customer should decide how to interact with the bank. Services shouldn't entail a visit to branch. While traditional model aims to deliver duplicative products and services through many channels, digital trends highlight tailor-made products which are suitable for customers' delivery preferences. Customers demand new services such as paperless account opening, e-invoicing, e-billing and new online financial tools. It is not possible to satisfy customers with traditional banking channels which rely on branches (Padmaavathy and Adalarasu, 2015).

Organizations should begin their digital transformation by assessing their resources which gain them competitive advantage and required resources to fit digital transformation. This entails a broader perspective than resource-based and strategic fit view (Liu et al., 2011)

Banks are forced to reassess their traditional business models including bricks-and-mortar branches According to Chairman and CEO of BBVA, Francisco Gonzalez, BBVA will be a software company in the future instead of a traditional bank (Capgemini, 2015). Explosion in the mobile phone usage changes the way how customers access the services. They still search for best services for comparing and applying for loans, credit cards and mortgages, but they substantially enter internet instead of visiting brick-and-mortar branches (EBF, 2015). In 2015, while internet banking channels grew from 53.7% to 70.5%, mobile banking channels grew from 16.1% to 36.4% (Capgemini, 2016). Population of 45% in EU accessed online banking sites in 2015. Leading country is Finland by 86% (EBA, 2016). It is clear that closing branches also reduce operation costs for banks. It is estimated that average cost saving from closing a branch is around £200.000 annually (Deloitte, 2014). According to Accenture 2015 North America Consumer Digital Banking Survey, 81% of consumers wouldn't change banks if their bank closed the local branch (Accenture, 2015).

Most of the largest banks have initiated or preparing to initiate their online services. On the other hand, challenger banks including Atom and Fidor Bank disrupt online banking environment. These banks only serve in online and mobile environments. They offer the best rates for savers and their simple business models are cost advantage. They distinguish themselves with transparency and superior data analytics (KPMG, 2016).

Blockchain

Blockchain technology and its most popular application Bitcoin hold tremendous potential both for financial services and non-financial services. Bitcoin can be used as a unique type of currency with its open-source and decentralized features. Blockchain technology allows any kind of asset to be transferred electronically. Moreover, it enables to track and verify a digital exchange in near-real time. In this sense, there are many special application areas. For instance, people are using Bitcoin to circumvent government's restrictions on receiving payments from abroad (Edgar & Dunn Company, 2016).

The greatest potentials of Blockchain are respectively seen as maintaining anonymity in the online payment process, a medium exchange in the developing countries, sending remittances, making online payments and financial investments. Current inefficiencies in B2B payments and P2P remittances stoke the demand for using blockchain in payments field. It also offers many advantages for settling stocks. In this sense, Nasdaq Private Markets is implementing blockchain technology since 2015 and looking at the ways to use it in its pre-IPO trading arm. Regarding asset and collateral management, inefficiencies and fraud attempts can be reduced by employing traceability features of blockchain technology.

It is estimated that the technology can reduce banks' infrastructure spending for securities trading, regulatory compliance and cross-border payments up to $20 billion annually by 2022 (Edgar & Dunn Company, 2016).

There are also many non-financial purposes for using blockchain technology including proof of ownership and asset transfer, smart contracts and identity management. In current process of registration and proof of ownership for land, home, auto or policy is complicated and takes a lot of time for preparing the documents and red tape. However, blockchain offers a simpler way to eliminate the intermediaries and speed up the process (Edgar & Dunn Company, 2016). For instance, Honduras government benefits Bitcoin technology for land title registration to prevent bribery (Reuters, 2015). On the other hand, transactions can be automatically executed under the negotiated terms between the stakeholders without the involvement of central authority by using smart contracts. Ethereum, famous for its founder and programmer Vitalik Buterin, runs for smart contracts as a decentralized platform. Samsung and IBM is in collaboration with Ethereum to test this concept for Internet of Things technologies. Blockchain can also solve the problem for fraud concerns to keep health records, voting records, marriage licences, personal identification such as passports, driver licenses and other documents. A system is devised by another start-up, Factom, to secure the authenticity of records that are embedded to blockchain. Everledger provides permanent certificates for ownership of diamonds (Edgar & Dunn Company, 2016).

Largest companies related to blockchain technologies serve in financial, logistics and compliance sectors. It is assumed that the technology will spread next to healthcare and Internet of Things. There are many organizations aim to solve biggest problems of blockchain and make it more accessible in every industry. One of these problems is empowering individuals to use public ledgers. Luxembourg-based Blockchain.info provides wallet solutions to make the access and usage easier for individuals. People can manage their transactions by using open-source application. Moreover, the company also provide a developer platform facilitating the developments of new applications. Secondly, identification, traceability and representation of assets in a digital manner is a problem. Israel-based company COLU links physical and digital assets to the blockchain. Its user friendly solution for issuing and managing assets adds metadata to the blockchain and links the assets. Moreover, the company builds a blockchain community to contribute the spread of the technology. Third problem is building, testing and operating applications with a blockchain backend (smart contracts). In this sense, the solution is developing distributed applications and smart contracts with a blockchain backend. UK-based Eris Industries' platform provides tools to produce blockchain applications in this purpose. Smart contracts' current usage is limited, but it is estimated that it will automate various business processes and applications. Fourth problem related to blockchain is providing professional services to blockchain start-ups. Luxembourg-based start-up Scorechain provides compliance services for financial institutions or any Bitcoin or smart contract users. Their analytical and monitoring tools facilitate meeting regulatory compliance requirements for

their customers. Fifth problem of the technology is reduction of efficiency in international trade due to non-optimal procedures along value chain. US-based start-up Skuchain aims buyers and sellers to interact directly. The company operates at the conjunction of finance, payments, business operations and customer relationship management systems to enhance transparency and reduce the transaction costs. It tracks the flow of goods through supply chain and allows trustable interactions between buyers and sellers (EU Commission, 2016).

Other Sectors

There are also many other application areas for Fintech start-ups. These fields involve insurance, personal investment, foreign exchanges and real estate. In this sense, business innovations affect and transform these sectors profoundly. For instance, data-based models became more of an issue. There are some companies which collect data with their device placed into cars and offers pay-per-mile auto insurance while the device measures data about driving habits of the policy holder. It is estimated that 50 billion objects will be connected to internet by 2020. That makes analyse of big data important for better insurance policies and other services. For similar purposes, technology companies such as Google, Facebook and Amazon collect big data related to user habits. On the other hand, online insurance platforms offer online peer-to-peer insurance platforms for small group of people to anonymously combine their premiums. Service enables up to 40% of premiums to return to clients if no claims are made (Chishti and Barberis, 2016).

Understanding new business models can contribute to comprehend investments, relationships, competition, new regulations and implementation of Open Innovation in Fintech space better.

2.9. Technology Acquisition and Collaboration

Financial markets dwarf many industries with extend of revenue and level of competition. Total annual revenue of top 300 banks in the world is around $3.8 trillion (Santander, 2015). This amount holds tremendous potential and fascinates thousands of new Fintech start-ups. They can be both partners and rivals for traditional organizations in many services including payments, funding and wealth management. Both parties require each other's collaboration in order to exploit new opportunities in the market. A different point of view can shed some light to this issue. A famous Russian scientist, Peter Kropotkin, who contributed Darwin's theory for evolutionary biology states that progressive development and mutual aid go hand in hand (Kropotkin, 1902). Financial institutions can strengthen their competitive position by collaborating with Fintech start-ups (Accenture, 2014).

There are many differences of Fintech start-ups from traditional banks and insurers in terms of their objectives, business model, organization, processes and technology. While incumbent finance institutions substantially try to optimize businesses as usual and they have immense regulation burdens, Fintech start-ups disrupt the existing products and services with user experience as a key driver and focus on one single point in these services. In addition, they regard intermediation as a key component and extract value from data more than the products in their business models. In contrast to large organizations of big players in the market, Fintech start-ups decrease operation costs and increase efficiency with their light and lean organizations. In addition, their short development cycles and time to market attracts traditional organizations to work with them since many stakeholders are involved in every step of the decision process of traditional organizations. Lastly, while Fintech start-ups utilize benefits of advance technology, traditional organizations are dealing with several business lines and legacy burden (Chappuis Halder, 2015).

On the other hand, Fintech start-ups need bigger organizations' collaboration to expand their businesses. Some of them are bound to build strategic partnership with companies who are holding banking licenses. Partnerships of Dwolla with Veridian Credit Union in USA, Holvi with Wirecard Bank in Germany and Savedo with biw AG in Germany exemplify this issue. On the other hand, Funding Circle managed to go on its way in the UK by being regulated by FCA. Fintechs also require banks to enlarge their customer base. For instance, Lending Club works with Union Bank in USA for this purpose (Chishti and Barberis, 2016).
Banks and Fintechs can offer better services by leveraging each other's advantages and create a better ecosystem for customer satisfaction. While banks are lowering the barriers for Fintechs by dealing with opening accounts, holding money, giving out credit and offering for regulated products and services to their customer base, Fintechs can improve their ability to innovate and reduce their operational risks. Banks are employing different strategies to exploit the opportunities of Fintech environment. In this respect, venture funds, mergers and acquisitions, accelerators and developer programs are some alternatives. According to Lloyds Banking Group, creating a culture of experimentation and driving the innovation across the Group is primary goal of their LBG Innovation Lab (Chishti and Barberis, 2016).

Innovation labs take part of the heart of collaboration activities. They are mentorship programmes for entrepreneurs and early-stage companies. Their primary goal is increasing the number of financial companies and expanding their resources to incumbent institutions. They offer a good opportunity to screen the development phases of new technologies and work with new promising developers. Moreover, banks can exploit commercial-ready applications in these labs. On the other hand, labs give relationship and networking chances to Fintechs. In addition, they receive mentorship from leading players. They are also efficient for reducing the sales cycles (Accenture, 2014).

Accenture's Fintech Innovation Lab initiated in New York in 2010. Founders of the organization are Partnership Fund for New York City and Accenture. Afterwards, it expanded to London, Hong Kong and Ireland. Significant institutions including HSBC, Citi, Bank of America, Credit Suisse, JP Morgan, Deutsche Bank, Barclays and Goldman Sachs are being represented by their senior executives in the events. Graduates of the programme raise significant levels of capital. Moreover, 14 London start-ups which graduated from the programme amplified their revenues by 170% and raised more than $35 million (Accenture, 2016). It should be also noted that New York's Fintech Innovation Lab has proven an efficient way for reducing long sales cycles. It is estimated that it can reduce the typical 18 month sales cycle to 12 weeks (Accenture, 2014).

On the other hand, many insurance companies started initiatives similar to Axa's Data Innovation Lab or German Allianz's joint venture with Fraunhofer Labs. These initiatives aim to utilize big data technologies in order to develop better and tailor-made products (Chishti and Barberis, 2016).

In addition to innovation labs, many large institutions prefer to build private equities and venture capital fund vehicles. Hundreds of millions of dollars were raised by promising Fintech start-ups in recent years. This is the strongest sign of how banks give importance to new technologies and business models offered by Fintech start-ups. For instance, BBVA and Sberbank each launched $100 million funds to invest in Fintech start-ups in recent years (Accenture, 2014).Big corporations in banking or other industries acquire technology companies. For instance, The Climate Corporation has devised a product which is important for insurance industry since it protects farmers against weather risk. This technology relies on individual and real-time weather data. The company was acquired by Monsanto and became a part of company's Integrated Farming System (Chishti and Barberis, 2016).

Large corporations employ corporate venture vehicles to engage with Fintechs to exploit their products and services by partial or full acquisitions. Number of unique corporations investing into emergent Fintech companies was 94 and this shows a 176% growth from 2010 (EY, 2016). In 2015, venture capital backed financial companies raised $13.8 billion across 653 deals. They took 73% of overall Fintech funding in 2015 (KMPG, 2016).

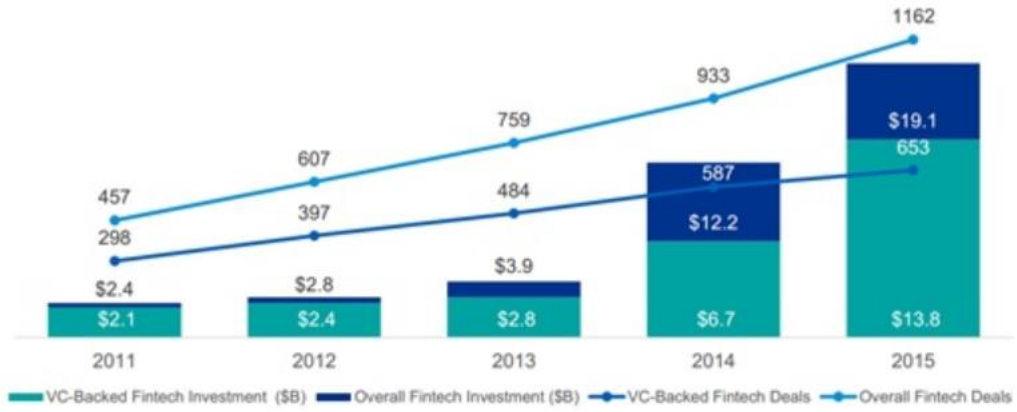

Figure 13. Annual global Fintech financing trend (KPMG, 2016, p.18)

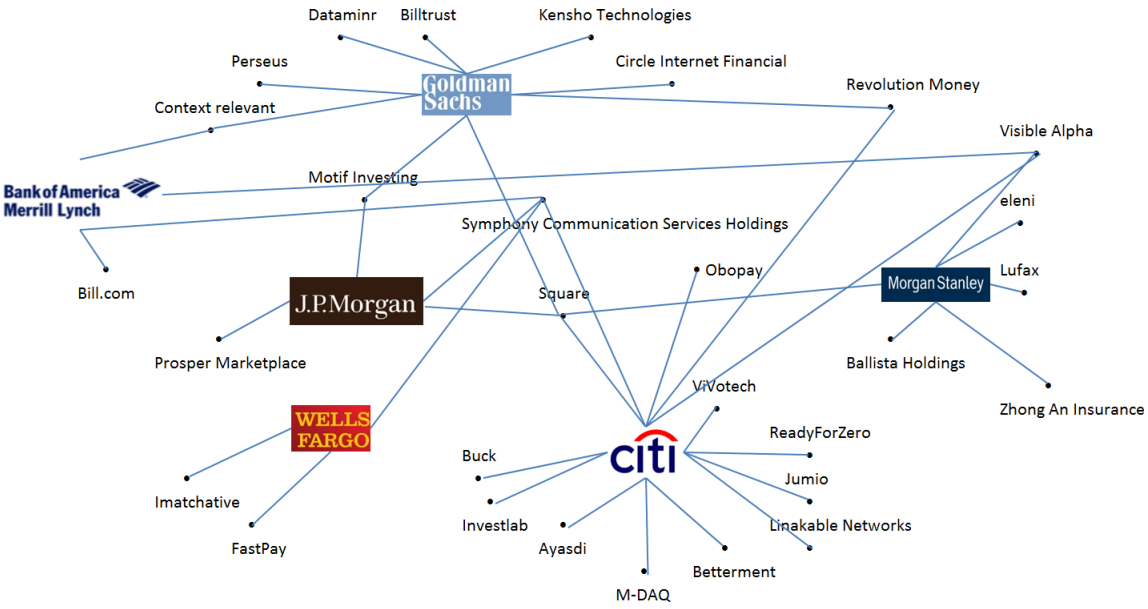

Figure 14. Major American banks' Fintech investment map between 2009 and 2015 (Developed by the author based on Chappuis Halder, 2015, p.3)

The figure above depicts well the investments of incumbent financial institions to Fintech start-ups during 2009 – 2015 in USA.

In North America, Fintech investments reached to $7.67 billion across 378 deals in 2015. Most active venture capital investor in North America is Andreessen Horowitz. It is followed by SV Angel, 500 Start-ups and Google Ventures. In this sense, Fintech environment attracts non-financial services corporations such as Google, Intel and Salesforce (Metrick and Yasuda, 2011).

The amount of funding to VC-backed Fintech companies boomed in Asia in 2015 and reached to $4.5 billion across 130 deals. Most active VC investors in Asia are Accel Partners, East Ventures and Sequoia Capital China (Metrick and Yasuda, 2011).

$1.48 billion in 125 deals were raised by VC-backed Fintech companies in Europe in 2015 and deal activity rose by 30% on a year-over-year basis. Only in UK 61 deals were made. Most active VC investors are Index Ventures, Balderton Capital and Accel Partners (Metrick and Yasuda, 2011).

Digital banking funding increased more than ten-fold since 2010 and reached to $6.9 billion in 2015. Personal digital banking start-ups including SoFi, Avant and Betterment attracted biggest share in 2015 (Metrick and Yasuda, 2011).

Among the insurance companies, AXA is a pioneer into spreading a digital and innovation mindset across their organization. Between 2013 and 2015, they invested 950 million EUR in digital projects. They have invested 200 million EUR directly into innovation by AXA Strategic Ventures for the areas including insurance, savings, banking, health and asset management. Fundshop, Particeep, Widmee, Flyr and ClimateSecure are some of their investments. They built digital partnerships with Facebook, Google, Linkedin and BlaBlaCar. They connect with new entrepreneurs through Axa Labs in California and Shanghai. While AXA digital academy helps all the employees for accelerating the digitalization of their businesses, AXA Seed Factory is specialized for digital services relevant to future insurance services. They have established an internal web agency, AXA Digital Factory, to underpin different initiatives within the Group. They hold an internal contest, AXA Start-in, to promote innovation in the organization. AXA Partnerships is responsible for building relationships with external partners such as Facebook and Google. In addition, AXA Incubator is dedicated to insurance tech with a €100 million budget. The company leveraged this massive organization and developed SOON, a disruptive and unique mobile banking platform developed by AXA which is based on the integration of external vendors. It is a fully digital bank and 100% mobile (Chappuis Halder, 2015).

mBank is another example for exploiting digital innovation successfully and reaching for new customers and revenue channels. It took only 15 months for Polish bank Bre Bank Sa to launch its 100% online banking platform mBank. Company has around 3.42 million internet customers and 0.89 million of them are mobile banking users. They employ gamification, P2P payments, Facebook integration, mobile payments and 2nd generation mobile applications including user interface, LBS, selling deals and PFM. They made a partnership with Orange to white-label its solutions to create a new platform. Moreover, they made a long-term agreement with online auction platform Allegro to offer bank's products to the website users. In addition, they devised a retail advice and discounting machine using customer data and behavioural patterns. The product uses geolocation services on customer's phone and alerts them for the offers at nearby shops (Chappuis Halder, 2015).

Technology acquisition and collaboration between parties are directly affected by Open Innovation methods used in Fintech space. In this regard, they are important for this thesis.

2.10. Policy and Regulations

Importance of Regulations

Regulations shape innovation and finance in terms of market entry, competition policy, monopoly and pricing (Liu et al., 2015). When it comes to banking or finance, it is impossible to rule out regulations and legislations. There is no doubt that without compliance and regulations, financial markets would be chaotic and more unstable. Organizations should embrace these rules instead of trying to bypass them. (Chishti and Barberis, 2016). Prieger (2012) puts forward that stricter regulations may have negative effects for innovation. On the other hand, regulators give importance to the relation between innovations and consumer welfare. The primary purpose of regulations is ensuring stability, efficiency and security in the marketplace by mitigating possible negative effects of the regulations. As technology advances, financial regulators may also find it difficult to understand innovations. In this regard, inflexible regulations may jeopardize their benefits. In contrast, successful regulations can enhance their benefits (Liu et al., 2015).

Effect of Economic Crises in 2008 to Regulations

Many new legislations and regulations enter into force after misselling of sub-prime mortgage-back securities which triggered the financial crises in 2008. Post-crises financial reforms change the ways how financial institutions operate and shape the markets (Arner et al., 2016). Moreover, financial scandals didn't come to an end and they emerged as new ones such as Libor interest rate manipulation scandal which resulted in questioning the ethical aspect of the financial world (Chishti and Barberis, 2016).

Regtech (Regulatory Technology)

Regtech term was promoted after the emergence of Fintech. It refers to the use of technology for regulatory monitoring, compliance and reporting. It is the marriage of technology and regulations. It offers enormous cost savings both for financial institutions and regulators. It has far more potential including continuous and real-time monitoring. On the other hand, the developments in Fintech space and wide-use of big data in financial services require a different point of view for new regulations. There is a transformation from Know-Your- Customer (KYC) to Know-Your-Data (KYD). This requires the ability of regulations to deal with new issues such as digital identities and data sovereignty (Arner et al., 2016).

Single Euro Payments Area (SEPA)

Most of the European Banks are still struggling after crises (Sabri, 2012). According to European Central Bank (2016), five supervisory priorities were listed: Business model and profitability risk, credit risk, capital adequacy, risk governance, data quality and liquidity (Kotarba, 2016). Basel III criteria came into force in a prudential manner by affecting capital requirements and liquidity coverage ratios of the banks to reduce their risks (Campenon, 2016). There are significant happenings especially in payments legislations in Europe. It is continuously evolving with the contribution of EU. Single Euro Payments Area (SEPA) was created and new regulations for e-money and payment services are being enacted (Sabri, 2012). Regulations especially in payments have special importance for institutions since European Banks' revenues from payments are estimated as one quarter of their total retail banking revenues (Cortet et al., 2016).

The purpose behind creating SEPA is facilitating cross-border economic activities by creating a cross- border market for payments and financial services (Sabri, 2012). Europe is a fragmented market which consists of many countries with different financial legislations. In this sense, there are many complex challenges in their integration. This requires cross-border regulatory cooperation instead of a single jurisdiction (Dy, 2016).

Payment Services Directive (PSD) II

Payment Services Directive (PSD) II is the revised directive on payment services and administered by European Commission. Its primary goals are improving payment services and enhancing e-commerce in EU. It came into force in January 2016 and it should be transposed into national laws by all member states by January 2018. It was enacted with respect to the changing environment and growth in online payments. It expands the term "payment services" as "payment initiation services" and "account information services" (Donnelly, 2016).

Financial institutions should pay PSD II more attention than other regulations. The developments in technology, emergence of new payment service providers which "disintermediate" banks and the change in customer behaviors are the triggers behind PSD II. In addition, European regulators identified that European banks have limited action for payment innovations. In this sense, PSD II opens the door for innovation in EU payments space. It forces banks to open accounts to licensed third-party service providers with the permission of account holders (Cortet et al., 2016).

Application Programming Interfaces (APIs) are essential in opening up the accounts to third parties and increase the share of big data. Banks should develop these APIs to connect third-party services to their accounts. According to PSD II, Payment Initiation Service Provider (PISP) (not holding any time user accounts) and Account Information Service Provider (AISP) can initiate payments or retrieve account information with the consent of consumer. In this regard, there are myriad opportunities for Fintechs to reach

revenues and attract customer attention. APIs have the potential to incite innovation. This is a chance for banks which seek collaboration with third-parties (Cortet et al., 2016).

Regulations Regarding Big Data

Financial services is one of the most data-intensive industries. Especially, trading platforms revolve around big data. Analyzing big data is crucial for success in financial services. Markets in Financial Instruments Directive (MiFID) II regulates financial instrument trading regime in EU. A second industry which is data-intensive after banking industry is insurance sector. Big data is being used to assess the risk more precisely and calculate policy prices more accurately. New techniques for collecting and analyzing data are extremely useful for the industry (Kemp, 2014).

A legal framework which consists of six levels is beneficial to set the relationship of big data and the other elements. Intellectual property (IP) rights, contracting for data and data regulation are three pillars of this framework in relation to data. Copyright, database right and confidentiality are the significant factors in IP rights. In contracts sense, they are enforced against a party and not against the whole world in contrast to IP rights. Thirdly, privacy, data protection, licensing and contracting are main interests of data regulation. Platform infrastructure, information architecture and information management and security are the other pillars of the framework (Kemp, 2014).

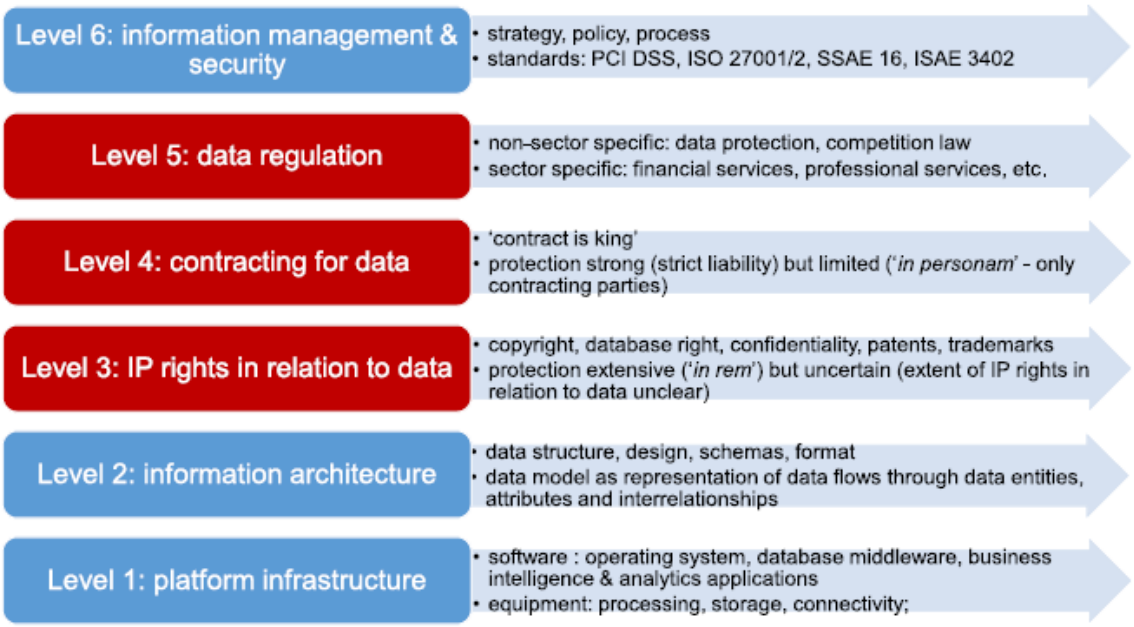

Figure 15. A framework for big data (Kemp, 2014, p.6)

Regulations Regarding Blockchain and Crowdfunding

There are new regulations for many activities based on Fintech community such as blockchains, crowdfunding, shadow banking and payments. These jurisdictions entail special attendance and there are many uncertainties around them. In terms of crowdfunding, incumbent financial system focuses on just 3 – 5% of population as accredited investors. However, many countries are fostering non-accredited investors to invest in companies through crowdfunding portals. For instance, Canada offers an exemption called "offering memorandum" for investors over the age of 18. On the other hand, the leader country in crowdfunding is USA. Jobs Act Title III and The US Securities and Exchange Commission (SEC) clearly regulates the crowdfunding market in USA. Title III allows non-accredited investors to invest minimum 2.000 USD up to a maximum of 10% of their income or assets in companies that are raising up to $1 million in funds. In the light of this new regulation, there are now a potential of 233.7 million new investors in the country (Chishti and Barberis, 2016).

The Bitcoin Association in Hong Kong (2013) is one of the leading non-profit Bitcoin organizations. It organizes leadership events and focus groups to contribute Bitcoin technology (Ernst & Young, 2016). On the other hand, there are many uncertainties in regulating activities of blockchain applications. While technology offers many advantages both for customers and organizations, lack of regulations and legislations is daunting for all stakeholders. It is also important to note that lobbying pressures of established organizations affect new regulations to enter into force. In European Union, despite some countries such as Luxemburg and UK start forward for brand new regulations, the other member countries are progressing slowly. There is a need for establishing new rules instead of trying to modify existing ones for blockchain technology. In addition to the efforts of countries, efforts of companies and organizations is necessary to solve legal and political issues for blockchain technology. For this reason, 45 financial companies including some biggest financial corporations such as BBVA, Barclays, Credit Suisse and Goldman Sachs established a consortium called R3 CEV. Their aim is to design common standards for distributed ledger technologies in global financial markets (EU Commission, 2016). In addition, a "BitLicense" regime was established by New York Department of Financial Services. It entails for parties which involve in "Virtual Currency Business Activity" to apply for license and comply with the requirements. A license holder can receive, buy, sell, control, administer and hold custody of a virtual currency and perform exchange services. Fraud prevention, recordkeeping, know your customer, booking and recording requirements and obligations are imposed by the new legislation (Douglas, 2016).

Regulations in Different Countries

London is known as capital of Fintech with respect to its investment flow. A successful legal framework, intensive infrastructure, a verifiable tax system and investment support are the leading factors behind the UK's success (Kalmykova and Ryabova, 2016). Open Application Programming Interface (API) Initiative was started in UK in 2015. Main goal of the initiative is to boost competition of incumbent financial institutions and Fintech companies for open banking applications by providing the basis for API environment (Chishti and Barberis, 2016). More innovative services with lower costs are implemented by allowing consumers and SMEs to access their bank data via APIs (EY, 2016).

Countries with better Fintech policies make a leap in this environment. According to their Fintech policies, most successful regions in the world are UK, Singapore, Australia, Hong Kong, Germany, California and New York respectively. Most influential factors regarding Fintech policies are regulatory regimes which facilitate participation of new entrants with new business models and government programmes for reducing the barriers for entry and taxation policy (Ernst & Young, 2016).

Project Innovate (2014) exemplifies a notable initiative in terms of a successful regulatory regime. It is supported by Financial Conduct Authority (FCA) in UK and includes a Regulatory Sandbox for businesses to test new models with an exemption from standard regulations. On the other hand, Australian Prudential Regulation Authority (APRA) and Australian Securities and Investments Commission (ASIC) develop two notable initiatives. While Innovation Hub (2015) helps new Fintechs to navigate ASIC's regulatory system, Digital Finance Advisory Committee facilitates engagement of Fintechs and innovative businesses with ASIC more broadly. In Singapore, Fintech and Innovation Group (FTIG) (2015) underpins development strategies and regulations. In this respect, an innovation lab works closely with Fintech companies. Moreover, Financial Sector Technology and Innovation (FSTI) scheme (2015) commits 100 million pounds over the next five years to fund innovation labs, projects and initiatives. Regarding Hong Kong case, it can be inferred that initiative is more government-led than regulatory led. There is a lack of clarity and transparency in Hong Kong. Lastly, regulatory initiatives which focuses on contribution and engagement for Fintechs fall short in USA and Germany. Although Fintech environments are highly active in these countries, there is a lack of collaboration (Ernst & Young, 2016).

When it comes to government support, UK is the leader for the success of its government Fintech programmes. Substantially, these programmes aim to open up countries' financial sectors, attracting foreign actors to the country, helping Fintechs to grow and improving cybersecurity. In the UK, UK Trade and Investments (UKTI) plays an important role to attract foreign Fintechs. Global Entrepreneur Programme assist early-stage entrepreneurs and start-ups to relocate their businesses in the country. British Business Bank (BBB) is a state-owned economic development bank contributing SMEs for accessing finance. SME

Mandatory Referrals (2015) is a UK legislation that entails banks to notify alternative finance providers about credit-rejected SMEs (Ernst & Young, 2016).

Other important initiatives aiming to open the Fintech sector are Innovate UK, Tech City UK, Financial Services Trade and Investment Board (2013), UK Angel Co-Fund (2011), Start-Up Loans (2013) and Future Fifty (2013). In USA, Jumpstart Our Business Start-up (JOBS) Act (2012) is a national law to promote SMEs and provide exemptions from many securities regulations. Moreover, Start-Up America (2011) and Consumer Finance Protection Bureau, Project Catalyst (2012) play important role in opening Fintech sector in USA. InvestHK (2000) and StartmeupHK (2013) programmes are also targeting to attract foreign Fintech investment into Hong Kong. Moreover, Injection into Innovation and Technology Fund (2015) is founded to underpin innovative projects in financial sector and approximately £450 million was injected in February 2015. Innovation and Technology Venture Fund (2016) was developed and about £175 million was funded for local Fintech start-ups with private Venture Capital funds. BMWi Start-up portal in Germany provides beneficial information and consulting for business registration, tax and legal services for Fintech businesses setting up in Germany. Apart from these government programmes, Financial Sector Technology and Innovation (FSTI) Scheme (2015) in Singapore and National Innovation and Science Agenda (2015) in Australia are other leading examples of government programmes in order to expand the sector (Ernst & Young, 2016).

Governments also aim to reduce red tape and ease of setting a business for attracting foreign Fintechs. It is especially a key success factor for Asia – Pacific. In UK, Better Regulation Executive launched "Cutting Red Tape" programme in 2015. "Grenzoffensive" is an award winning cross border initiative for SMEs in Germany also for this purpose. In addition, Digital Signature Act in Estonia enables a company to start a business in 15 minutes (Ernst & Young, 2016).

Governments try to facilitate access to privately-owned common infrastructures to open up the Fintech sector. In this respect, there are three kinds of privately-owned common resources. These are payments infrastructures and systems typically owned and operated by large banks. Government data including Public Sector Information (PSI) such as economic, environment, transport, health and geo-spatial data and customer data particularly stored in financial institutions contribute development of better services. In detail, Payment Systems Regulator (2015) in UK, Strategies for Improving the US Payment System (2015) in US and Reserve Bank of Australia (RBA) Payments System Board (1998) are implementing strategies for this purpose. According to World Bank Group (2015), days to start a business takes 2 days in Hong Kong, 3 days in Singapore, 3 days in Australia, 4 days in New York, 5 days in UK, 8 days in Los Angeles and 11 days in Germany (Ernst & Young, 2016).

Data.gov.uk (2009) in UK and data.ny.gov in New York and Smart Nation Platform in Singapore are notable platforms to utilize government data. These platforms provide better connectivity and facilitate faster connection between businesses, public agencies and

citizens. Open banking platforms become more of an issue in order to leverage customer data. Open API and Open Banking Working Group in UK allows customers and SMEs to integrate bank data to their services via APIs. Moreover, gov.uk creates an official identification for customers to Fintech products and services (Ernst & Young, 2016).

As mentioned above, taxation policy is one of the core elements of Fintech policy of a country. It can profoundly affect promotion of entrepreneurial activities and innovation in R&D as well as the expansion of investment within a market. UK is again in the leading position in this segment with programmes such as SEIS and EIS. EIS (1994) is a tax relief for investors in smaller high-risk trading companies. On the other hand, SEIS (2012) is a tax relief for investors in high-risk start-up projects. Other programmes such as VCT Scheme (1995), Entrepreneurs Relief (2008), R&D tax credits (2002) and Innovate Finance ISA (2016) are other notable programmes for tax policy regarding Fintech start-ups in the UK. In Australia, National Innovation and Science Agenda (2016) involves diverse tax incentives for stimulating Fintech investments. In US, California Competes Tax Credit (2014) facilitates businesses to settle in California according to the importance of their activities. In addition, Qualified Emerging Technology Company Incentives (2005) offers tax credits for qualifying emergent Fintech companies. Productivity and Innovation Credit (PIC) Scheme (2010) in Singapore and Extension of Profit Tax Exemptions to Offshore Private Equity (PE) funds (2015) in Hong Kong are serving for similar purposes (Ernst & Young, 2016).

In Asia, Fintech companies mainly focus on China and India because of the fact that the other countries are very fragmented. New regulations were adopted in China by the end of 2014 and this results in a challenging competition for foreign suppliers and service providers in the country. Companies are compelled to share their secret source code with Chinese auditors and enable them to detect back doors into hardware and software (Ernst & Young, 2016).

3 METHODOLOGY

Methodology chapter has special importance regarding the quality of the research and the credibility of the findings. Research design, research method, and collection and analysis methods of data have profound effects on the reliability and validity of the findings.

This chapter is divided into two subchapters as “Research Design” and “Data Collection and Analysis”. While “Research Design” gives information about the research methodology, “Data Collection and Analysis” handles data sources, how they are analyzed and quality of data.

3.1. Research Design

A framework which describes how data is collected and analyzed is provided in this chapter Research design is formulated with respect to the aspects of research process (Bryman and Bell, 2011).

This research addresses Fintech space in an overarching manner from Open Innovation perspective. This requires a deep understanding for the recent happenings in the field. Fintech environment involves two types of primary actors as incumbents and start-ups. On both sides, developments and happenings consist various fields including banking, payments, lending, investments, accelerators and technology providers. There is a need to assess the developments and happenings from different perspectives Moreover, it is important to discuss these developments with the experts from different fields. By nature of competition, respondents may contradict to each other in the same questions. It is important to compare findings objectively to understand the big picture and reach a reliable conclusion.

In this respect, main research question is:

RQ: *What are the underlying drivers behind Fintech development and opportunities, threats, risks and challenges in Fintech space from an Open Innovation perspective?*

In order to facilitate answering this question, it is divided into five research questions. These questions are given in the table below with their objectives and research and data collection methods.

Table 3. Research methodology

Research Objectives	Research Questions	Research Methods	Data Collection Methods
To understand the triggers behind Fintech development	**RQ1:** What are the triggers behind Fintech development?	Qualitative research	**Primary data:** Semi -structured interviews **Secondary data:** Consulting company reports Economic organizations' reports Company websites
To understand role of Open Innovation in Fintech space	**RQ2**: What is the role of Open Innovation in Fintech space?		
To understand advantages and disadvantages of incumbents and Fintechs	**RQ3**: What are the advantages and disadvantages of Fintechs and incumbents?		
To understand the opportunities and threats in Fintech space	**RQ4:** What are the opportunities and threats in Fintech space?		
To understand the risks and challanges in Fintech space	**RQ5**: What are the risks and challenges in Fintech space?		

Research method is a technique which specifies how data is collected. Different instruments such as surveys, semi-structured interviews can be used in different methods (Bryman and Bell, 2011). Qualitative research strategy is widely-used in business researches in addition to quantitative and mixed methods. It emphasizes words instead of quantification and qualitative researchers don't apply measurement (Bryman and Bell, 2011). In contrast to quantitative research, it focuses on understanding social relationships through interpretation. Its steps are specified in the figure below in next page.

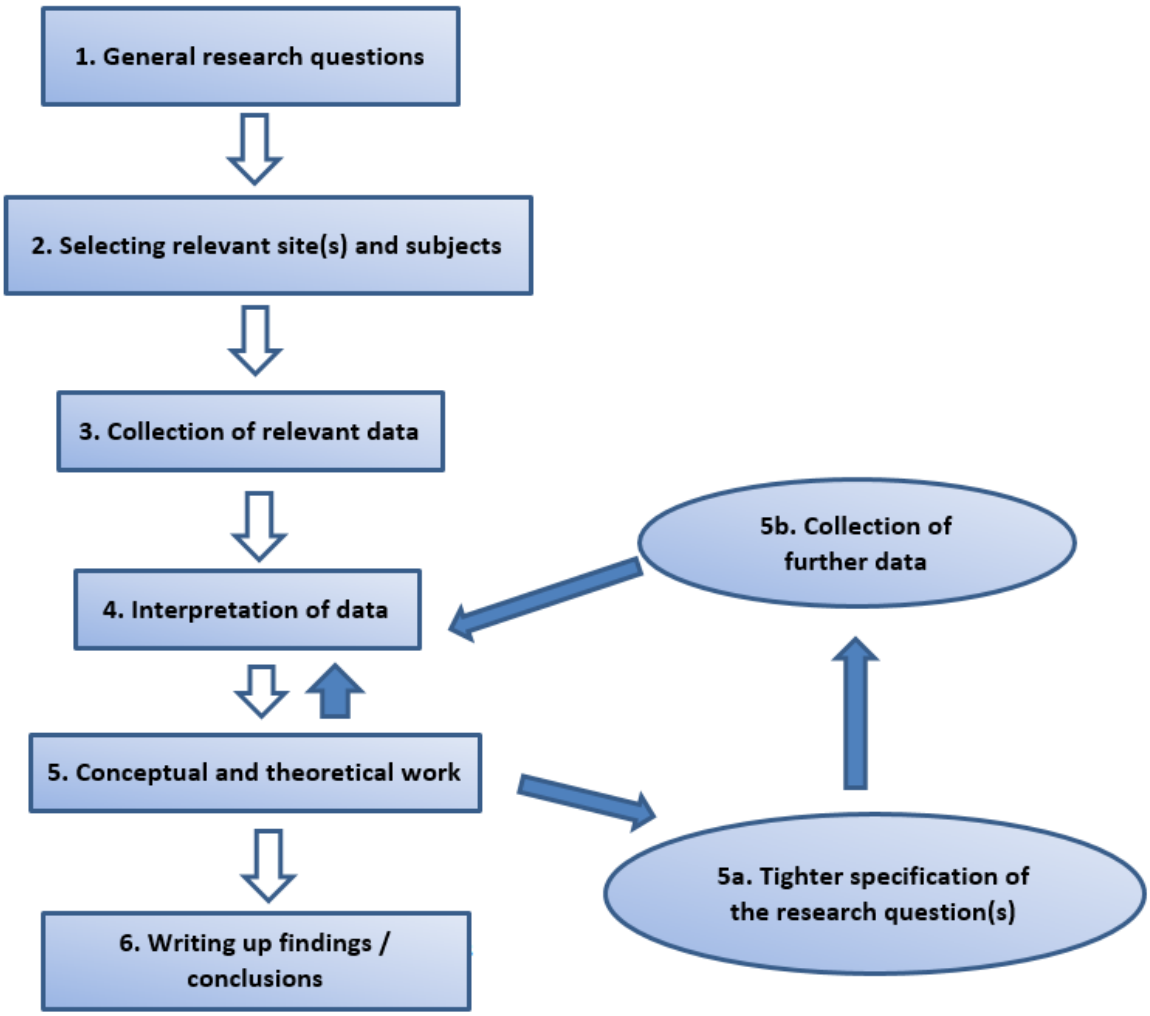

Figure 16. Steps in qualitative research (Developed by the author based on Bryman and Bell, 2011)

Qualitative research substantially reflects an inductive approach (Bryman and Bell, 2011). It is also known as inductive reasoning. This approach starts with observations and the theories which are built with respect to these observations in the end (Goddard and Melville, 2004). In addition, it is iterative. The researcher can update the theory and

research questions with respect to new data (Bryman and Bell, 2011). This gives the researcher the freedom to change the research process.

A qualitative research design in an inductive way is applied in this research. No assumptions and hypothesis are done in the beginning in accordance with an inductive reasoning strategy. It is required to understand the Fintech space from the perspective of interviewees before building theories. Researcher aims to build a framework after conducting interviews. In addition, researcher also restructures the research questions in accordance with the data obtained from respondents. In this sense, an inductive way makes more sense than a deductive way. It is required for the researcher to assess deeply the topic by combining different views of different respondents. This entails obtaining qualitative data with in-depth interviews. Therefore, carrying out a qualitative strategy is more effective than a quantitative strategy in this research.

3.2. Data Collection and Analysis

Research instruments are tools such as semi-structured interview or questionnaire. Semi-structured interview refers to an interview including series of questions, but the interviewer can add or subtract questions or change their sequences. Interviewer can ask further questions with respect to the answers of the respondent. Semi-structured interviews also enable researchers to address topics with fairly clear focus (Bryman and Bell, 2011). In recent years, there is an increase in the number of computer-assisted interviews. There are two basic types as computer-assisted personal interviewing (CAPI) and computer-assisted telephone interviewing (CATI) (Bryman and Bell, 2011).

Primary data is collected from semi-structured interviews. It is required to add and subtract some questions in the interview guide according to the expertise of the respondents. In addition, it is important to give freedom to respondents to receive in-depth answers regarding specific comments. It may also entails for the researcher to ask additional questions. Respondent may want to share his/her experience in a specific field and it is hard to manage it before the interview. In order to obtain most beneficial information, there is a need for dynamic attitude in asking questions Therefore, semi-structured interviews with open ended questions is the best method to use in this research.

An interview-guide was prepared before conducting the interviews. While some questions were asked to all the respondents. Some questions were subtracted or added according to the field and expertise of the respondent. Providing a copy of the interview guide can strengthen the dependability of the research (Bryman and Bell, 2011). Interview guide was shared with the respondents who demanded it. Interview guide can be seen in the next page.

Peer-reviewed articles, books, economic organizations' reports, consulting company reports and company websites are the secondary data resources. Most of the secondary data is obtained from peer-reviewed articles. Books which were written by eminent scholars in the field of research are chosen. Economic organizations' reports include reports which were written by economic organizations like European Commission. In addition, consulting company reports are selected from world-wide known consulting companies with high reputation. They provide beneficial information especially in market figures.

Table 4. Interview guide

• What do you think about latest developments in Fintech space?
• How do these developments affect your business?
• Are you collaborating with a Fintech start-up or incumbent organization?
• What are the best ways and strategies for collaboration?
• How do you address Fintech start-ups, as threats or opportunities for collaboration?
• What are the best strategies for incumbents to compete with new disruptive models in payment, lending and investment?
• What are the best strategies for incumbents to leverage their customer base and capital resources to turn into revenues regarding Fintech developments?
• Are traditional organizations successful to implement digital and innovative solutions?
• What are the burdens of incumbent organizations?
• What are the advantages and disadvantages of Fintechs and incumbents?
• Are incumbents and Fintechs competing in a fair environment in terms of regulations?
• What do you think about new regulations in Fintech space?
• What do you think about performance of government and regulators in your country?

Non-probability sample refers to a sample which isn't selected as randomly. It is very likely that human judgement affects the selection process (Bryman and Bell, 2011). Purposive sampling is the most common type of non-probability sampling (Guest et al., 2006). Researcher doesn't sample respondents randomly. He/she samples them in a strategic way to select the most relevant cases/respondents for the research (Bryman and Bell, 2011).

A purposive sampling method is applied to select the respondents. The aim is conducting interviews with respondents who have expertise in different fields in Fintech space. In addition, respondents should be selected both from Fintech start-ups and incumbents. KPMG Fintech 100 Leading Global Innovators Report 2015 was used to define successful companies. Researcher sent an invitation to e-mail addresses to all of these companies. However, none of them replied. Afterwards, researcher sent invitations of authors of The Fintech Book (2016). This is one of the most important resources regarding Fintech space. It is written by 168 authors who possess profound expertise and experience in various fields in Fintech space. This source is really important for Fintech researchers since there are really few books and articles about Fintech. The number of scientific researches in Fintech space is really few and it is a new area for business researchers. Then, researcher became a member to Fintech groups in LinkedIn to reach possible respondents. These groups are Fintech Circle, Fintech 20/20, Fintech Start-ups, Open Innovation Community and Front End of Innovation. These groups have more than 180.000 members. Researcher carefully examined the profiles and backgrounds of possible respondents according to their expertise and work experience. Researcher gave a special importance to the fields in payments, remittances, P2P lending, blockchain, investments, M&A, digital technologies, banking technologies, online and mobile banking and financial regulations. Possible respondents are working in incumbent organizations including large banking institutions, technology giants, technology start-ups management consulting companies, capital management companies and universities. Invitations sent to possible respondents who are purposely selected by the researcher.

Primary data are collected from semi-structured interviews. More than 300 invitations were sent via e-mail and 25 of them accepted to conduct an interview. However, 10 of them didn't participate to the interviews. Semi-structured interviews were carried out via computer-assisted personal interviewing (CAPI) and computer-assisted telephone interviewing (CATI). Totally, 15 semi-structured interviews were carried out. According to Guest et al. (2006), twelve interviews are sufficient to reach saturation for non-probabilistic samples. While some respondents preferred a face-to-face interview via Skype, some of them preferred to conduct it via telephone. Researcher called all of them via Skype software. Interviews were substantially conducted in English. Only two of them were conducted in Turkish. These interviews were translated by the interviewer and sent to the respondents. Most of the interviews took around 60 minutes. Length of interviews vary between 30 and 75 minutes. All of the interviews were recorded with the permission of respondents. MP3 Skype Recorder software was used to record the interviews. Afterwards, these interviews were transcribed. Firstly, various transcription programs were tried by the researcher. However, none of them were satisfactory. Researcher transcribed the interviews without using any program. While some of the respondents allowed to share their name and companies, come of them refused it. Researcher kept all the respondents' identities anonymous. Respondent list is given in the table below:

Table 5. Interviewee list

Participant	Title of Participant	Expertise	Additional Contribution	Work experience	Current Organization	Field of Organization	Location
η	Co-Founder	Investments	Author	Startups, accelerators	Incumbent financial organization	Private equity investment	Singapore
Ω	CEO	Blockchain	Author	Incumbents, startups, accelerators	Fintech startup	Digital economy consulting	Canada
γ	CEO	P2P Lending	Author	Startups, accelerators	Fintech startup	Financial technology consulting	UK
λ	Fintech Platform Strategist	Banking Technologies	Author	Incumbents, startups	Fintech startup	Financial technology consulting	India
Φ	Head of Technology	Digital Transformation	Author	Technology giant, startups, accelerators	Technology giant	Financial technology consulting	Singapore
Υ	Board Member	Blockchain		Incumbents, startups, accelerators	Fintech startup	Financial technology consulting	Switzerland
ψ	Digital Banking Expert	Digital banking	Author	Incumbents	Incumbent financial organization	Banking	Austria
Π	Head of Accelerator	Accelerators	Lecturer	Incumbents	Incumbent financial organization	Banking	India
ε	Market Development Manager	Banking	Author	Startups	Fintech startup	Financial technology consulting	UK
β	Head of Research Unit	Banking	Lecturer	Academia	Academia	Education / Research	Luxembourg
δ	Executive Director	Investments	Author	Incumbents	Incumbent financial organization	Management consulting	Singapore
μ	Vice President	Banking technologies	Author	Incumbents	Incumbent financial organization	Banking	Singapore
θ	Product Manager	Payments	Author	Incumbents, startups	Fintech startup	Financial technology consulting	Turkey
Σ	Researcher	Business consulting	Author	Incumbents, academia	Incumbent financial organization	Education / Research / Consulting	Luxembourg
α	Managing Principal	Capital Markets		Incumbents, startups	Incumbent financial organization	Capital Management	US

Researcher addressed the answers from all respondents in an objective way. It is clear that there are contradicting answers to the same questions from different parties as well as supporting answers. Researcher quoted from both contradictory answers and made a comparison of different views instead of deciding which answer has more value.

Triangulation is a method to increase the quality of the research. More than one methods or data sources are used in triangulation. In addition, different respondents can be used to employ triangulation (Bryman and Bell, 2011). In this thesis, researcher benefits from 15 interviewees to support and compare the findings.

Secondary resources are mostly consulting company reports, official company websites and economy news websites. In order to reach unbiased information with high quality, these resources are carefully selected. As consulting company resources, most of the information relies on the work of prestigious companies including Deloitte, PwC, Ernst & Young and KPMG. Economy news websites are also carefully selected and most of the information were obtained from Forbes and the Economist.

4 RESULTS

Results chapter involves many subchapters in accordance with research questions. It includes respectively “Triggers of Fintech Development”, “Role of Open Innovation in Fintech Space”, “Advantages and Disadvantages of Fintechs and Incumbents”, “Opportunities and Threats in Fintech Space” and “Risks and Challenges in Fintech Space” subchapters. Summary of results and the supportive quotations are given in Tables 6 and 7 in the following pages.

Table 6. Summary of evidences (first part)

Research Questions	Results	Quotes
RQ1: What are the triggers behind Fintech development?	Global economic crises in 2008	*Respondent ε: "Especially after the global financial crises, customer trust for banks decreased and this created opportunities for Fintech sector. As more and more customers started to choose these innovative startups, for their financial needs, there is an increasing interest towards Fintech solutions. Banks started to lose their shares in the market because this lack of trust."*
	Developments in technology after 2008	*Respondent ψ: "Technology companies which weren't in our playground before know our customer better than us. Eventually, customers carry their smartphones 7/24. 90-95% log in to Facebook. They know customer's situation, profile, what he ate last, and his last check-in. I am competing with this company."*
		Respondent Ω:" If you look at the graphs of what it costs to startup 10-20 years ago and what it takes for team of young enthusiast people to do startup, today is very cheap and it is very quick."
	Changes in business models of technology companies	*Respondent γ: "Technology companies, software companies and other creative, smart, capable technology companies changed their behavior and started to thinking about giving their service, giving their knowledge directly to the end customers by jumping the intermediaries. Leaving banks out of the party."*
	Changes in demographics	*Respondent ψ: "They say if Facebook, Google or Square will give me this service, there is no point to visit branches. The reason lying behind this is they don't need banks, they need banking."*

Table 7. Summary of evidences (second part)

Research Questions	Results	Quotes
RQ2: What is the role of Open Innovation in Fintech space?	Collaboration is a must	*Respondent ε: "I don't think there is a competition in a pure way. They need each other and they collaborate and it creates a win-win strategy."*
		Respondent δ: "So the big story banks don't have a choice. The ones that we embrace how an opportunity to participate in the new ecosystem. The ones that ignore will die in a very painful way. A painful death means a thousand cuts. That's already happening."
	Outsourcing becomes more important for incumbents.	*Respondent α: "I think we are much more likely to see banks to buying than doing things internally."*
	Importance of alliances	*Respondent Π: "That's about alliances which help startups grow and help us to grow. They are more like a partner to bank than competing with the bank".*
	Importance of timing	*Respondent η: "My biggest advice to banks is don't engage too early. Don't expect a startup to be a tech vendor. IBM, SAP, Oracle have huge engines behind them to sell high tech, but startups are very different."*
	Incumbents should redefine their boundaries.	*Respondent δ: "Second option is banks say OK we will collaborate. Then, they have to define clear boundaries in terms of what role a bank will play."*
	New Regulations, API economy and Banking as a Service Model enhances Open Innovation in financial services.	*Respondent ε: "You know they say banks will be technology companies in future. I totally agree with it.Currently there will be a new payment service directive, PSD II. It forces banks to provide their APIs to third party providers. That means banks will become open platforms. This will help them to understand their customers better and create and develop new products better. Customers as well they can have an account in a bank, but they can choose other providers for different services at the same time. So it will offer customers more choice and control over their finances. It seems like a trend. We will see what will happen in the sector in the coming years."*

Table 8. Summary of evidences (third part)

Research Questions	Results	Quotes
RQ3: What are the advantages and disadvantages of Fintechs and incumbents?	Capital and customer base are main advantages of incumbents.	*Respondent α:" But you don't have a scale advantage or access to clients' assets advantage. Banks have that regardless of how creepy their technology is. Most of what startups are doing is saying dramatically lowering cost of the service for the customer whatever service they are working on which means that they need even more scale than the bank even to be more profitable."*
	Inflexibility, regulations, old technology, cultural gap are disadvantages of incumbents.	*Respondent β: "Certainly banks usually have very rigid structures. They are not very flexible. They have to comply with so many regulations. It is obviously pretty though for them to accommodate within flexibility."*
		Respondent β: "When it comes to bringing some intelligence to the data, for example for new services or new offerings, they (banks) are pretty slow and pretty retarded."
		Respondent δ: "Most of the senior management folks still don't have even Facebook. So they don't understand how it happens in Facebook environment."
	Techonology, flexibilty and low regulatory burdens are advantages of Fintechs.	*Respondent ψ: "One of the main advantages of the Fintechs is there won't be a legacy burden. A new system will be constructed and it can be built as a more cost effective system which is compatible to digital economy."*
		Respondent α: "If you are a startup, you have no legacy costs, no legacy ways to think about things. You can build things very quickly. You can change things very quickly. You have two major advantages over banks: One is technology."
	Lack of capital and customer base are disadvantages of Fintechs.	*Respondent Π: "At the end of the day startups are looking for two things: One capital, two customer."*

Table 9. Summary of evidences (fourth part)

Research Questions	Results	Quotes
RQ4: What are the opportunities and threats in Fintech space?	Fintechs contribute to market and incumbents	*Respondent Σ: "Fintech has created based on many disruptive forces in the financial industry in many ways from cost reduction, process development, development of new business models and development of new value propositions. It is a very dynamic way for creating new technological breakthroughs within the financial industry meaning that in the process of delivering financial services, companies are trying to find things to do them in a very cost effective, smart, fast and in other ways approachable for the customer. They bring value, they bring new ways of developments and services for the customer."*
	Incumbents can contribute to Fintechs.	*Respondent θ: "Also bank can contribute to the Fintech. At the background, bank possess a financial power, customer database and reputation."*
	If incumbents ignore collaboration, they may lose their customer base.	*Respondent δ: "One is to say sorry, we are not collaborating. So what will happen? Customers will start leaving those banks and start moving to banks which are collaborating and partnering. That's one. Second option is banks say OK we will collaborate. Then, they have to define clear boundaries in terms of what role a bank will play."*
	Incumbents should embrace technology and change their traditional mindset.	*Respondent Π: "We need to evolve ourselves as technology companies."*
		Respondent γ: "Many people say no, no, no banks have to totally change, otherwise they totally die. But my answer is no, smart, evolutionary, step by step, incremental change is enough. Banks can manage this. This is my personal opinion. Step by step adjustment."
		Respondent Φ: "Banks' culture and the way they operate will not allow them to change."
		Respondent Φ: "The big mistake what banks are doing, that's the culture shift that they don't get it, they are taking a new technology called blockchain which can provide them the innovation and they are using it for saving costs. This is a big big mistake."

Table 10. Summary of evidences (fifth part)

Research Questions	Results	Quotes
RQ4: What are the opportunities and threats in Fintech space?	New regulations, especially PSD II in Europe and Banking as a Service Model	*Respondent γ: "PSD II is very important. It will bring significant changes to banking industry. It will bring new value to customers. Customers will be able to choose through which third party do I want to access my account. Many companies from outside banking will try to become third parties."*
		Respondent γ: "Smart banks will set up their own party providers."
		Respondent ε: "You know they say banks will be technology companies in future. I totally agree with it.Currently there will be a new payment service directive, PSD II. It forces banks to provide their APIs to third party providers. That means banks will become open platforms. This will help them to understand their customers better and create and develop new products better. Customers as well they can have an account in a bank, but they can choose other providers for different services at the same time. So it will offer customers more choice and control over their finances. It seems like a trend. We will see what will happen in the sector in the coming years."
	Disruptions in Fintech space will continue with new models.	*Respondent Φ: "When u look at WeChat, they are not a bank. You can transfer money, you can look payments. It is invisible."*
		Respondent Φ: "This (Banking as a Service) is true, this will happen, but this is a temporary measure. This has already started to happen, but the end state of financial service is going to exist in a way that is called invisible banking."
		Respondent Φ: "Tomorrow, Facebook can provide you a specific loan based on your profile."

Table 11. Summary of evidences (sixth part)

Research Questions	Results	Quotes
RQ5: What are the risks and challenges in Fintech space?	Regulations	*Respondent Σ:" I think in general, the regulations always falling behind."*
	Brexit	*Respondent ε: "Actually even the government doesn't know. They don't have a plan yet. We still don't see a clear answer about what to do about Brexit, so definitely the referendum brought an uncertainty."*
		Respondent ε: "However, UK definitely needs to keep its passporting rights after Brexit. This is very crucial. These rights enable financial organizations to access to other EU countries to get additional authorization to operate in these countries "
	Digestion problem	*Respondent γ: "HSBC has 40.000 IT people globally within the bank. How do you make 40.000 learn from a small Fintech company? How do you make them learn from 20 small Fintech companies? 40.000 people. They don't even know each other. You can't make 40.000 people visit the company. It costs like a billion dollar to make 40.000 to learn. It is bigger than a university."*
	Doubts about Fintechs	*Respondent δ: "It is not just about founding a company and launching a web site. It is about launching a business around it. There are a lot of people who build a web site and say we are a Fintech, but what is the product. What is the business? Is it profitable? When you start checking all these companies, you will be surprised not even 6% of the companies who call themselves Fintech companies qualify those criteria."*
	Overvaluation of Fintechs	*Respondent Σ: "What I am afraid is that maybe all these new startups and young companies might be overvalued and as you said there are many that they proclaim a bubble. I think what we need right now is rationalization."*
		Respondent α: "Valuations for all these startups are optimistic, but not more so than ever in history. Valuations of technology startups are always optimistic."

4.1. Triggers of Fintech Development

Crises and Loss of Consumer Trust

Most of the respondents agree that global financial crises in 2008 contributed the rise of Fintechs. According to Respondent α from an investment management company, crises are not anomalies in financial sector, but they are the realities of the system.

Respondent α: "I think that every 5 to 10 years, everybody forgets that there is a crises every 5 to 10 years. These are not anomalies. These are core components of the financial system that we live in."

Most of the other interviewees also agree on this fact. They say current situation of the financial system needs improvement in the sense of business methods, regulations and technology. This is one of the primary reasons behind why crucial changes are happening in financial markets. Law makers started enacting new laws and regulations after economic downturn in 2008 to increase consumer trust, competition, fairness and stability of the financial sector. Fintech start-ups and unicorns are benefitting emerged opportunities in the markets. In short notice after crises, changes in relationships between incumbent financial institutions and their customers started to be observed. Loss of trust is one of the primary reasons behind it.

Respondent ε: "Especially after the global financial crises, customer trust for banks decreased and this created opportunities for Fintech sector. As more and more customers started to choose these innovative start-ups, for their financial needs, there is an increasing interest towards Fintech solutions. Banks started to lose their shares in the market because of this lack of trust."

While consumer trust is decreasing, new services are being introduced by Fintechs.

Respondent α: "This time there is a lot more technology and alternatives"

Consumers started to use financial services more often by the help of mobile technologies. This expanded the market and opened room for new innovations and new entrants. A respondent from a large bank, Respondent ψ, said that customer trust for technology companies such as Google, Facebook and Amazon are far higher than the customer trust for incumbent organizations. He also added that these companies became inseparable parts of our lives due to the explosion in mobile technologies and social networks. It is no surprise for technology companies and Fintech start-ups to attract the brightest minds and bridge the gap in the market in their favour.

Respondent γ: "The outside third party providers all of a sudden had a better image. They were smaller, they were younger, but they looked so much better in the eyes of the clients. This is the trick. This is why it is a special model. This is one of the most complicated things about Fintech."

One participant from academia, Respondent β, declared that the main contribution of intermediaries such as banks and other financial intermediaries is ensuring "trust".

Respondent β: "If a Fintech company is performing the same service with the same level of quality, same level of confidence, trust and safety, of course people will go for that in the cheapest way as long as this is reliable and then it is going to be a loss of market share for the banks."

It can be said that incumbents may face a rapid market loss to Fintechs.

On the other hand, Fintechs employ different methods and leverage technologies such as artificial intelligence (AI) and complex algorithms to establish consumer trust. For instance, while banks are using "Fair, Isaac and Company" (FICO) score to evaluate customer creditworthiness, many Fintechs are examining customers' social networks. Respondent ψ, who is working at a large bank as a digital banking, expert puts forward that new methods offered by Fintechs can be more reliable than the traditional ones.

Respondent ψ: "I have a criminology background and I managed fraud departments of various banks. I have witnessed some interesting facts. Banks employ credit scoring to evaluate creditworthiness of customers. There are some special software checking customers' information. On the other hand, some methods used in social media lead better results in comparison to traditional ones."

Respondent α also approved this comment by declaring that traditional credit scoring mechanisms are problematic and gameable.

Emerged Technologies After 2008

The aftermaths of the global crises in 2008 are shaping the markets at the same time with the advancements in mobile technologies. After the first release of iPhone in 2007, an explosion in mobile technology was observed and this also affected the financial sector. Companies such Facebook gather customer information 7/24 and they know internet searches of the customer, where they went last for dinner, whether they are preparing to buy a new house or go on a vacation. They have information about personal interests of consumers. These companies know consumer expectations and turn these valuable information which are being analysed semantically into new revenues.

Respondent ψ: "Technology companies which weren't in our playground before know our customer better than us. Eventually, customers carry their smartphones 7/24. 90-95% log in to Facebook. They know customer's situation, profile, what he ate last, and his last check-in. I am competing with this company."

Mobile technologies led an enormous amount of information flow through technology companies and this situation changes the flow of assets. Advanced big data analyses give the possibility for these companies to offer the most attractive offers to their customers.

According to Respondent ψ who is a digital banking expert in a large banking institution, banks have no alternative to adopt this change in the market. A second technological development which profoundly affects sector and increases the number of Fintech start-ups is cloud technology. By exploiting the opportunities in cloud technology, start-ups decrease their costs and this facilitates establishment of a new company. Before cloud technology, starting a business was quite hard with a couple of people due to the high costs of servers and infrastructure. Companies such as Amazon offer pay-per-use models for infrastructure and software. This helps organizations minimize their costs.

Respondent θ: "This is one of the main reasons behind huge number of Fintech companies. It is very easy for 2-3 persons to found a company without buying servers "

Respondent Ω:" If you look at the graphs of what it costs to start-up 10-20 years ago and what it takes for team of young enthusiast people to do start-up, today(in 2016 it is very cheap and it is very quick."

Respondent α also added that technologies such as robo-advisors enable people who are less affluent and can't access financial services before to access financial services. This means that these companies open the markets to masses and democratize financial services.

Change in Business Models of Technology Vendors

One interviewee from UK Fintech industry, Respondent γ, stated that financial institutions were always bound to ICT companies, but the relationship between technology providers and end users have changed after 2008.

Respondent γ: "Technology companies, software companies and other creative, smart, capable technology companies changed their behavior and started to think about giving their service, giving their knowledge directly to the end customers by jumping the intermediaries. Leaving banks out of the party."

He also stated that traditional organizations have always acquired computer software and hardware from outside providers and proportion of in-house technology development is always limited. They are still bound to technology companies in many aspects. He also declared that these technology providers never shared their solutions for financial markets directly with the end users in between late 50s and global financial crises in 2008. For instance, innovations such as ATMs and credit cards were introduced to end users through intermediaries such as banking institutions. Afterwards, this model has been changed and technology companies started to offer financial solutions directly to end users. This is one of the main reasons lying behind Fintech revolution.

Change in Demographics

Another interesting change happens in demographics. New generation, also called "Millennials", have an inclination to prefer technology companies and Fintechs instead of incumbent organizations. One participant from a start-up, Respondent θ**,** declared that new generation doesn't want to visit branches and deal with people for executing financial services. They have also strong inclination towards technology companies such as Google and Facebook. Respondent ψ approved this by saying that these people don't want to use banks and other traditional banking institutions instead of Facebook's money transfer service.

Respondent ψ: "They say if Facebook, Google or Square will give me this service, there is no point to visit branches. The reason lying behind this is they don't need banks, they need banking."

Respondents also approved that millennials give importance to sharing economy instead of buying new things. Respondent ψ stated that many young people are graduating from universities with huge loan burdens and this causes a shift in consumer habits towards sharing existing goods instead of consuming new ones. The rise in car sharing services exemplifies well this situation. He also added that this is a new notion for banks and they should deliberate on new business models to attract this new consumer type. Another respondent from academia, Respondent β, approved this and elaborated it with the examples of Uber and Airbnb. She also added that these people are also interested in investing local economy rather than investing in a fund which is managed by a company in another continent. The purpose behind is creating a local impact while acting globally.

Respondent β: "There is also a trend towards sharing economy with Uber, Airbnb and all that, so it is not a surprise that people are also keen on investing directly locally. For example, if you want to invest your money, sometimes you don't want to invest in a fund which is managed by US and investing in Asia. Maybe you want to have a local impact and you want to know that whatever your investment will contribute and support the local economy, the regional economy and things like that."

On the other hand, Respondent α stated that most of the millennials are so young to be wealthy and force large institutions to change their business models for them.

4.2. Role of Open Innovation in Fintech Space

Compete of Collaborate

There is a debate for large institutions for positioning their strategies in Fintech space. In this regard, the question is whether these organizations should compete with Fintechs, or collaborate with them. An interviewee from a British start-up, Respondent ε, who is also an author of a book in Fintech field, declared that this question was meaningful in 2014, but

now there is no choice for large institutions except collaboration. She also added that competition is not helping them since Fintechs are faster and more innovative. On the other hand, Respondent δ stated that Fintechs are also bound to collaborate because people are keeping their deposits in the banks eventually. Respondent θ puts forward that companies likes of Square increase the number of credit card transactions in the market and contribute to market growth. Although their business models are threating banks, banks will increase their revenues from credit card transactions at the end of the day. Respondent Σ stated that the necessities in banking or any other field will remain the same. People will always need payments and other core functions. Moreover, customers will be the same. The only change introduced by Fintechs is happening in the ways and the methods for executing these transactions. They create ways such as 7/24 connectivity, mobile payments, cashless transactions, reduced fees, faster transactions and leveraging social media.

Respondent Σ: "People will always need to pay, always need to do transactions, so the core function of the financial service when it comes to payments or lending or doing daily business is going to be the same. The thing is that how do you make sure that you use the technology to change the way, the needs are being covered and addressed. And how do you create not only new needs, but how you create ways for giving solutions to the customer such as 7/24 connectivity, online payments, mobile payments, cashless transactions, reduced fees potentially, faster transactions . How you use social media in that respect."

On the other hand, companies such as famous peer-to-peer (P2P) lending companies claim that they are separate from traditional channels, but they raise huge amount of investments from traditional organizations at the same time. They are somehow still connected to the traditional sector. In this respect, competition isn't happening in a pure way and collaboration is a win-win strategy for both parties. Financial markets offer myriad opportunities both for incumbents and Fintechs through collaboration.

Respondent ε: "I don't think there is a competition in a pure way. They need each other and they collaborate and it creates a win-win strategy."

Respondents agree on the fact that if incumbent organizations try to ignore this fact and insist on their conservative models, they will inevitably lose their customers and market shares.

Respondent δ: "So the big story is banks don't have a choice. The ones that embrace how an opportunity to participate in the new ecosystem. The ones that ignore will die in a very painful way. A painful death means a thousand cuts. That's already happening."

Most of the respondents agree that customers will start moving to companies which are collaborating and partnering. Respondent δ declared that this process has already started and incumbents are witnessing this issue. Second option for traditional organizations is accepting collaboration. In this case, they should revisit their business models and agree on new roles that they should play in the financial sector.

Respondent δ:" One is to say sorry, we are not collaborating. So what will happen? Customers will start leaving those banks and start moving to banks which are collaborating and partnering. That's one. Second option is banks say OK we will collaborate. Then, they have to define clear boundaries in terms of what role a bank will play."

On the other hand, Respondent *η*, who has profound experience in mergers and acquisitions (M&A) in Fintech space**,** emphasized that incumbents should choose the right time for collaboration.

Respondent η: "My biggest advice to banks is don't engage too early. Don't expect a start-up to be a tech vendor. IBM, SAP, Oracle have huge engines behind them to sell high tech, but start-ups are very different."

Respondent η: "You have to partner, but don't partner too early."

Open Innovation Methods in Fintech Space

There are different Open Innovation methods for large institutions to engage with Fintechs. According to Respondent *β,* first one is acquisition of Fintech companies. Incumbent organizations prefer early stage acquisitions for maximum return and lower costs. Respondent *Φ* stated that incumbents prefer acquisitions if the product can easily be applied to incumbent's existing model. Respondent *δ* stated that BBVA's acquisition of Simple Bank exemplifies well a complete acquisition of customer layer. Second option is investing to start-ups. Many large organizations established their venture capital funds for this purpose. Respondent *Φ* declared that incumbents prefer this model if the success is more about Fintech's business model instead of the product. Similar to the acquisitions, they also prefer early stage investments for Fintech start-ups. They try to identify good opportunities at very early stages for maximum returns. Different organizations may be investing the same company at the same time. Another option is partnerships and alliances. According to Respondent *δ,* JP Morgan Chase's deal with On Deck Capital for providing credit lines is a good example for building partnerships. JP Morgan is still hiring data-scientists and decision scientists to improve their in-house capabilities. Respondent *Π* from a large bank in India, emphasized the importance of alliances for their organizations to reach innovation outside of their organizations. He stated that three pillars of their success are alliances, relationship and technology. He continue as:

Respondent Π: "That's about alliances which help start-ups grow and help us to grow. They are more like a partner to bank than competing with the bank".

Respondent Π: "We are not forthcoming with an acquisition point of view because managing innovation in large organizations is very difficult. Innovations are very well managed when they are left to innovators. Innovators need that sort of freedom and free minded thinking. Large organizations might not be able to give this."

Incumbents are hosting Fintechs and helping them to grow through incubators, accelerators, innovation labs and hackathons. It offers many advantages to Fintechs as well as incumbents. They are beneficial for Fintechs to understand large organization's problems, show themselves and get the change to collaborate with them. In addition, they receive mentorship.

Respondent ε: "We were in the program for three months. We had partners of the program like MasterCard, PwC and Amazon. That kind of companies were supporting the program. During the program, we had office space with different start-ups from different segments. We had mentors coming from these organizations. They were coming and we were having meetings with them. They were solving our business problems. They were also gatekeepers who are letting us to enter their organizations. If the partner like the solution of any company, they can just meet and start to collaborate. It means more business opportunities for both sides. So it was really a good opportunity and you have more kind of exposure. The program itself has a very high reputation. It was a really great program in terms of support."

Respondents *η, μ and Π* who are contributors of well-known accelerators emphasized the importance of accelerators for incumbents in order to reach cutting-edge technologies and collaborate with Fintechs start-ups.

On the other hand, even well-known conservative banks started to support new start-ups established within their organizations by their employees. Respondent *γ* from UK referred to Barclays' and Erste Bank's programs for this purpose. Barclays Social Innovation project supports start-ups founded by their employees for a social purpose. If the start-ups serve a social purpose and enables to break even, it can be funded by Barclays. Erste Bank from Austria also runs a similar program to support profitable start-ups founded by their employees. After funding, Erste Bank holds majority shares of the start-up.

Among all these strategies, there is no one specific best way or strategy. Respondent *ε* stated that it differs with respect to the sizes, business plans, long term strategies and risk appetites of incumbent organizations. In addition, Respondent *η* added that it is dependent on the motivation of the parties. He also said that the most important topic regarding Open Innovation is changing the culture inside of traditional organizations by fostering entrepreneurial mindset and bringing innovation from outside to inside by successful engagement strategies.

During collaboration, incumbents monitor Fintechs start-ups' capabilities. Their ability to work with large organizations and their contribution in terms of technology and regulations are important criteria.

Respondent Π: "First thing we do is try to understand their technology to solve a part of a business problem. Secondly, we try to see how flexible is that start-up in terms of understanding and working with large organizations like us. Thirdly, we make sure products of start-ups are up to date in terms of regulations."

Develop In-House or Outsource

There is a question for large institutions whether to improve their in-house capabilities and develop internally, or buy technology from outside. Large institutions may avoid taking the risks for new technology developments and prefer acquiring the established ones. One respondent from academia who made research in this field, Respondent β, stated that banks are developing less and less by themselves probably because of the fact that systems evolve and they don't possess the key resources and competencies to do that. In addition, the shift of human resources with high ICT capabilities to technology companies force them to buy technology outside and collaborate with start-ups instead of developing them in-house.

Respondent α: "I think we are much more likely to see banks to buying than doing things internally."

4.3 Advantages and Disadvantages of Fintechs and Incumbents

Advantages of Incumbents

Most of the customers agree that main advantages of incumbents over Fintechs are their capital and customer base. They have enjoyed the advantage of restrictions against new entrants such as banking licenses and governed financial sector. Moreover, they have accumulated huge assets.

Respondent α:" But you don't have a scale advantage or access to clients' assets advantage. Banks have that regardless of how creepy their technology is. Most of what start-ups are doing is saying dramatically lowering cost of the service for the customer whatever service they are working on which means that they need even more scale than the bank even to be more profitable."

Respondent δ: "Now the banking in commerce enjoyed an unfair advantage for so many years. Unfair advantage was called regulatory modes."

Respondent λ: "They have the advantage of building the relationship for many years. That is very difficult for smaller companies to overcome."

In this regard, Fintechs are trying to reach customer bases of incumbents and financial resources by attracting investments and collaboration opportunities.

On the other hand, incumbents have profound experiences regarding regulations and how to conduct business in financial markets. Even Respondent Φ, who claimed that incumbents will fail in retail banking in the long run, stated that banks will act as an intermediary between technology companies, consumers and governments in terms of laws and regulations.

Burdens of Incumbents

According to many respondents, incumbent organizations have huge technology and legacy burdens. An interviewee who has profound technical experience in large institutions, Respondent *δ,* stated that core banking and backend systems used by large banks are more than two decades old. He also gave Delta Airlines example which resulted in major loses in revenues and consumer trust due to the failure in company's worldwide computer network. He added that too much investments were done for the existing systems and it is extremely difficult for large institutions to change them from scrap. Another respondent from a large bank, Respondent *ψ,* approved this and noted that core banking systems consist different layers of components and it makes difficult to adopt these systems for digital banking. These architectures aren't synchronized with digital economy and it is quite hard to make radical changes due to the costs and organizational structures.

Another type of burden for incumbent organizations is regulatory burden. Most of the respondents declared that incumbents are not flexible due to the regulations.

Respondent β: "Certainly banks usually have very rigid structures. They are not very flexible. They have to comply with so many regulations. It is obviously pretty though for them to accommodate within flexibility."

Respondent *μ* stated that there is not enough room for radical movements for these organizations since they are subject to strict regulations which most of the start-ups are not subject to. These regulations force the industry to be more conservative. Moreover, they make it challenging for traditional organizations to accommodate quickly to new environment and revisit their business models. A product manager from a start-up, Respondent *θ*, added that it takes months for banks to approve and start a new project while start-ups are about to finalize it. Start-ups are more focused to particular services and it makes them more agile to provide new solutions. On the other hand, Respondent *ψ* added that Fintechs are not subject to the same laws and regulations which banks are subject to. He added that holding a banking license brings additional obligations to banks and this makes their processes slower. In this sense, making a small change in their business models can be pretty though for them. In addition, Respondent *γ* added that start-ups have more risk appetite than traditional ones to be successful in the market. They can take more risks by ´benefitting from grey areas in the regulations.

Innovation and Change

According to Respondent *Y*, who has made various investments in different high-tech industries, innovation isn't only related with technology. Actually, it is more relevant with people and the way they are executing their businesses. The change is about how people are willing to change their habits and their acceptance. He also stated that it takes a lot of time and it is much slower than compared to the rapid changes in technologies. The only thing that can ease the change for conservative organizations is collaboration. It is a long

process that may force organizations to relearn completely the ways in daily business. It is quite challenging to understand databases like Hadoop without collaboration for the incumbents managed by people who don't even have Facebook accounts.

Respondent δ: "Most of the senior management folks still don't have even Facebook. So they don't understand how it happens in Facebook environment. Most of them don't understand how a big data processing, unstructured database like Hadoops of the world, Apaches operate. So how alternate data can be practical for risk management. Most of them are still struggling the fact how customers interact with financial services providers by using a mobile device 7/24. Because if you have been born in an environment where branches were open from 10 am till 4 am in the afternoon, and in a mobile environment a branch has to be open 7/24. It is a new reality that bank people are adjusting. Some of the smartest ones have accepted that. The other ones are struggling."

On the other hand, one respondents from a famous technology company claimed that it is not possible for banks to adopt new cutting edge technologies and new business models in the future.

Respondent Φ: "Banks' culture and the way they operate will not allow them to change."

Cultural Gap and Different Mindset

Another challenge for large institutions for adapting new environment is the cultural gap and existing traditional mindset against developments in the market. Respondent *δ* declared that most of the people who run technology divisions in large banks were born in the times that there were no e-mails, no internet and no mobile phone.

Respondent δ: "Most of the senior management folks still don't have even Facebook. So they don't understand how it happens in Facebook environment"

In this sense, understanding new technologies and business models and developing new ones is pretty though for these people and their organizations. In addition, Respondent *Σ* approved this and added that the starting point of innovations is embracing new developments. If human resources of these organizations can't understand the developments, it is impossible to embrace them. In this sense, the thing to be done is attracting human resources who possess high capabilities in terms of new technologies and business models. However, traditional organizations are struggling to attract millennials to work with them and these people prefer technology giants such as Facebook and Google.

Respondent δ "Good talent says I want to go and work with Facebooks and Googles of the world."

The image of the traditional financial sector in the eye of new generation hampers the innovation capabilities of traditional organizations. Some people are really pessimistic

about banks' future regarding their cultures and mindsets. They believe that it would be impossible for most of them to transform themselves to new environment.

Respondent Φ: "Banks' culture and the way they operate will not allow them to change."

Regarding cutting edge technologies such as blockchain, many respondents believe that incumbents fail in using them. Many of them referred to the R3 Consortium which is established by the largest financial institutions in the world. Respondent *ψ* quoted from Henry Ford and said that "If I had asked people what they wanted, they would have said faster horses." He added that banks are trying to use blockchain as a faster horse, although it is a ground-breaking technology. Another interviewee who is a manager of a famous cutting-edge technology company supported this by saying:

Respondent Φ: "The big mistake what banks are doing, that's the culture shift that they don't get it, they are taking a new technology called blockchain which can provide them the innovation and they are using it for saving costs. This is a big big mistake."

He also added that incumbents won't be able to control the markets with their power and it will be controlled by the customers. On the other hand, Respondent *θ* stated that the establishment will remain the same and nothing will change the role of central banks.

Advantages and Disadvantages of Fintechs

Respondent α declared that Fintechs have two major advantages over banks including technology and appetite for regulatory risk. On technology side, they are always creating and changing things faster than large institutions. Systems can be constructed as more cost effective and more compatible with digital economy.

Respondent ψ: "One of the main advantages of the Fintechs is there won't be a legacy burden. A new system will be constructed and it can be built as a more cost effective system which is compatible to digital economy."

They have more focused and lean organizational structures with less technology burdens. On the regulatory side, Respondent *α* stated that most of the start-ups are not sure whether their company will survive in the next 6 or 12 months. Therefore, they are more eager to take regulatory risks and benefit from grey areas in the regulations.

When it is compared with large institutions, start-ups have both advantages and disadvantages. Start-ups need capital and customer base.

Respondent Π: "At the end of the day start-ups are looking for two things: One is capital, two is customer."

Respondent Φ: "Main difference for a Fintech start-up, it is very hard to go to market without partnering with a bank or insurance company. The only way to success is collaboration."

On the other hand, customer base is one of the biggest advantage on the large organizations' side. Eventually, banks are entitled to keep the deposits and they are controlling the financial markets all around the world. No matter how faulty their technology is, incumbent organizations are controlling the assets.

Respondent α:" But you don't have a scale advantage or access to clients' assets advantage. Banks have that regardless of how creepy their technology is. Most of what start-ups are doing is saying dramatically lowering cost of the service for the customer whatever service they are working on which means that they need even more scale than the bank even to be more profitable."

Even though incumbents faced a reduction in consumer trust with global financial crises in 2008, relationships with their customers rely on many years and it is not easy to change habits. Most of the Fintechs except technology giants are small companies when they are compared to incumbent organizations and it is quite challenging for them to overcome trust factor in the eye of end user.

Respondent λ: "They have the advantage of building the relationship for many years. That is very difficult for smaller companies to overcome."

In the eyes of banking institutions, some start-ups are not well equipped and they think they can turn this on their favour.

Respondent Π: "Start-ups are not very well equipped to handle everything on their own. The question is can we help start-ups to help banks."

4.4. Opportunities and Threats in Fintech Space

Strategies of Fintechs

Respondents agree that that there are three main strategies of Fintechs. Firstly, some of them fill the gaps in niche segments which banks are reluctant to. According to Respondent *Ω*, services of M-Pesa in Africa exemplifies well this model. Opening branches and giving financial services in many countries are far from being profitable for traditional baking institutions. In this respect, mobile payment services of M-Pesa, which is a subsidiary of British telecom company Vodafone, reach to millions of underbanked customers in Africa. Secondly, some Fintechs offer financial services overlapping with the services of incumbent organizations. For instance, challenger banks such as Atom Bank are direct competitors to traditional banking institutions and they are giving these services in a more cost effective way. One respondent from UK, Respondent *γ*, referred to the latest marketing campaign of Transferwise which claims that they are transferring money faster and cheaper than banks and advices customers not to use banks for money transfers and remittances. Lastly, some Fintechs are not working with end users and they are giving services only for financial institutions. Most of them are enhancing technology capabilities

of traditional organizations by implementing new solutions such as big data analyses with advanced algorithms and artificial intelligence. Respondent γ referred to the services of Duco, a British firm leveraging artificial intelligence and advanced algorithms to manage big data. He also added that most of the banking institutions are still dealing with thousands of Excel sheets and doing manual work to manage customer data.

One participant from a large bank, Respondent *ψ*, noted that Fintechs which are competing with banks are focusing on the most profitable services delivered by banking institutions. He added that banks offer around 500-600 services and very few of them such as payments and lending are attracting new entrants. He also claimed that due to the strong competition in the market, some banks might lose revenues up to 50% of total in the short run if they won't adopt to new channels such as digital and mobile banking. He highlighted the number of people fired from large institutions and number of closed branches. He stated that this situation is inevitable. An interviewee from a British start-up, Respondent *ε*, declared that there was a 6% decline in branch transactions in UK in 2014. She added that these banks are closing their branches to invest more in human resources with Information and Communication Technology (ICT) capabilities, financial technologies and digital channels.

According to a participant from Singapore who has a profound experience in credit and risk management, Respondent *δ*, Fintechs such as Avant and Square Capital offer better methods especially in lending and KYC (Know Your Customer) process. He noted that money multiplier effect of banks through loan creation is one of the core mechanisms in financial sector and it is under the threat of Fintechs. He referred to the Square Capital's and PayPal's SME lending programmes. He noted that these programs should be distinguished from peer-to-peer marketplace lenders such as Lending Club since marketplace lenders are not balance sheet lenders. He said that these companies have major impact on KYC process, compliance and anti-money laundering.

Contribution of Fintechs to Incumbents

Fintechs contribute to the incumbents in many ways as including technology, regulatory and entrepreneurial aspects as well as contributing to the market.

Respondent Σ: "Fintech has created based on many disruptive forces in the financial industry in many ways from cost reduction, process development, development of new business models and development of new value propositions. It is a very dynamic way for creating new technological breakthroughs within the financial industry meaning that in the process of delivering financial services, companies are trying to find things to do them in a very cost effective, smart, fast and in other ways approachable for the customer. They bring value, they bring new ways of developments and services for the customer."

As mentioned above, incumbents are struggling in development. In this regard, reaching innovations outside of their boundaries is one of the primary reasons to collaborate with

Fintechs. Respondent *Π* who is responsible from accelerator in a large bank openly declared that they are working with start-ups to solve their business solutions with respect to latest technologies. Many of the respondents made similar comments.

Respondent γ: "Banks never manufactured computers themselves. Banks rarely wrote software. They bought this technology from third party providers, outside. Ever since mid-50s when first computers appeared in banks."

Respondent α: "If you are a start-up, you have no legacy costs, no legacy ways to think about things. You can build things very quickly. You can change things very quickly. You have two major advantages over banks: One is technology."

Respondent β: "When it comes to bringing some intelligence to the data, for example for new services or new offerings, they (banks) are pretty slow and pretty retarded."

Another thing to keep in mind is technology offered by Fintechs are valuable if they solve a problem.

Respondent Ω: "One of the banker said that we do not invest in technology, we invest in solutions. This stack with me. Because at the end of the day, your average customer doesn't care how great your technology looks behind the scenes, they want to know if it works, is it secure, and does it work better what I'm using currently."

Acquisition is one of the main strategies for incumbents to work with Fintechs. According to Respondent *θ*, when a banking institution acquires a Fintech start-up, it can contribute to bank's vision, innovation culture, speed and technology. Most acquired start-ups continue their daily operations as before since working as a separate organization is much more efficient when it comes to agility and regulations.

Respondent Π: "We are not forthcoming with an acquisition point of view because managing innovation in large organizations is very difficult. Innovations are very well managed when they are left to innovators. Innovators need that sort of freedom and free minded thinking. Large organizations might not be able to give this."

Respondent *ε* who is working at a start-up added that acquiring or collaborating with a Fintech contributes to innovation culture. Moreover, it contributes to the reputation and trust of the large institutions in the eye of their customers. They may think that large institution is giving importance to its customers by investing in new technologies and business models which will make their lives easier.

Respondent ε: "Mentoring start-ups means on their side to bring innovation culture inside their organization because these employees see the start-up environment. How these start-up companies are working and what their culture is. They take this culture into their organization and maybe try to change in terms of their innovation culture. So it creates developments and solutions in the end to the customers. Any way to interact with Fintechs shows customers that their banks are carrying about them and they want to understand their better and innovative solutions. It makes their customers happy as well. There is a

positive effect on their reputation as I mentioned. It shows customers their bank is innovative and they are keeping up with the changes in the industry."

A product manager from a start-up, Respondent θ, noted that services such as Apple Pay and Uber are bringing additional value to the markets for facilitation of the payments. For instance, when a customer use Uber's service, he/she makes no additional effort for payment process after receiving transportation service. In addition, respondent added that the cost of cash is quite high for governments and financial institutions. It requires printing, securing and delivering process which increase the cost of the money. Moreover, the more digital payments are made, the more payments are recorded in the system and it is beneficial for the government. In this sense, Fintechs contributing digital economy and facilitating the transactions also grow the market for all financial actors. This creates a win-and-win situation. He exemplified this with Square. The company delivers POS device for "Small and medium-sized enterprises" (SMEs) mostly who don't have an agreement with banks for POS devices. Their service increase the number of credit card payments instead of cash and eventually customers use the credit cards of the banks. Therefore, even Square which is competing with banks in delivering POS services, they contribute the revenues of banks and record of payments.

In addition, it is mentioned above that start-ups are subject to less regulations and they have an advantage in this sense. Many incumbents work with start-ups because of this reason. It facilitates their innovation process. Respondents θ and λ who are from start-ups openly declared that one of the main reasons why incumbents work with them is their regulatory advantages. In addition, Respondent Π from a large bank in India also stated that they are building alliances with start-ups due to their flexibilities in regulations.

Contribution of Incumbents to Fintechs

On Fintech's side, most of the Fintechs require capital and customer base. In this sense, support of a well-known large institution will benefit them for accessing a large customer base and it will lead to an increase in their reputations in the eye of customers and investors.

Respondent θ: "Also bank can contribute to the Fintech. At the background, bank possess a financial power, customer database and reputation."

Large institutions can contribute to Fintechs in many ways including accelerators incubators. These enable them to understand real necessities and cultures in large organizations to developing better solutions and prove their capabilities. These programs offer many benefits for Fintechs.

Respondent ε: "We were in the program for three months. We had partners of the program like MasterCard, PwC and Amazon. That kind of companies were supporting the program. During the program, we had office space with different start-ups from different segments. We had mentors coming from these organizations. They were coming and we were having

meetings with them. They were solving our business problems. They were also gatekeepers who are letting us to enter their organizations. If the partner like the solution of any company, they can just meet and start to collaborate. It means more business opportunities for both sides. So it was really a good opportunity and you have more kind of exposure. The program itself has a very high reputation. It was a really great program in terms of support."

Revisiting Business Models

Most of the interviewees from incumbent organizations, Fintechs and academia agree on the fact that traditional institutions should revisit their business models and deliberate on their new roles in the financial sector.

Respondent δ: "Second option is banks say OK we will collaborate. Then, they have to define clear boundaries in terms of what role a bank will play."

This brings that they may quit some fields that they are currently struggling. It is mentioned that banks are subject to more strict regulations than start-ups and this requires additional time and costs such as paperwork and red tape. An interviewee from India, Respondent λ**,** who has a profound experience in large institutions stated that he has founded a start-up which is benefitting from the regulatory burdens of the banking institutions. While his company is managing loan process in automotive finance market in a digital platform, banks are bound to do paperwork which increases approval time and costs for the customers. Because of the amount of work and strict nature of regulations, most of the traditional institutions are not able to change their business models. In traditional auto financing, process starts mostly with customer's arrival to a dealer who provides also financing. However, there is a strong focus on assisting the customer to select the car and finalizing the sales. They don't pay enough attention to financing although 75-80% of the customers require financing for buying the automotive product. In this sense, innovative platform of the start-up is able to change the whole value chain upside down and make dealership to pay for financial institutions. This situation forces dealers to evaluate financing as priority. Eventually, it is beneficial for traditional organizations, dealers and customers.

Ain interviewee from another start-up**,** Respondent θ**,** also gave a similar example from his company. Regarding current regulations and KYC process, banks are rejecting 75% of virtual POS applications and it takes around 3 weeks for customers to receive the final result. In their current business model, the start-up is able to finalize KYC process in 24 hours and assume all the risk on behalf of the bank. Due to the regulatory burden on the bank, their business model is quite successful and this start-up managed to attract the highest amount of venture capital investment in the market.

Respondent δ declared that real purpose of banks is allocating capital in a minimum risk manner. Afterwards, other functionalities evolved such as value transfers and payments.

Some of these services are linked to the customer interaction and they are challenging incumbent organizations to execute these services. Technology companies who control networks consist of millions of users leverage customer interaction and change the principal relationship between borrowers and lenders. This also leads a change in flow of capital which was previously towards banks. Flow of information is diverted to servers of technology companies instead of servers of banking institutions and this also changed the flow of capital.

Respondent δ: "There is a principal relationship between lender and borrower so and so forth. That is getting challenged with the likes of the large consumer technology companies which have created community of several hundreds of million users. Amazon, Facebook, Googles of the world. And they have far more deeper inside on customers' transaction data than banks do which allows them to provide very sophisticated and superior services. So what does it mean? It essentially means the flow of the capital which was towards banks is not towards banks right now."

In new scenario, keeping the deposits and continuing money multiplier role by creating credits are still banks' core functions. It is clear that these capabilities require banking licenses and most of technology companies don't have an intention to hold banking licenses.

4.5. Regulations

Regulations, Banking as a Service and API Economy

Respondent *Y* who invested in many different technologies so far stated that technology is ready to disrupt the financial markets and it is possible to manage it to go to mainstream. The most important factor for disruption is regulations. According to a respondent from a large banking institution, Respondent *δ*, banks and other incumbent organizations enjoyed an unfair advantage by regulations so far.

Respondent δ: "Now the banking in commerce enjoyed an unfair advantage for so many years. Unfair advantage was called regulatory modes."

However, this situation has been changing with the new laws and regulations such as PSD II. New regulations incite the changes in the markets in order to increase competition between incumbent organizations and Fintechs. This can create a fair competition. All countries which strongly support Fintech development such as UK and Singapore are enacting new laws and regulations. Respondents agree that these regulations force traditional organizations to be more open to third party providers and Fintechs. This will definitely enhance collaboration. In this sense, PSD II forces banks to share customer account information to third parties. For instance, if a customer agrees to share his/her account details with Amazon while purchasing a book, Amazon will be able to receive the amount of money directly from customer account at the bank and there will be no need to

use bank's credit cards (Cortet et al., 2016). By doing so, third parties will be more competitive against banks and banks should deliberate on new business models.

Respondent γ: "PSD II is very important. It will bring significant changes to banking industry. It will bring new value to customers. Customers will be able to choose through which third party do I want to access my account. Many companies from outside banking will try to become third parties."

Respondent Σ: "I think the disruption that the PSD II brings on a European level, this third party access to accounts and the use of different and various APIs to really connect the merchants and banks and this ability to consolidate account information."

Respondents agree that this situation will force banks to transform into open platforms and "Banking as a Service" notion comes into prominence.

Respondent ε: "You know they say banks will be technology companies in future. I totally agree with it. Currently there will be a new payment service directive, PSD II. It forces banks to provide their APIs to third party providers. That means banks will become open platforms. This will help them to understand their customers better and create and develop new products better. Customers as well they can have an account in a bank, but they can choose other providers for different services at the same time. So it will offer customers more choice and control over their finances. It seems like a trend. We will see what will happen in the sector in the coming years."

Respondent *Π* gave Unified Payment Interface (UPI) in India as an example for API economy. He said that his bank is working with 60 different APIs and the system offers seamless payment solutions including Facebook integration in India since 6 months.

A digital banking expert, Respondent *ψ*, claimed that most of the banks will deliver their services from third party providers. For example, while a bank outsourcing its payment services to a start-up, it will outsource a part of its lending system to a marketplace lender. They will establish open platforms which combine all these services and enable their customers to access these services on a single platform. This method has many advantages for all parties. On banks' side, they will be able to collaborate with Fintechs and access their better technology without their direct competition. Secondly, they will offer these different valuable services to their customers on a single platform. He also mentioned that it will increase the quality and value of their services, customer satisfaction, loyalty and trust will also increase. On Fintech's side, they will be able to benefit banks' large customer bases and establish partnerships. This will definitely increase their revenues and make their businesses more sustainable. On customers' side, increased competition and collaboration in the market will definitely provide them better, more efficient and cost effective services. Respondents both from incumbents and Fintechs approve the importance of "Banking as a Service" notion and they also approve that new regulations and developments will force banks to employ this model in near future.

Respondent γ added that smartest banks will establish their own third party providers not to lose their revenue channels to other Fintechs.

Respondent γ: "Smart banks will set up their own party providers."

In addition, he emphasized that banks which are successful in developing third party providers can serve for other banks' customers. For instance, a customer can keep his/her deposit in Bank A while he/she is receiving credit card information from Bank B and money transfer information from Bank C. This will be possible with third party providers, open APIs and new regulations. These different services will be connected with APIs and customer will reach to more cost effective services. Aggregator services can operate subscription or fee per usage based systems in accordance with the agreements they made with intermediaries. These services will also leverage the information in social networks and personal offers will be created for customers according to their likes, intentions and plans. This will definitely create a huge economy based on APIs. In this sense, banks should deliberate on how they can turn customer data into new businesses and revenue channels.

Respondent β: "When it comes to bringing some intelligence to the data, for example for new services or new offerings, they (banks) are pretty slow and pretty retarded."

Respondent Φ: "At the end of the day, banks will struggle with technology."

However, it is a tricky situation since consumers' financial data is sensitive information and its share and usage is strictly regulated.

Respondent β:" That's the key issue because that is also a matter of confidentiality and treatment of the data. The key issue is they are not able to, not allowed to sell customer data like that. I think also it is a good barrier and this is safe to have that at least in a way."

Respondent ψ declared that transformation of banks to open platforms is similar to the transformation of automotive companies a couple decades ago. Formerly, auto plants were producing all the components and parts of a car. However, most of these parts are produced in different suppliers and assembled in the auto plant in 2016. Auto company delivers the final product to the customers who chooses its brand. One respondent from a well-known cutting-edge technology company, Respondent Φ, puts forward that "Banking as a service" is happening at the moment, but this situation will also be changed and most of the technology companies will offer banking services seamlessly and invisibly without platforms in the long run.

Respondent Φ: "This (Banking as a Service) is true, this will happen, but this is a temporary measure. This has already started to happen, but the end state of financial service is going to exist in a way that is called invisible banking."

Respondent Φ: "When u look at WeChat, they are not a bank. You can transfer money, you can look payments. It is invisible."

Respondent Φ: "Tomorrow, Facebook can provide you a specific loan based on your profile."

He also claims that there isn't enough space in the market for all the banks to build their own platforms. He also states that most of the banking platforms will fail in the long run.

Respondent Φ:" All companies are going to start provide financial services at small and large scale."

Will Financial Institutions Transform to Software Companies?

Most of the respondents declare that transforming of banks into software companies is not necessary while a few of them are opposing. Some respondent highlighted the quote of BBVA's CEO saying that BBVA will be a software company in the future. Respondent γ stated that BBVA's CEO is a perfect leader to pinpoint the visible goal in the company's horizon. Respondent δ claimed that every company will be a technology company in near future.

Respondent δ: "I fully endorse of the CEO of BBVA and what he says. And I will go beyond that. Every company will be a technology company in next five years."

Respondent Π:" We need to evolve ourselves as technology companies".

Respondent Σ declared that banks won't turn into software companies, but it is beneficial to emphasize the importance of digital transformation for financial institutions. He mentioned that the aim behind Open Innovation activities of incumbents is not turning into a software company. Respondent Φ stated that incumbents should transform themselves as technology companies, but they won't be able to manage this process successfully.

The debate is also around whether the transformation of incumbent organizations should be in radical way, or in an incremental way. Although some respondents claim that incumbents should change their business models radically, most of the respondents agree on the fact that the change should be in an incremental way.

Respondent γ: "Many people say no, no, no banks have to totally change, otherwise they totally die. But my answer is no, smart, evolutionary, step by step, incremental change is enough. Banks can manage this. This is my personal opinion. Step by step adjustment."

By the way, incumbents are changing their old back-end systems incrementally and it takes time. Respondent μ highlights the importance of incremental change due to existing investments.

Respondent μ: "So it takes alone 5 to 7 years to replace old technology system and bring to the new one and then integrate all the new stuff."

Respondent γ noted that the change is in an evolutionary sense instead of revolutionary sense. In addition, Respondent ψ declared that 10 years ago there were internet divisions of

all companies, but all the finance institutions will transform into technology companies in the near future. In this sense, technology becomes the core of everything.

Another debate is about whether banks will disappear, or not. Respondents agree that banking institutions will remain and there is a certain need for them especially in core functions such as keeping deposits and multiplying money through credit creation.

Respondent β: "Certainly I think that banks need to remain because the core processes and the financial intermediation, giving loans, providing credits, investment processes and all of that need to remain regulated."

Respondent **Φ,** who claims that retail and investment units of banking institutions won't survive against technology, also highlights the importance of future roles of banking institutions. He claims that banks will bridge the gap between governments, Fintechs and customers when it comes to regulation.

A respondent from a large banking institution, Respondent **ψ,** criticized the banks who try to establish their own start-ups. He noted that the results substantially are not beneficial since the mindsets of these start-ups are nearly same with the traditional mindsets of incumbent organizations. A participant from a large bank also supported this view.

Respondent Π: "Innovations are very well managed when they are left to innovators. Innovators need that sort of freedom and free minded thinking. Large organizations might not be able to give this."

He also added that innovation is not core businesses of banks since their priority is managing large assets in financial markets.

One interviewee, who is also investing in Fintech start-ups, Respondent *Y*, added that most of the current investments of traditional organizations are unsuccessful. He emphasized the importance of diversification in investments since predicting the future is not quite possible.

4.6. Risks and Challenges in Fintech Space

Risks in Regulations

There are various issues and challenges regarding regulations in Fintech space. Technology and services change so fast and it is quite hard for legislators to comprehend benefits and possible abuses of these innovations.

Respondent Σ:" I think in general, the regulations always are falling behind."

Respondent *θ* stated that technology and product emerges first and then it creates a market. Afterwards, spread of the use of the product creates a need for new regulations. In legislative sense, approach of different countries differ when it comes to enact laws.

Respondent α mentioned that while some countries such as UK and Singapore try to enact regulations proactively to foster the growth in the economy, others may act slower or choose to observe the needs and abuses for a longer time. Respondent β stated that there is a growing debate around how regulations will monitor the developments in Fintech sector and to what extend incumbent organizations will keep their safe area in the core processes of intermediation. Participants from large banks declare that there is an unfair competition between Fintechs and incumbents in the market. Respondent ψ claimed that some Fintechs delete accounts of some customers who are not profitable for them. He also added that banks will be subject to pay large amount of fees in a similar situation. One respondent from US, Respondent α**,** claimed that they ended a partnership with a famous Fintech company in US since they were doing illegal things. Respondent δ, who has conducted business in the same country, stated that most of the Fintechs which act illegally don't attract attention of the regulators till they reach significant growths. Then, officials start questioning their operations and start charging them. One of the biggest discussion in regulations is about the use, share and ownership of data. Respondents from academia and banking institutions emphasize that it is sensitive information and there should be restrictions. On the other hand, Respondent Φ declared that this is the excuse of large organizations not to develop new services leveraging data since they are not able to develop innovations. He also mentioned that there are many ways to use data without jeopardizing confidentiality similar to the use of data in social networks and other mobile technologies.

Respondent θ declared that many Fintechs don't pay enough attention to regulations like large institutions and he gave the PayPal case in Turkey as an example. In 2012, Turkish banking regulation and supervision agency enacted a law for payment providers, electronic currency suppliers and system providers. It demands these organizations to have servers in the country to be able to operate their services. In return, they can receive licenses. According to the respondent, PayPal lobbied instead of building new servers and the company couldn't acquire the license. Therefore, they had to announce that they will quit from Turkish market.

The United Kingdom's Withdrawal from European Union

The UK's withdrawal from EU is another issue which threatens Fintech development especially in Europe. The surprising result for leaving European Union brings many uncertainties both for the UK and EU regarding Fintech space. According to Respondent Σ, London is venture capital and financial centre of Europe, but this is in danger with the latest referendum. Many companies are thinking to relocate their headquarters to another European city. Operating in a European Union member country gives passporting rights for financial organizations. This enables them to be authorized for operating their services in any other European countries. If the UKWITH can't keep its passporting rights after

Brexit, these companies may move to other European counties to continue their services in EU.

Respondent ε: "However, UK definitely needs to keep its passporting rights after Brexit. This is very crucial. These rights enable financial organizations to access to other EU countries to get additional authorization to operate in these countries."

Respondent *Σ* also stated that Fintech unicorns such as Transferwise are being approached by other countries such as Ireland and Switzerland to move their headquarters to these countries. In this sense, other counties see Brexit as an opportunity to attract companies located in UK and grow in Fintech space. In addition, rights of workers who came to country from other European countries are not clear. They may have to leave the country regarding work permit issues. Respondent *ψ* declared that only the number of Italian white collars working in UK is about 1 million. Brexit may lead to divert the money and talent flow from UK Fintech arena to other destinations. It jeopardizes London's leading position in the field. In EU sense, Respondent *β* declared that Brexit destroyed the trust for Europe's being one single market. Most of the respondents agree on the fact that Brexit may trigger other exits and single market for Europe may be a dream in this situation. There is a huge uncertainty around Brexit. People are in a very waiting mode and even British officials don't know what to do.

Respondent ε: "Actually even the government doesn't know. They don't have a plan yet. We still don't see a clear answer about what to do about Brexit, so definitely the referendum brought an uncertainty."

Respondent Σ: "Maybe Brexit also could disrupt the Fintech business and could affect the regulation, movement of employees. Right now nothing has changed. I would say that we are still in a very waiting mode."

Uncertainty brings political, financial, regulatory and investment risks and hampers the development. In this respect, a successful exit strategy and keeping passporting rights are crucial for the UK.

Digestion Problem

Engagement of incumbent organizations and Fintechs brings many hurdles to overcome. Most of the respondents agree that digesting acquired start-ups is one of the problems of incumbents. In theory, acquisition of a start-up seems to be very beneficial in terms of learning new technologies and business methods for large institution, but it can be also quite challenging. Respondent *γ* declared that HSBC has more than 40.000 IT staff. When HSBC acquires a Fintech start-up, it is impossible to teach their unique methods to the employees who are not even able to communicate with each other.

Respondent γ: "HSBC has 40.000 IT people globally within the bank. How do you make 40.000 learn from a small Fintech company? How do you make them learn from 20 small

Fintech companies? 40.000 people. They don't even know each other. You can't make 40.000 people visit the company. It costs like a billion dollar to make 40.000 to learn. It is bigger than a university."

On the other hand, he also approved that business models of Fintech start-ups can be totally opposite to the traditional business models of large institutions. It may be impossible to integrate their models to the existing models of incumbent organization. In such cases, acquisition of a start-up may serve the purpose for eliminating the threat from the market.

Doubts about Fintechs

Thousands of Fintech start-ups emerged after 2008. However, most of them failed. One respondent highlighted the importance of building a business model around a new technology. He also declared that few of the start-ups are offering real value in Fintech space.

Respondent δ: "It is not just about founding a company and launching a web site. It is about launching a business around it. There are a lot of people who build a web site and say we are a Fintech, but what is the product. What is the business? Is it profitable? When you start checking all these companies, you will be surprised not even 6% of the companies who call themselves Fintech companies qualify those criteria."

On the other hand, many people are sceptical about services of Fintechs in terms of cyber security, data privacy, protection of big data and intellectual property. In addition, failures in Fintech space such as stolen Bitcoins and bankruptcy of Mt. Gox, a bitcoin exchange in Tokyo, and latest scandal in P2P marketplaces stoke the doubts about Fintechs. In this sense, Fintech start-ups should prove themselves to answer these reservations.

Respondent Σ: "I don't know what could be the immediate risk, but the basic risk I see is these business models have to really pay off. We see an enormous growth in Fintech start-ups and that would make sense. On the other hand, they have to prove themselves what they can actually do and what they actually can't offer."

In addition, changes in the economies and markets will definitely affect the growth. For instance, according to a Respondent γ, marketplace lending companies enjoyed low interest rates dictated by central banks and this situation contributed their growth. Many people preferred investing to these channels, but when Federal Reserve (FED) starts a hike cycle, these companies may lose revenues.

Bubble and Overvaluation

While many of the respondents mention that there may be a bubble in Fintech space, most of them agree that there is an overvaluation in Fintech space.

Respondent Σ: "What I am afraid is that maybe all these new start-ups and young companies might be overvalued and as you said there are many that they proclaim a bubble. I think what we need right now is rationalization."

Respondent α: "Valuations for all these start-ups are optimistic, but not more so than ever in history. Valuations of technology start-ups are always optimistic."

Respondent δ: "Global banking industry makes 1 trillion dollars in 2015. Their annual spending on technology 200 billion dollars in 2015. The total amount of money which has flown into Fintech related start-ups across the world is not even 25 billion dollars. That's not even 25% of annual spending on technology. That sets the context in terms of size, so I don't think there is a bubble."

5 DISCUSSION

This chapter includes the discussion of results with respect to research questions and relevant theories in the field.

In order to understand Fintech effect on financial services, there is a need to understand the triggers behind it. In this sense first research question is:

RQ1: *What are the triggers behind Fintech development?*

As *Respondent ε* also mentioned, economic downturn in 2008 led to the loss of consumer trust towards incumbent financial organizations. According to Shiller (2004), risk of losing homes can be devastating for families and this situation happened in last global crises. In this regard, people started questioning financial services offered by the incumbents. Moreover, they started searching for alternative ways. In this sense, post-crises reforms also triggered these changes (Arner et al., 2016; Chishti and Barberis, 2016). This is one of the primary reasons behind the rise of Fintechs.

On the other hand, the explosion in smartphones and mobile technology opened many doors for new financial services in favour of technology companies (Pham and Ho, 2015; Liu et al., 2015; Karnouskos and Vilmos, 2004). Especially in payments field, many entrants emerged in the market (Staykova and Damsgaard, 2015). As mobile applications spread in the market, technology companies started to accumulate huge amount of valuable data and they created successful business models to turn it into revenue streams. As Respondent δ stated, flow of financial information was diverted towards these companies and this helped them to grow their Fintech businesses. The developments in big data analytics triggered this situation (Wamba et al., 2016; Chen et al., 2012; Dobre and Xhafa, 2014). According to Mention et al. (2014), the share of companies with innovation activities are directly proportional to the mobile phone usage in Europe. As Respondent γ also mentioned, technology vendors also benefitted from loss of consumer trust towards incumbents and spread of mobile technology by offering financial solutions directly to the end users. This has never happened before 2008. In addition, as Respondent θ mentioned, cloud technology facilitated to found a start-up and this is one of the reasons why so many Fintech start-ups emerged in recent years.

Lastly, change in demographics and millennials' different point of view for financial services triggered a change in the market. It became a necessity to invest innovations to attract new customer segments. As Respondent ψ stated, millennials have an inclination towards technology companies and incumbents are struggling to build relationships with them. However, as Respondent α also mentioned, millennials haven't accumulated enough assets to force the existing financial system to change totally. In the long run, they will have this power and traditional financial system has to evolve to satisfy their needs.

In order to understand role of Open Innovation in Fintech space, second research question is as follows:

RQ2: *What is the role of Open Innovation in Fintech space?*

There is a question for incumbents whether they should collaborate with Fintechs, or not. It is clear that incumbents don't want to lose their market share to new entrants (Ondrus and Lyytinen, 2011). While technology companies and start-ups emerge with their new technologies and business models which regarded as rivals for incumbents and threaten them for stealing their customers, some of them are also quite beneficial for incumbents to reach innovations and reduce their costs. As Respondent γ also mentioned, incumbents have developed limited technology by themselves since the emergence of software and hardware companies. As Salampasis (2014) also mentioned, financial institutions are bound to innovations developed by ICT companies. Martovoy et al. (2012) also says that knowledge inflow are more prevalent than internal development and knowledge outflow. In this respect, debate about compete or collaborate doesn't make sense as Respondent ε also supports. Collaboration and leveraging Open Innovation is a must for both parties. They are dependent on each other to grow. Moreover, combining different resources and assets including knowledge assets and complementary assets shape companies' competitive advantage as Teece et al. (1997) mentions.

Different stakeholders have to be integrated in complex and dynamic networks instead of a linear chain for successful service innovation (Chae, 2012; Reuver and Bouwman, 2012; Hidalgo and D'Alvano, 2014). There might be a learning gap between the complexity of technology and knowledge of the firm. In this sense, collaboration is a must to fill this learning gap (Steensma, 1996). Organizations can improve their learning processes by improving searching competences and adopting their aspirations to learn what to hope for (Levinthal and March, 1981). On the other hand, the competition between incumbents and Fintechs doesn't take place in a pure way. As Respondents δ and θ declared, it is not quite possible to separate the parts in this competition and it is beneficial for both parties in many aspects. For instance, while a Fintech company is providing an alternative way for Point of Sales (POS) access to merchants, this also increases the number of transactions and credit card usage in the market. It is clear that the change in the markets is inevitable with new business models and customer needs. As Respondent δ also mentioned, it will be painful for traditional institutions if they try to resist this change in a conservative point of view.

As Chesbrough (2010) mentions, fast pace developments in distributing knowledge and new manufacturing methods create a commodity trap for companies. Learning innovations and imitating them became so easy. In this sense, Open Service Innovation is a beneficial way to break this commodity trap for incumbent organizations (Chesbrough, 2010). Companies try to expand their boundaries by employing methods such as venture capital, mergers and acquisitions, co-developments, spin-offs, in-licensing, out-licensing and participation of employees in partners (Chesbrough et al., 2006). They can enhance their

innovation process by Outside-in, Inside-out and Coupled processes (Gassmann and Enkel, 2004).

Incumbents employ Open Innovation to reach new technologies, reduce their development and process costs and attract new customers by enhancing value of their products and services. As Respondent *Π* supported, incumbents use Open Innovation methods to reach their strategic goals. These methods are acquisition of Fintechs, establishing venture funds for investing in Fintechs and building partnerships and creating accelerator programs to find companies and engage with them. As Respondent *Φ* mentioned, acquisitions often take place if the product of Fintechs can be easily applied to incumbents' existing business models. Fast moving markets and global competition stoke the need for ownership of new technologies and assets (Teece, 2007). As Respondent *α* declared, incumbents prefer acquisitions instead of doing in-house as the markets and technologies rapidly change. Even the largest banks prefer acquiring innovations from outside since it reduces the costs significantly when it is compared to building R&D teams and developing new technologies (Martovoy et al., 2012). On the other hand, if the innovation is more about new business models instead of products, incumbents prefer investing to Fintechs to expand their revenue channels. As Respondent *ε* brought up, there is no specific solution. Each case should be regarded as differently. The strategy can differ to the goals and growth of the organization. In addition, motivation is also important as *Respondent η* mentioned. In this sense, West and Gallagher (2006) states that organizations need motivation as well as maximization and incorporation for maintaining their absorptive capacities.

Many incumbents prefer alliances and partnerships to avoid possible risks of acquisitions. As Respondent *η* and Respondent *Π* also support, alliances and partnerships have special importance in Fintech space. Respondent *Π* stated that alliances is one of the success pillars of their bank in India as well as technology and customer relationship. Another surprising activity in incumbent organizations for fostering in-house innovation development and entrepreneurship is supporting start-ups which are founded by their employees. Even the most conservative banks such as Erste Bank in Austria are giving financial support to these companies and expand their businesses. In this sense, organizational learning theory emphasizes that acquisition of innovative abilities is impossible and organizations should build them by themselves (Teece, 2007). In the light of organizational learning theory, these companies are doing the right thing.

Respondent *Π* referred to an important point and stated that Fintechs should build successful business models around their new technologies. As Respondent *Ω* also mentions, customers and incumbents are giving importance to solutions instead of the technology itself.

In order to understand the advantages and disadvantages of Fintechs and incumbent organizations, third research question is as follows:

RQ3: *What are the advantages and disadvantages of Fintechs and incumbents?*

Respondent α stated that primary advantages of incumbent organizations are their assets and customer bases. As Respondent δ mentioned, they enjoyed the monopoly for controlling the financial markets and intermediation activities with the support of laws and legislations for a long time. By doing so, they have built relationships with millions of people and accumulated enormous assets.

When it comes to their disadvantages, traditional organizations are slow and inflexible since they have huge technology and legislation burdens. In technology sense, they have invested heavily to old back-end systems as Respondent δ also supports. According to Teece (2007), prior investments for existing systems mostly deter to invest for new innovations. In this regard, their prior investments hamper their dynamic capabilities. Levinthal and March (1993) puts forward that abundant resources can be beneficial in the short run, but they can jeopardize continuous innovation in the long run. In this sense, Citi Bank's operations in Germany is a good example. The company had to quit German market due to its slow reaction to innovations and poor performance although it was the largest bank in the world (Fasnacht, 2009).

Regulatory burden on the traditional organizations distinguish them from Fintechs in the competition. As Respondent ψ declared, they are subject to more regulations than most of the Fintech are subject to in financial services and this increases their processes and makes them inflexible for radical innovations. Changing a little detail in their business model leads them to be questioned by the officials and the can be charged for enormous fees. In addition, they do more paperwork and the processes take more time than Fintechs. As Respondent θ also mentioned, Fintechs can finish a project while banks just started it.

Because of the reasons mentioned above, it can be quite challenging for traditional organizations to increase their R&D capabilities without Open Innovation methods and collaboration. It is also compelling for them to compete with Fintechs when it comes to technology. Chesbrough (2010) emphasizes that one of the most important roadblocks for incumbents to overcome is business model inertia. Their organizational structure and mindsets of managers and investors cause this inertia. Incumbents should firstly eliminate this inertia to embrace the change and adopt their organizations to the new environment. As Respondent Y also mentions, innovation and change are more about people and processes than the technology itself. It is quite challenging to change people and their mindsets rather than replacing old back-end systems. Because of this reason, it takes a lot of effort and time. However, some respondents from cutting-edge technology companies such as Respondent Φ claim that incumbent organizations will fail in this transformation due to the ways they are executing their businesses and the old mindsets of people.

As Respondent Σ emphasizes, change is only possible by understanding and embracing innovations. In this regard, there are lots of responsibilities on the shoulders of managers. They have to align internal factors to market conditions and they should embrace a customer-centric approach. These changes require strong leadership skills (Neu and

Brown, 2008). Managerial awareness and managerial role understanding are crucial in this transition (Gebauer and Friedli, 2005).

It is mentioned above that new generation has an inclination for technology companies. As Respondent δ mentioned, incumbents are struggling to attract people with high qualifications. Most of them prefer to work for well-known technology companies. It seems that the era which management consulting companies were the most attracting organizations for new graduates has ended. According to Nonaka (1994), individual mindsets and skills are crucial to establish an organizational knowledge creation.
Some people such as *Respondent* Φ put forward that incumbents are doing a huge mistake by trying to limit the innovation. He stated that banking organizations are trying to use a groundbreaking technology such as blockchain to reduce their costs instead of changing their services in a revolutionary way. Largest financial institutions founded R3 Consortium to search for opportunities in blockchain technology. In this regard, Respondent ψ quoted from Henry Ford and said that banks are trying to develop faster horses although they have the ability to develop cars. At this point, Teece (2007) emphasizes that new problems require new perspectives to solve them. Incumbent organizations have an inclination for trying to solve new problems with old mindsets. Managers in incumbents may not to fully understand the problems and emerging business opportunities in the market. On the other hand, these managers still have to build dynamic capabilities despite the legacies in their organizations.

There is a debate about revolutionary financial concepts such as blockchain. While some respondents such as Respondent Φ are declaring that incumbents can't prevent the changes in spite of their huge resources and lobbing power, some interviewees such as Respondent θ claim that establishment will control the markets forever and they can buy any competitors which threaten their existing system. R3 Consortium shows that incumbents are collaborating and they can speak one voice against the technologies which threaten their intermediary positions in the market. In addition, their total assets have the power to buy and eliminate any competitor in the market. However, it is not quite easy to control customer behaviour and preferences. It seems that the establishment will try to control and benefit from any emerged technology.

When it comes to the Fintechs, they possess many advantages including technology and flexibility (Douglas, 2016). As Respondent α declares, their advanced technologies and lack of regulatory burdens are the main advantages. These offer flexible structures as Respondent ψ stated. They can act without the burdens of prior investments, old back-end systems and restrictions of regulations. Moreover, the can benefit from the grey areas in regulations. In addition, their mindset facilitates understanding and developing innovations. These attract people with high skills, investments and incite traditional organizations to work with them. Moreover, they have strong customer trust and they can easily integrate their financial solutions to the other technology services such as social media. When people get used to send remittances to each other while just talking in social

networks, it will be really challenging for banks to convince them to visit their websites or use mobile applications with their poor user experience and interfaces.
On the other hand, Fintechs' requirement for capital and customer base are their most significant disadvantages. Teece (2007) advocates that small enterprises are mostly vulnerable to failure while incumbents have more resources to survive. Customers have built their relationships with incumbents so far and this enabled incumbents to accumulate huge assets as Respondent α also mentioned. It is not easy to break habits of people as Respondent λ stated. On the other hand, people keep their deposits at banks. This is not the purpose of the Fintechs. Most of them don't want to acquire a banking license and don't want to be subject to the same regulations with incumbents. In this respect, they are bound to work with incumbents instead of a pure competition. In addition, they need financial support of incumbents to grow their businesses and maintain sustainability as Respondent Φ mentioned.

In order to understand the opportunities and threats in Fintech space, fourth research question is as follows:

RQ4*: What are the opportunities and threats in Fintech space?*

There is a need to understand the business strategies of Fintechs when it comes to understand the opportunities in the market. As Respondents Ω and γ mentioned, Fintechs have three different strategies involving operating in niche segments, directly competing with incumbents and working with incumbents to enhance their capabilities without competition. In the second strategy which they are in direct competition, their models are powerful in terms of using cutting-edge technologies and cost reduction as Respondent ψ mentioned. They are threatening the most profitable business segments of incumbents and it is quite challenging for incumbents to cope with them. Number of people discharged from incumbents are huge and financial markets have already started to witness the effects of competition as Respondent ψ also mentioned. In this sense, Teece (2007) manifests that new players threatens revenue channels of incumbents. In addition, the relationships between companies, governments, suppliers and customers shape the opportunities in the market.

Fintechs and incumbents contribute to each other for creation of new opportunities in the market. As Respondent Σ mentioned, Fintechs contribute to incumbents in many ways in terms of development of new technologies, cost reduction, process development, new business models and new value propositions. As many of the respondents agree on the fact that they are far more successful than incumbents to create new technologies such as new ways to analyse big data, advanced algorithms and leveraging social networks. As Respondent Π brought up, incumbents benefitting from Fintechs to solve their technology problems is one of the success pillars of incumbents. However, it is crucial to build a business plan around a new technology and offer a solution to an existing problem as Respondent Ω emphasized. On the other hand, when an incumbent acquires or collaborates

with a start-up, contribution of Fintech for enhancing the vision and mindset is beneficial as Respondent θ has already mentioned.

Mindset and innovation culture of Fintechs are pretty different than incumbents. Respondent ψ stated that technology companies bought or created by incumbents are likely to fail for creating a new mindset. In this sense, it is important to give freedom to Fintechs to maintain their innovation culture and enhance the opportunities in market even if they are acquired by a large organization as Respondent Π already mentioned.

On the other hand, Fintechs contribute to creation of new opportunities for incumbents even if they are directly threatening them. As Respondent θ also mentioned, while a payments facilitator is threatening the banks in terms of the number of people who use credit cards, it increases the number of transactions in the market at the same time. This is beneficial for incumbents as well as the merchants. In addition, Fintechs offer less regulatory burden and red tape to incumbents with their lean and flexible organizations. This definitely facilitates the development cycles for incumbents.

Incumbents also contribute to Fintech development and creation of new opportunities in the markets in many ways. Capital and customer base are the main contributions of incumbents for Fintechs to grow and expand their innovations. In addition, their accelerator programs are helpful to Fintechs in many ways as Respondent ε mentioned. They open the door for Fintechs to reach investments, customer base, expand their network and understand problems of traditional organizations.

While collaboration between Fintechs and incumbents are triggering new services, it entails a requirement for incumbents to revisit their business models and boundaries. As Respondents λ and θ mentioned, Fintechs can speed up processes of incumbents which have legislation and technology burdens. Fintechs can execute some services in shorter periods with higher efficiencies. This can enable incumbents to reach more customers. On the other hand, participants such as Respondent Π from incumbents declare that they are ready to work with Fintechs and help them grow their businesses through partnerships and investments. Incumbents are reluctant to quit from operations no matter how inefficient they are. In this sense, dynamic capabilities theory manifests that organizations should find the balance for benefitting innovations without cannibalizing their own products (Teece, 2007).

As Respondent Y stated, it is dependent on regulations for a new technology to become mainstream. Regulations can restrict the possible benefits of an innovation as well as it triggers its spread. It is important to mention PSD II at this point. New regulations enacted by European Union foster Fintech development especially for payment services (Cortet et al., 2016). As participants such as Respondent ψ already mentioned, "Banking as a Service" paradigm becomes more of an issue with respect to open APIs, third party involvement and share of financial data. According to Teece (2007), customers demand the integration of products, services and networks and there is a requirement for platforms in

cumulative industries. In the light of dynamic capabilities approach, "Banking as a Service" paradigm will be beneficial for all the stakeholders in financial services.

PSD II enables customers to select the third parties for different financial services and forces banks to open their bases with permission of customers. This will incite the competition in the market and it can create a revolution similar to one which made by iTunes in music industry. In this sense," Banking as a Service" is really important for value creation (Chesbrough, 2010). This is possible with open APIs. According to service based model, open APIs are the backbones of the system and service portal aggregates different services with them (Donnelly, 2016; Cortet et al., 2016). On customers' side, they can access to various services developed by different suppliers. On developer's side, they can access and contribute to services on a single platform (Ballon et al., 2008). As Respondent ψ mentioned, this is similar to the change in automobile industry. Banks should change their boundaries and revisit their roles in financial markets. Actually, a similar model is being used since early 2000s. Open architecture model enables financial institutions to aggregate different products and offer them to the customers at a single source. Initially, incumbents started to employ this method in fund distribution (Fasnacht, 2009). However, "Banking as a Service" is more profound than Open Architecture with respect to employing new technologies and the regulatory support behind it. It is clear that this paradigm will shape financial markets and create myriad opportunities. As Respondent Π declared, similar services are being introduced also outside of Europe and it is currently changing the markets.

On the other hand, Respondent Φ mentioned another point which is interesting as "Banking as a Service". He claims that most of the technology companies will provide invisible and seamless financial services in the future. This means that it won't be necessary to use any banking application for service executions. Any application can be linked to banking accounts and financial service providers and customers can carry out these transactions while chatting with their friends, playing a game or posting their hashtags. This is also revolutionary and it can change whole the market in relation to the millennials and their new consumer habits.

There is a debate whether financial organizations are turning to software companies, or not. BBVA CEO's comment also incited this debate (Capgemini, 2015). Most of the respondents agree that he mentioned a good point, but turning into a software company is exaggerated. It seems true since the goal of financial organizations is performing intermediation activities as Respondent Σ stated. Developing software or cutting edge technologies isn't their priority. It is true that they should invest more on technology as Respondent Π emphasized. Liu et al. (2011) also highlights the importance of digital transformation.

Another question is the transformation of incumbents should be incremental or radical. Many of the participants as Respondent γ stated that incremental steps are enough and it is the most reasonable thing to do with respect to existing investments and organizational

structures. Moreover, many incumbents have already started to replace their old back-end systems and invest in new technologies. On the other hand, there are also some opposing comments especially from respondents who work at cutting-edge technology companies.

In order to understand the risks and challenges in Fintech space, fifth research question is as follows:

RQ5: *What are the risks and challenges in Fintech space?*

While acquisition of assets and new technologies seem as a solution for incumbents to enhance their in-house developments, acquisitions may bring many hurdles as Respondent γ emphasizes. Spread of knowledge can be a huge problem and these organizations may face a digestion problem. It is an important issue and especially managers should deliberate on it. It requires also an ability to enhance organizational learning and dynamic capabilities of the organization.

Technologies such as cloud platforms facilitated entrepreneurs to build their organizations and there is an explosion in the number of companies in Fintech space (Armbrust et al., 2009; Cai et al., 2009). However, they should give importance to business models in addition to new technologies as Respondent δ mentioned. Technology alone isn't sufficient to solve business problems. In addition, Respondent *Y* declared that innovation is more related with people and processes especially in service industry. Teece (2007) manifests that building a business model around an innovation involves various difficulties which are specific to the market. It requires defining organizational boundaries and leveraging economies of scale.

Fintechs attracted huge amount of investments from incumbents so far. However, some scandals and bankruptcies cast shadow to the field. In addition, happenings in economies such as decision of FED to start a rate hike cycle have the potential to change the balance in the Fintech space. It is time for Fintechs to prove that they deserve the investments and the attention they grabbed in recent years as Respondent Σ also mentioned.

Some respondents say that there might be a bubble in Fintech environment. On the other hand, numbers show that there is a room for new investments as Respondent δ declared. It doesn't mean that there isn't overvaluation. Respondent α mentioned that technology companies always attract too much attention and investments till something bad happens. In a possible failure many companies may face a reduction in their values, but Fintechs still attract investments. Levinthal and March (1993) posits that organizations are impatient and focused on short run activities. However, most of the exploratory experiments fail in the short run and success is dependent on the experience of the organization. Moreover, experimentation in the long run gives the chance to accumulate knowledge and turn innovations into success.

Regulations deeply shape Fintech space (Liu et al., 2015; Ondrus and Lyytinen, 2011; Dahlberg et al., 2008). While proactive governments enact laws and regulations to trigger Fintech development, ambiguities and unsuccessful regulations can also hamper the

environment. Regulations substantially fall behind as Respondent Σ declares. Therefore, there are many grey areas in regulations regarding latest developments. While Fintechs can benefit from grey areas, this also hampers fair competition and healthy growth in the market. Teece (2007) posits that dynamic capabilities can be limited by rules and regulations.

Political uncertainties jeopardize the developments in Fintech space. One of the biggest political uncertainties is Brexit in 2016. It jeopardizes London's Fintech leadership in Europe and brings many uncertainties regarding relocation of headquarters and complicated human resources issues. It is crucial for financial institutions to keep their passport rights to govern their operations in Europe. Otherwise, they may consider to move their headquarters to another country. Moreover, there isn't a plan and exit strategy. This situation incites the doubts and pessimism in Fintech space.

Table 12. Summary of discussion

Research Questions	Results	Relevant Literature
RQ1: What are the triggers behind Fintech development?	Global economic crises in 2008	Shiller (2004), Mention et al. (2014), Arner et al. (2016), Chishti and Barberis (2016), Armbrust et al. (2009), Cai et al. (2009)
	Developments in technology after 2008	
	Changes in business model of technology companies	
	Changes in demographics	
RQ2: What is the role of Open Innovation in Fintech space?	Collaboration is a must.	Salampasis (2014), Martovoy et al. (2012), Teece et al. (1997), Levinthal & March (1982) , Steensma (1996), Chesbrough et al.(2006), Chae (2012) Reuver & Bouwman (2012) Hidalgo & Dalvano (2014), Gassmann and Enkel (2004), Teece (2007), West and Gallagher (2006), Ondrus & Lyytinen (2011)
	Outsourcing becomes more important for incumbents	
	Importance of alliances	
	Importance of timing	
	Incumbents should redefine their boundaries.	
	New Regulations, API economy and Banking as a Service Model enhances Open Innovation in financial	
RQ3: What are the advantages and disadvantages of Fintechs and incumbents?	Capital and customer base are main advantages of incumbents.	Levinthal & March (1993), Fasnacht (2009), Chesbrough (2010), Douglas (2016), Neu & Brown (2008), Gebauer & Friedli (2005), Nonaka (1994), Teece (2007)
	Inflexibility, regulations, old technology, cultural gap are disadvantages of incumbents.	
	Techonology, flexibilty and low regulatory burdens are advantages of Fintechs.	
	Lack of capital and customer base are disadvantages of Fintechs.	
RQ4: What are the opportunities and threats in Fintech space?	Fintechs contribute to market and incumbents.	Teece (2007), Cortet et al. (2016), Chesbrough (2010), Donnelly (2016), Liu et al. (2011, Ballon et al. (2008), Fasnacht (2009)
	Incumbents can contribute to Fintechs.	
	If incumbents ignore collaboration, they may lose their customer base.	
	Incumbents should embrace technology and change their traditional mindset.	
	New regulations, especially PSD II in Europe and Banking as a Service Model	
	Disruptions in Fintech space will continue with new models.	
RQ5: What are the risks and challenges in Fintech space?	Regulations	Teece (2007), Levinthal & March (1993), Liu et al. (2015), Ondrus & Lyytinen (2011), Dahlberg et al. (2008),Armbrust et al. (2009), Cai et al. (2009)
	Brexit	
	Digestion problem	
	Doubts about Fintechs	
	Overvaluation of Fintechs	

6 CONCLUSIONS

This chapter provides answers for research questions and summary of the findings. It also involves theoretical contribution, managerial implications and limitations of the research and further research implications.

6.1. General Conclusions

This research provides beneficial information to understand Fintech space from an Open Innovation perspective. The findings can be valuable for many people with different backgrounds.

It shows that main triggers behind Fintech development are global financial crises in 2008, advancements in technology after 2008, especially mobile technology, the decrease in customer trust for incumbents and post-crises regulations. These findings show that Fintech notion will continue to attract customers' and investors' attention and it will continue to grow.

Findings also show that collaboration with Fintechs and adoption to new environment is a must for incumbents. If they ignore Fintech fact, they may lose their customer base and revenues. On the other hand, Fintechs are also bound to incumbents in many ways including capital and customer base.

Incumbents and Fintechs possess different advantages and disadvantages. While capabilities to develop new technologies and flexibility with less burdens are the main advantages of Fintechs, they require customer base and more capital. On the other hand, incumbent organizations which possess these resources are struggling with their new technologies and regulatory burdens in addition to their old mindsets.

Collaboration has many benefits for both parties. While Fintechs can increase the efficiency of the markets and quality of financial services with their cutting-edge technologies, incumbents can help them to reach necessary resources. This can be a win-win strategy. On the other hand, many Fintechs threaten traditional businesses in many ways. Incumbent organizations should embrace new mindsets and organizational changes.

There is a debate around whether incumbents should change radically, or incrementally. While most of the respondents agree that incremental change is enough, some of them put forward that incumbents need a radical change. It is clear that traditional organizations should invest technology and new channels more. This entails cultural and organizational changes.

Once parties agree to collaborate, especially incumbents should revisit their business models and organizational boundaries. Acquisition of assets, investing to new business

models, building alliances and partnerships and accelerators are leading ways for employing Open Innovation strategies in Fintech space. Disrupters need freedom to maintain their advantages. In addition, incumbents are struggling in changing their culture and spreading innovations in their organizations. In this sense, building alliances and partnerships may be preferred more instead of direct acquisitions.

Post-crises regulations have profound effect on Fintech development. Developed countries such as the UK, and Singapore are quite active and they enact promising regulations and laws to incite growth in Fintech space. Especially, PSD II regulations in EU which regulate payments services introduce many opportunities. They incite the collaboration between banking institutions and third parties and support the development of "Banking as a Service" model with open APIs. This is promising for Fintech growth and development of new services in favor of customers. Moreover, it is directly related with Open Innovation studies and it deserves further research.

Lastly, Brexit, political and regulatory ambiguities and overvaluation of Fintechs can hamper the developments in Fintech space. Especially, Brexit brings many challenges and it jeopardizes the UK's leading position in Europe.

This research can be regarded as valid and reliable. Firstly, it aggregates valuable information from 15 interviewees who are experts in their fields. According to Guest et al. (2006), number of interviewees to reach "saturation" in a qualitative study is at least 12. Secondly, most of the comments of respondents are conforming each other. This can be used as a triangulation (Bryman and Bell, 2011). Interviewees are selected with respect to a strategy by the researcher. Most of the other data sources are peer-reviewed articles. They are supported by reports of worldwide known consulting companies. These companies have high reputation and highly cited in many researches.

6.2. Theoretical Contributions

There are eminent researchers working in the field of Open Innovation methods' implementation in financial services. Some of them are listed in the "Research Background" chapters. This research contributes to this space by introducing a complementary study which aggregates comparative views both from the eyes of incumbent organizations and Fintechs regarding the triggers behind Fintech development, advantages and disadvantages of both parties, Open Innovation methods and their implementation in Fintech space, possible opportunities, threats and risks in the market.

In addition, this study contributes to the previous researches which emphasize the importance of open architectures in financial services. Chesbrough (2010) highlights the use of platforms in service structures. Fasnacht (2009) follows him by exemplfying the use of open platforms in funding distribution in finance in the early 2000s. These examples tie into the aggregation of different services from different parties at a single platform.

Kousaridas et al. (2008) puts forward the guidelines of Open Financial Services Architecture (OFSA) in mobile financial services and API integration. This thesis contributes to also this field by showing the importance of "Banking as a Service" notion for financial services and Open Innovation studies. This thesis introduces a new perspective to Open Innovation studies in financial services about the facts in Fintech space in an overarching manner by aggregating comparative expert views both from incumbent and Fintech organizations.

6.3. Managerial Contributions

This study provides an overarching understanding about the Fintech market. Readers both from Fintech and incumbent organizations can find it benefical with respect to market issues, collaboration, Open Innovation methods in the field, possible opportunities, threats and risks in the field. It can provide a useful resource for the people who deliberate on how to assess the Fintech issues in the market such as new technologies, emergence of entrants, threatening business models, possible risks, collaboration strategies and Open Innovation methods to benefit from new environment. It can be useful for Fintechs and incumbents to understand each other better. This is crucial for developing new strategies and adopting to the new environment.

6.4. Limitations

There are some limitations which may affect the credibility of the research.

Firstly, this research is based on qualitative methods. There are some discussions regarding reliability and validity of qualitative methods. It can be said that adopting external reliability and external validity is quite difficult for a qualitative research (Bryman and Bell, 2011). In addition, it is not possible to increase internal reliability for this research since there is only one researcher. Some scholars bring up that alternative criteria such as trustworthiness and authenticity are necessary to evaluate the quality of qualitative studies (Bryman and Bell, 2011).

Second limitation may be the scope of research objectives. Wide scope of this research makes it challenging to focus on a single issue and address it in more detail. Most of the interviewees were reluctant to give interviews more than 1 hour. More interviewees might be useful to increase the credibility of the findings. On the other hand, Guest et al. (2006) states that 12 interviews are sufficient regarding the saturation in a qualitative research. The number of interviewees are 15 in this research.

6.5. Future Implications

This research highlights the importance of "Banking as a Service" notion and seamless financial services. New technologies and regulations seem to shape the markets for changes in this way. It is clear that these models enhance collaboration, use of Open Innovation methods and engagement in financial services. There is a clear need to make a research which focuses on "Banking as a Service" and seamless financial services by addressing also regulations from an Open Innovation perspective.

This research can be enhanced with more interviews and this can increase the credibility of the findings. In addition, various quantitative researches can be conducted for the subchapters of this research including Open Innovation strategies, new business models, effects of Fintechs, effect of regulations, cultural change in organizations, PSD II and Banking as a Service, seamless financial services and Open Innovation.

REFERENCES

Alli, G., Baresi, L., Bianchessi, A., Cugola, G., Margara, A., Morzenti, A., Ongini, C., Panigati, E., Rossi, M., Rotondi, S. and Savaresi, S., 2012, October. Green Move: towards next generation sustainable smartphone-based vehicle sharing. In *Sustainable Internet and ICT for Sustainability (SustainIT), 2012* (pp. 1-5). IEEE.

Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R.H., Konwinski, A., Lee, G., Patterson, D.A., Rabkin, A., Stoica, I. and Zaharia, M., 2009. Above the clouds: A berkeley view of cloud computing.

Arnaboldi F. and Claeys P., 2014. Chapter four Banks and patents in the U.S. Innovation in financial services: A dual ambiguity, p.70.

Arner, D.W., Barberis, J.N. and Buckley, R.P., 2016. FinTech, RegTech and the Reconceptualization of Financial Regulation. *Northwestern Journal of International Law & Business, Forthcoming*.

Arora, A., Fosfuri, A. and Gambardella, A., 2001. Markets for technology and their implications for corporate strategy. *Industrial and corporate change*, *10*(2), pp.419-451.

Ballon, P., Walravens, N., Spedalieri, A. and Venezia, C., 2008, October. An advertisement-based platform business model for mobile operators. In *12th International ICIN Conference, Bordeaux, France, 20-23 October*.

Berkovitch, E. and Narayanan, M.P., 1993. Timing of investment and financing decisions in imperfectly competitive financial markets. *Journal of Business*, pp.219-248

Blonigen, B.A. and Taylor, C.T., 2000. R&D intensity and acquisitions in high-technology industries: Evidence from the US electronic and electrical equipment industries. *Journal of Industrial Economics*, pp.47-70.

Bryman, A. and Bell, E., 2011. *Business research methods*. Oxford University Press, USA.

Cai, H., Zhang, K., Wang, M., Li, J., Sun, L. and Mao, X., 2009, September. Customer centric cloud service model and a case study on commerce as a service. In *2009 IEEE international conference on cloud computing* (pp. 57-64). IEEE.

Campenon, B., 2016. Fintech and the future of securities services. *Journal of Securities Operations & Custody, Volume 8, Number 2*

Capachin, J., 2011. Change on the horizon: The impact of cloud computing on treasury and transaction banking. *Journal of Payments Strategy & Systems Volume 4 Number 4.*

Cavusgil, E., Seggie, S.H. and Talay, M.B., 2007. Dynamic capabilities view: Foundations and research agenda. *Journal of Marketing Theory and Practice*, *15*(2), pp.159-166.

Chae, B.K., 2012. An evolutionary framework for service innovation: Insights of complexity theory for service science. *International journal of production economics*, *135*(2), pp.813-822.

Chaffee, E.C. and Rapp, G.C., 2012. Regulating Online Peer-to-Peer Lending in the Aftermath of Dodd-Frank: In search of an evolving regulatory regime for an evolving industry. *Wash. & Lee L. Rev.*, *69*, p.485.

Chen, H., Chiang, R.H. and Storey, V.C., 2012. Business Intelligence and Analytics: From Big Data to Big Impact. *MIS quarterly*, *36*(4), pp.1165-1188.

Chesbrough, H., 2003. The logic of open innovation: managing intellectual property. *California Management Review*, *45*(3), pp.33-58

Chesbrough, H.W., 2006. Open innovation: The new imperative for creating and profiting from technology. *Harvard Business Press.*

Chesbrough, H.W., 2006. The era of open innovation. *Managing innovation and change*, *127*(3), pp.34-41

Chesbrough, H., 2010. *Open services innovation: Rethinking your business to grow and compete in a new era*. John Wiley & Sons.

Chesbrough, H., Vanhaverbeke, W. and West, J., 2006. *Open innovation: Researching a new paradigm*. Oxford University Press on Demand.

Chiesa, V. and Toletti, G., 2003. Standard-setting strategies in the multimedia sector. *International Journal of Innovation Management*, *7*(03), pp.281-308.

Chishti, S. and Barberis, J., 2016. The Fintech book: The financial technology handbook for investors, entrepreneurs and visionaries. *John Wiley & Sons*

Chuen, D.L.K. and Teo, E.G., 2015. Emergence of FinTech and the LASIC principles1. *Who will disrupt the disruptors?* p.24

Cortet, M., Rijks, T. and Nijland, S., 2016. PSD2: The digital transformation accelerator for banks. *Journal of Payments Strategy & Systems*, *10*(1), pp.13-27.

Crosby, M., Pattanayak, P., Verma, S. and Kalyanaraman, V., 2016. BlockChain Technology: Beyond Bitcoin. *Applied Innovation*, p.6.
Available at: http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf

Da Silva M., 2014. Chapter three Innovation and financial inclusion: The Brazilian bank experience. *Innovation in financial services: A dual ambiguity*, p. 43.

Dahlberg, T., Mallat, N., Ondrus, J. and Zmijewska, A., 2008. Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications*, *7*(2), pp.165-181.

De Reuver, M. and Bouwman, H., 2012. Governance mechanisms for mobile service innovation in value networks. *Journal of Business Research*, *65*(3), pp.347-354.

De Reuver, M., Verschuur, E., Nikayin, F., Cerpa, N. and Bouwman, H., 2015. Collective action for mobile payment platforms: A case study on collaboration issues between banks and telecom operators. *Electronic Commerce Research and Applications*, *14*(5), pp.331-344.

De Smet, D.D., Mention, A.L. and Torkkeli, M., 2015. Alliances in the financial services sector-exploring its organisational learning mechanisms. *International Journal of Business Excellence*, *8*(4), pp.458-470.

De Smet, D., Mention, A.L. and Torkkeli, M., 2013. Innovation-related knowledge from customers for new financial services: A conceptual framework. *Journal of Innovation Management*, *1*(2), pp.67-85.

Den Hertog, P., van der Aa, W. and de Jong, M.W., 2010. Capabilities for managing service innovation: towards a conceptual framework. *Journal of Service Management*, *21*(4), pp.490-514.

Dictionary, Oxford English. “Service". (2016).

Dobre, C. and Xhafa, F., 2014. Intelligent services for big data science. *Future Generation Computer Systems*, *37*, pp.267-281.

Donnelly, M., 2016. Payments in the digital market: Evaluating the contribution of Payment Services Directive II. *Computer Law & Security Review*.

Douglas, J.L., 2016. New Wine into Old Bottles: Fintech Meets the Bank Regulatory World. *NC Banking Inst.*, *20*, p.17.

Dy, M., 2016. The Challenges to Cross-Border Financial Regulation in the Post-Financial Crisis Era Conference Report.

Fasnacht, D., 2009. *Open Innovation in the financial services: growing through openness, flexibility and customer integration*. Springer Science & Business Media

Gassmann, O. and Enkel, E., 2004. Towards a theory of open innovation: three core process archetypes.

Gebauer, H. and Friedli, T., 2005. Behavioral implications of the transition process from products to services. *Journal of Business & Industrial Marketing*, *20*(2), pp.70-78.

Germann, F., Lilien, G.L., Fiedler, L. and Kraus, M., 2014. Do retailers benefit from deploying customer analytics?.*Journal of Retailing*, *90*(4), pp.587-593.

Grant, R.M., 1996. Toward a knowledge- based theory of the firm. *Strategic management journal*, *17*(S2), pp.109-122.

Guest, G., Bunce, A. and Johnson, L., 2006. How many interviews are enough? An experiment with data saturation and variability. *Field methods*, *18*(1), pp.59-82.

Hidalgo, A. and D'Alvano, L., 2014. Service innovation: Inward and outward related activities and cooperation mode. *Journal of Business Research*, *67*(5), pp.698-703

Hydle M. K., Aas T. H. and Breunig K. J., 2014. Chapter ten Strategies for financial innovation: Innovation becomes strategy-making. *Innovation in financial services: A dual ambiguity*, p. 239

Huston, L. and Sakkab, N., 2006. Connect and develop. *Harvard business review*, *84*(3), pp.58-66.

Kalmykova, E. and Ryabova, A., 2016, January. FinTech Market Development Perspectives. In *SHS Web of Conferences* (Vol. 28). EDP Sciences.

Kamouskos, S. and Vilmos, A., 2004, October. The European perspective on mobile payments. In *Mobile Future, 2004 and the Symposium on Trends in Communications. SympoTIC'04. Joint IST Workshop on* (pp. 195-198). IEEE.

Kemp, R., 2014. Legal aspects of managing Big Data. *Computer Law & Security Review*, *30*(5), pp.482-491.

Kim, K.H., Hwang, M.S., Jae, E.Y., Jun, S.H. and Kwon, M.C., 2016. A Study on Message Queue Safe Proper Time for Open API Fast Identity Online Fintech Architecture. *International Journal of Software Engineering and Its Applications*, *10*(5), pp.33-44.

Kim, Y., Park, Y.J., Choi, J. and Yeon, J., 2015. An Empirical Study on the Adoption of "Fintech" Service: Focused on Mobile Payment Services.

Kindström, D., Kowalkowski, C. and Sandberg, E., 2013. Enabling service innovation: A dynamic capabilities approach. *Journal of business research*, *66*(8), pp.1063-1073.

Kogut, B., 1989. The stability of joint ventures: Reciprocity and competitive rivalry. *The Journal of Industrial Economics*, pp.183-198.

Kotarba, M., 2016. New factors inducing changes in the retail banking customer relationship management (CRM) and their exploration by the Fintech industry. *Foundations of Management*, *8*(1), pp.69-78.

Kousaridas, A., Parissis, G. and Apostolopoulos, T., 2008. An open financial services architecture based on the use of intelligent mobile devices. *Electronic Commerce Research and Applications*, *7*(2), pp.232-246.

Kropotkin, P.A., 1922. Mutual Aid: A Factor of Evolution. Knopf.

Kutvonen A., 2016. Open Innovation Lecture.

Lamport, L., Shostak, R. and Pease, M., 1982. The Byzantine generals problem. *ACM Transactions on Programming Languages and Systems (TOPLAS)*, *4*(3), pp.382-401

Laursen, K. and Salter, A., 2004. Searching high and low: what types of firms use universities as a source of innovation?. *Research policy*, *33*(8), pp.1201-1215.

Laursen, K. and Salter, A., 2006. Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic management journal*, *27*(2), pp.131-150.

Lee, T.H. and Kim, H.W., 2015. An Exploratory Study on Fintech Industry in Korea: Crowdfunding Case.

Leonard- Barton, D., 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic management journal*, *13*(S1), pp.111-125.

Lee, C.W., Kim, J.W. and Cho, S.H., 2014. A Study of e-Trading System over Mobile Applications. *International Journal of Software Engineering and Its Applications*, *8*(8), pp.55-64.

Levinthal, D. and March, J.G., 1981. A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, *2*(4), pp.307-333.

Levinthal, D.A. and March, J.G., 1993. The myopia of learning. *Strategic management journal*, *14*(S2), pp.95-112

Leiponen, A., 2006. Organization of knowledge exchange: an empirical study of knowledge-intensive business service relationships. *Economics of Innovation and New Technology*, *15*(4-5), pp.443-464.

Liu, D.Y., Chen, S.W. and Chou, T.C., 2011. Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project. *Management Decision*, *49*(10), pp.1728-1742.

Liu, J., Kauffman, R.J. and Ma, D., 2015. Competition, cooperation, and regulation: Understanding the evolution of the mobile payments technology ecosystem. *Electronic Commerce Research and Applications*, *14*(5), pp.372-391.

Lusch, R.F., Vargo, S.L. and O'Brien, M., 2007. Competing through service: Insights from service-dominant logic. *Journal of retailing*, *83*(1), pp.5-18.

Mainetti, L., Patrono, L. and Vergallo, R., 2012. IDA-Pay: a secure and efficient micro-payment system based on Peer-to-Peer NFC technology for Android mobile devices. *Journal of Communication Software and Systems*, *8*(4), pp.1-6.

March, J.G., 1991. Exploration and exploitation in organizational learning. *Organization science*, *2*(1), pp.71-87.

Martovoy A., 2014. Chapter eleven Advantages and disadvantages of Open Innovation: Evidence from financial services. *Innovation in financial services: A dual ambiguity*, p. 259.

Martovoy, A., Kutvonen, A., Mention, A.L. and Torkkeli, M., 2012, January. Open innovation in banking services: advantages and disadvantages. In *ISPIM Conference Proceedings* (p. 1). The International Society for Professional Innovation Management (ISPIM).

Mell, P. and Grance, T., 2011. The NIST definition of cloud computing

Mention, A.L., Martovoy, A. and Torkkeli, M., 2014. Open innovation in financial services: what are the external drivers? *International Journal of Business Excellence 5*, *7*(4), pp.530-548

Mention, A.L. and Torkkeli, M., 2014. Innovation in financial services: A dual ambiguity. *Cambridge Scholars Publishing*.

Metrick, A. and Yasuda, A., 2010. Venture capital and the finance of innovation. *Venture Capital and the Finance of Innovation, 2nd Edition, Andrew Metrick and Ayako Yasuda, eds., John Wiley and Sons, Inc*.

Moy, R.L. and Terregrossa, R., 2011. Nerds: A case study of the PC industry. *Journal of Business Case Studies (JBCS)*, *5*(6), pp.23-34.

Mina, A., Bascavusoglu-Moreau, E. and Hughes, A., 2014. Open service innovation and the firm's search for external knowledge. *Research Policy*, *43*(5), pp.853-866.

Nakamoto, S., 2008. Bitcoin: A peer-to-peer electronic cash system.

Neu, W.A. and Brown, S.W., 2008. Manufacturers forming successful complex business services: Designing an organization to fit the market. *International Journal of Service Industry Management*, *19*(2), pp.232-251.

Nonaka, I., 1994. A dynamic theory of organizational knowledge creation. *Organization science*, *5*(1), pp.14-37.

Ondrus, J. and Lyytinen, K., 2011, June. Mobile payments market: Towards another clash of the Titans?. In *2011 10th International Conference on Mobile Business* (pp. 166-172). IEEE.

Padmaavathy, P.A. and Adalarasu, B., 2015. The next generation banking: Cyber transformation.

Perks, H., Gruber, T. and Edvardsson, B., 2012. Co- creation in radical service innovation: a systematic analysis of microlevel processes. *Journal of Product Innovation Management*, *29*(6), pp.935-951.

Pham, T.T.T. and Ho, J.C., 2015. The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments. *Technology in Society*, *43*, pp.159-172.

Raina, V.K., Pandey, U.S. and Makkad, M., 2012. A user friendly transaction model of mobile payment with reference to mobile banking in India. *International journal of information Technology*, *18*(2).

Prieger, J.E., 2002. Regulation, innovation, and the introduction of new telecommunications services. *Review of Economics and Statistics*, *84*(4), pp.704-715.

Sabri, T., 2012. An Overview of the Payments Regulatory Landscape in the EU 2001-2011. *Banking and Finance Law Review*, *27*(2), p.315.

Sakakibara, M., 2003. Knowledge sharing in cooperative research and development. *Managerial and Decision Economics*, *24*(2- 3), pp.117-132.

Salampasis, D.G., 2015. Trust-Embedded Open Innovation: Towards a human-centric approach in the financial industry.

Salampasis, D., Mention, A.L. and Torkkeli, M., 2014. Open innovation and collaboration in the financial services sector: exploring the role of trust. *International Journal of Business Innovation and Research*, *8*(5), pp.466-484.

Sivarajah, U., Kamal, M.M., Irani, Z. and Weerakkody, V., 2016. Critical analysis of Big Data challenges and analytical methods. *Journal of Business Research*, *70*, pp.263-286.

Spender, J.C., 1996. Making knowledge the basis of a dynamic theory of the firm. *Strategic management journal*, *17*(S2), pp.45-62.

Teece, D.J., Pisano, G. and Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic management journal*, pp.509-533.

Staykova, K.S. and Damsgaard, J., 2015. The race to dominate the mobile payments platform: Entry and expansion strategies. *Electronic Commerce Research and Applications*, *14*(5), pp.319-330.

Steensma, H.K., 1996. Acquiring technological competencies through inter-organizational collaboration: an organizational learning perspective. *Journal of Engineering and Technology Management*, *12*(4), pp.267-286.

Sundbo, J., 1997. Management of innovation in services. *Service Industries Journal*, *17*(3), pp.432-455.

Teece, D.J., 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, *28*(13), pp.1319-1350.
Torkkeli, M.T., Kock, C.J. and Salmi, P.A., 2009. The "Open Innovation" paradigm: A contingency perspective. *Journal of Industrial Engineering and Management*, *2*(1), pp.176-207.

Vargo, S.L. and Lusch, R.F., 2004. Evolving to a new dominant logic for marketing. *Journal of marketing*, *68*(1), pp.1-17.

Vargo, S.L. and Lusch, R.F., 2008. Service-dominant logic: continuing the evolution. *Journal of the Academy of marketing Science*, *36*(1), pp.1-10.

Vermeulen, P., 2004. Managing product innovation in financial services firms. *European Management Journal*, *22*(1), pp.43-50.

Lusch, R.F. and Vargo, S.L., 2006. Service-dominant logic: reactions, reflections and refinements. *Marketing theory*, *6*(3), pp.281-288.

Wamba, S.F., Gunasekaran, A., Akter, S., Ren, S.J.F., Dubey, R. and Childe, S.J., 2016. Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, *70*, pp.356-365.

West, J., 2006. Does appropriability enable or retard open innovation. *Open Innovation: Researching a New Paradigm*, pp.109-133.

West, J. and Gallagher, S., 2006. Challenges of open innovation: the paradox of firm investment in open- source software. *R&D Management*, *36*(3), pp.319-331.

Yermack, D., 2013. Is Bitcoin a real currency? An economic appraisal (No. w19747). *National Bureau of Economic Research*.

2006. Space Act Agreement Between National Aeronautics and Space Administration and Space Exploration Technologies Corp. For Commercial Orbital Transportation Services Demonstration (COTS). *NASA*. Available at: https://www.nasa.gov/centres/johnson/pdf/189228main_setc_nnj06ta26a.pdf

2010. Open Innovation Projects – NASA challenges through open innovation. *NASA*. Available at: https://www.nasa.gov/centres/johnson/pdf/478350main_2010-davis-nasaOpenGovInnovationArticlePosting.pdf

2013. The Bitcoin Pizza Purchase That's Worth $7 million today. *Forbes*. Available at: http://www.forbes.com/sites/ericmack/2013/12/23/the-bitcoin-pizza-purchase-thats-worth-7-million-today/#7f939efa6449

2014. Banking disrupted – How technology is threatening the traditional European retail banking model? *Deloitte*. http://www2.deloitte.com/content/dam/Deloitte/pt/Documents/financial-services/dttl-fsi-uk-Banking-Disrupted-2014-06.pdf

2014. Digital Disruptor –How Bitcoin is driving digital innovation in entertainment, media and communications (EMC)? PwC. Available at: http://www.pwc.com/us/en/industry/entertainment-media/publications/consumer-intelligence-series/assets/pwc-consumer-intelligence-series-bitcoins-entertainment-media-communications.pdf

2014. Innovation in Space – Powering a new era. *International Space University*. Available at: https://isulibrary.isunet.edu/opac/doc_num.php?explnum_id=655

2014. Private Business Insights. *PwC*. Available at: http://privatebusiness.pwc.co.nz/wp-content/uploads/pwc-private-business-insights-autumn-2014.pdf

2014. The Rise of Fintech. *Accenture,* Available at: http://pfnyc.org/wp-content/uploads/2014/06/NY-FinTech-Report-2014.pdf

2015. Alibaba and Lending Club to Form Financial Partnership. NY Times. Available at: http://dealbook.nytimes.com/2015/02/03/lending-club-to-form-financing-partnership-with-alibaba/?_r=0

2015. Banking shaped by the customer. *Accenture*. Available at: https://www.accenture.com/us-en/~/media/Accenture/Conversion-Assets/Microsites/Documents17/Accenture-2015-North-America-Consumer-Banking-Survey.pdf

2015. How Anti-Kickstarter GoFundMe Became The Crowdfunding King With Causes Not Projects. *Forbes*. Available at: http://www.forbes.com/sites/ryanmac/2015/09/24/gofundme-largest-crowdfunding-platform-1-billion-donations/#4f352b664139

2015. How can FinTechs and Financial Institutions work together? *Chappuis Halder & Co*., Available at: http://www.fintechconnectlive.com/wp-

content/uploads/2015/12/CHCo_FinTechs-connect-with-FinInstitutions_Dec-2015_v0.4.pdf

2015. Honduras to build land title registry using Bitcoin technology. *Reuters*. Available at: http://in.reuters.com/article/usa-honduras-technology-idINKBN0O01V720150515

2015. Klarna powers mobile payments for Overstock.com in U.S. push. *Fortune*. http://fortune.com/2015/09/01/klarna-overstock-payments/

2015. Peer Pressure – How peer-to-peer lending platforms are transforming the consumer lending industry? *PwC*. Available at: https://www.pwc.com/us/en/consumer-finance/publications/assets/peer-to-peer-lending.pdf

2015. Retain and Attract Customers on Social Networks, Social Media Banking. *BBVA*. Available at: http://www.centrodeinnovacionbbva.com/sites/default/files/ebook-cibbva-social-media-banking_eng.pdf

2015. The digital transformation of banks and the digital single market. *European Banking Federation*. Available at: http://www.ebf-fbe.eu/wp-content/uploads/2015/06/EBF-Discussion-paper_Digital-transformation-of-banks-and-the-DSM_June-2015-2.pdf

2015. The Fintech 50: The Complete List. *Forbes*. Available at: http://www.forbes.com/sites/samanthasharf/2015/12/09/the-fintech-50-the-complete-list/2/#6a07952f18be

2015. The Fintech 2.0 Paper: rebooting financial services. *Santander*. Available at: http://santanderinnoventures.com/fintech2/

2015. The Road to Contactless Payments- EMV, Apple Pay and Tokenization. *NCR*. Available at: http://www.ncr.com/wp-content/uploads/15FIN3279A_Contactless_EMV_Apple_Pay_wp.pdf

2015. World of change. *EY*. Available at: http://www.ey.com/Publication/vwLUAssets/EY-The-way-we-bank-now-A-world-of-change/$FILE/EY-and-BBA-The-way-we-bank-now-A-world-of-change.pdf

2016. *Accentur*e. Available at: www.accenture.com

2016. About the remittance prices. *The World Bank*. Available at: https://remittanceprices.worldbank.org/en/about-remittance-prices-worldwide

2016. A new way landscape – Challenger banking annual results. *KPMG*. Available at: https://home.kpmg.com/content/dam/kpmg/pdf/2016/05/challenger-banking-report-2016.PDF

2016. APIs – What do they mean for payments? *Payments UK*. Available at: https://www.bbvaresearch.com/wp-content/uploads/2016/04/DEO_Apr16_Cap1.pdf

2016. Banking is necessary, banks are not; how banks can survive in the digital age. *Capgemini*. Available at: https://www.capgemini-consulting.com/blog/customer-experience/2016/07/banking-is-necessary-banks-are-not-how-banks-can-survive-in-the

2016. *Bloomberg the company & Its Products*. Available at: https://www.bloombergtradebook.com/

2016. Business Innovation Observatory. *European Commission*. Available at: http://ec.europa.eu/growth/industry/innovation/business-innovation-observatory_en

2016. Brexit: What is next? *PwC*. Available at: https://www.pwc.ie/media-centre/assets/publications/2016-pwc-ireland-brexit-fintech-and-digital.pdf

2016. Commission Stuff Working Document - Crowdfunding in the EU Capital Markets Union. *European Commission*. Available at: http://ec.europa.eu/finance/general-policy/docs/crowdfunding/160428-crowdfunding-study_en.pdf

2016. *Cutting through the noise around financial technology. McKinsey & Company*. Available at: http://www.mckinsey.com/industries/financial-services/our-insights/cutting-through-the-noise-around-financial-technology

2016. Fintech and evolving landscape: landing points for the industry. *Accenture*. Available at: http://www.fintechinnovationlablondon.co.uk/pdf/Fintech_Evolving_Landscape_2016.pdf

2016. Finance transformation. *Capgemini*. Available at: https://www.uk.capgemini-consulting.com/finance-transformation

2016. *IBM*. Available at: http://www.ibm.com/us-en/

2016. Pulse of Fintech Webinar. *KPMG*. Available at: https://www.cbinsights.com/research-webinar-fintech-q2-2016

2016. *Safaricom*. Available at: http://www.safaricom.co.ke/

2016. Top 10 Trends in Banking in 2016. *Capgemini*. Available at: https://www.capgemini.com/resource-file access/resource/pdf/banking_top_10_trends_2016.pdf

2016. Sixth Trend Report. *European Commission*. Available at: http://ec.europa.eu/growth/industry/innovation/business-innovation-observatory/trend-reports_en

2016. Square Capital starts offering loans more broadly. *Fortune*. Available at: http://fortune.com/tag/square-capital/

2016. The Pulse of Fintech, 2015 in Review, *KPMG*. Available at: https://home.kpmg.com/content/dam/kpmg/pdf/2016/03/pulse-of-fintech-q1-2016-north-america-report.pdf

2016. Understanding the business relevance of open APIs and open banking for banks. *Euro Banking Association*. Available at: https://www.abe-eba.eu/downloads/knowledge-and-research/EBA_May2016_eAPWG_Understanding_the_business_relevance_of_Open_APIs_and_Open_Banking_for_banks.pdf

2016. UK FinTech, On the cutting edge, An evolution of the international Fintech sector. *UK Treasury*. Available at: https://www.gov.uk/government/publications/uk-fintech-on-the-cutting-edge

2016. World Retail Banking Report. *Capgemini*. Available at: https://www.worldretailbankingreport.com/