CUTTING THROUGH THE NOISE OF FINTECH

HOW BUSINESS MODEL INNOVATION OF FINTECH IN CHINA IS DRIVEN BY BIG DATA

<MASTER THESIS>

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PREFACE

This master thesis started out as a joint work with Xiao Peng (106256). However, it was decided to terminate the contract and write it alone respectively. New supervisor was reached by me to provide related guidance. The topic is the same as the previous, but the research question has been fundamentally revised to fit the length of individual work and avoid the risk of plagiarism.

This entire thesis is purely individual work of the author. No contents of this paper were produced jointly. Written material was distributed with consensus of all relative parties under the regulations of master dissertations of CBS to avoid plagiarism

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ABSTRACT

Over the past decades, FinTech has hogged the limelight of the publicity and flourished the whole finical service industry. The uniqueness and complexity of the Chinese market originated from multiple factors including its immature financial infrastructure, its transforming towards a domestic consumption-driven economy defines Chinese market as a fertile ground for FinTech players. The likes of Ant Financial, ZhongAn have spread their reputations across the world through their adept mastering of advanced technologies in shaping the landscape of traditional financial services. However, how specific technologies such as Big data are driving the business model innovation (BMI) of FinTech in China have received little attention. With the aim to formulate holistic paradigm on this research body, this dissertation undertakes a multiple case study approach by deeply analyzing the BMI among four organizations covering four biggest FinTech segments in China. The big picture of how Big data analytics assisted BMI in FinTech in China is configured in this dissertation. The extensive review on keywords extracted from both preliminary review and co-occurrence analysis provide conceptual understandings of FinTech under different contexts, as well as Big data technologies in FinTech and its role in BMI of FinTech. The multiple case study method is adopted to compare the various aspects of BMI in FinTech through Big data technologies. The result of case study and literature review highlights that a virtuous and sustainable circle has been established with the assistance of Big data technologies through dynamic data feeding mechanism within the core elements of BMI. The collaborative nature in the inter-relationship and ecosystem-oriented growth model of Chinese FinTech players enable them to capture and feed data in a mutually supportive manner, which in turn results in the most disruptive BMI.

Key words: Business Model Innovation, FinTech, China, Big data, Ecosystem, Scenario

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1. INTRODUCTION

As FinTech is experiencing rapid growth globally, the introduction section will present the background and framework on which the thesis has been built. The research problem is identified followed by the main research question with three sub-research questions. Scope and delimitation of the thesis will be elaborated at the end of this part.

1.1 PROBLEM IDENTIFICATION

FinTech, a leading buzzword which stands for the contraction and intersection of "finance" and "technology", has hogged the limelight of the publicity and flourished the whole finical service industry over the past decade. As a disruptive force for traditional financial systems, FinTech injects the technological advancements such as Big data, Cloud Computing, Blockchain and Artificial Intelligence (AI) into traditional financial services to bring out novel solutions with the purpose of fulfilling increasing higher expectations on customer experience and coping with fiercer competition from inside and outside of the industry. Setting intrinsic problems aside, opportunities such as mobile payment and microloan not prioritized by traditional financial systems provide FinTech companies with incentives to prosper in diverse manners. Through the initiative of FinTech, the conventional business models of the financial industry with a rigid structure have been changed and even subverted with the advent of a new epoch of financial services that embrace every aspect of our life. The focus of current FinTech solutions has been shifted from intro-organizational solutions to inter-organizational solutions that differ regarding interaction types from more customer-oriented business-to-customer (B2C) and customer-to-customer (C2C) to more provider-oriented business-to-business (B2B) approaches (Puschan mann, 2017). There are mainly eight segments in FinTech based on their lines of business: Online Payment, Data Analytics, Transactions and Capital Markets, Lending, RegTech and Cyber Security, Wealth Management, Blockchain and Digital Currencies, Insurances (DBS and EY, 2016a; EY, 2017; H2 and KPMG, 2017).

The 2008 global financial crisis stirred the massive shock-out of the financial industry and triggered a sudden rise of FinTech start-ups across the world. Public anger and distrust towards the

establishment of the financial industry, together with an increasing need for customized financial products created prerequisites for FinTech to rise. According to the KPMG report in 2017, global FinTech funding set a record and approached US$31 billion in 2017 buoyed by a surge in financing for FinTech startups in the US, UK and China, benchmarked to the number of only US$7 billion in 2013 (KPMG, 2017). According to Google search trend, the hotness of theme "FinTech" in Google search has drastically increased over the past five years. The search index trend shown in Figure 1 indicates searches for keywords containing "FinTech" has doubled from 2015 till now. Google search index is a normalized "search interest index" showing how popular one keyword is in a certain area during a certain period.

Figure 1. Google Search Trend of "FinTech" Over Time (Source: Google Trends https://trends.google.com/trends)

Before the researcher digs deeper into the correlation of Big data and FinTech, a co-occurrence analysis was conducted prior to case study analysis to obtain a preliminary understanding of primary keywords highly correlated to FinTech in multiple contexts. Co-occurrence analysis allows the researcher to extract macro network relationships between each of these keywords standing out in the co-occurrence map. The detailed procedures and results of the co-occurrence analysis can be found in the Appendix 1. Based on the outcome of the co-occurrence analysis, the researcher also conducted an interrelationship analysis which is shown in the appendix (see Appendix 1 Figure 6 for the interrelationship analysis). Evidently, among the keywords that surround FinTech, Big data and China are the ones that hold a strong correlation with FinTech and thus must not be neglected.

Among all emerging markets, China is the one that deserves special consideration in respect of its uniqueness and complexity. The enthusiasm of Chinese customers to adopt mobile services and FinTech services is just as striking (see Appendix Figure 8 and 9 for the Internet and Mobile penetration rate in China). According to the EY report in 2017, 84% of customers are aware of FinTech services in 2017, benchmarked to 62% in 2015. Among the 20 markets surveyed, China has the highest adoption rate at 69% with a population of 1.4 billion people (EY, 2017). KPMG collaborated with H2 Ventures and compiled a list of 100 most innovative companies which race ahead within FinTech industry with the first, second and third place occupied by Chinese companies (H2 and KPMG, 2017). 2013 is widely acknowledged as the onset of the Chinese FinTech industry with the launch of WeChat Pay, ZhongAn Insurance and business development into mobile payments of Ant Financial. Till 2017, China's digital payments accounted for half of the global volume with an astonishing number of US$5.5 trillion, and online lending accounts for impressive three-quarters of the worldwide volume. China has occupied four positions of the top five world's most innovative FinTech firms with Ant Financial at the leading place (The Economist, 2017). Ant Financial now is the largest Chinese FinTech company and the world's highest-valued FinTech firm that has been valued at about US$150 billion, surpassing and doubling ride-sharing giant Uber. The juvenile financial system in China majorly owned and operated by the state has put their focus on servicing state-owned enterprises. The soaring financial demands of small and medium-sized enterprises (SMEs) and individuals with rapidly accumulating wealth have been significantly neglected (see Appendix Figure 10 for the number of Chinese SMEs from 2012-2018) (Brookings, 2018). Noticed these underserved demands from its large potential FinTech user base, Chinese FinTech firms started to step in to fill the void. With multiple factors such as regulatory parties easing their stance on FinTech, major cities in China escalating support on the development of FinTech Hubs (Hangzhou, Shanghai, Shenzhen) and IT technologies being drastically applied in the finance sector, Chinese FinTech industry is booming in many aspects of financial services. In May 2017, the central bank of China has established a FinTech committee to conduct research on FinTech industry and formulate

blueprints for development of FinTech as well as relevant sectors. Its function also includes coordination within pertinent parties of the FinTech industry for overall balanced development.

The excitement surrounding the FinTech industry is justified by Big data technologies. FinTech firms are leveraging Big data from any Internet-based services to innovate entire whole business ecosystems across financial systems to personalise the customer experience, progress operational efficiencies and reach previously unnoticed customers. Big data and relevant technologies are becoming essential infrastructure in business as well as many other aspects of daily activities (Gantz and Reinsel, 2011a). Despite the sizzling discussions by financial industry practitioners around the other data science technologies, Big data is still widely acknowledged as the most fundamental and frontier technology for some financial solutions and also the predecessor of the subsequent data science technologies such as Blockchain, Cloud Computing and Machine Learning (Chuen, 2015). Data generated from online transactions, health records, tax records etc., are being stored and analysed in large servers around the globe. Before 2003, 5 exabytes (10^{18} bytes) of data was created in entire human history. This number expanded to roughly 20 zettabytes (10^{21} bytes) in 2017 and is expected to double in 2019 (Reinsel, Gantz and Rydning, 2017). The analysis of Big data has also rapidly advanced in the past decade. Entire human genome decryption which required ten years of processing can be finished within one week according to today's computing power. Google alone is now monetarizing 7 billion pages and processing 20 petabytes (10^{15} bytes) per day. It is estimated that the quantity of information will increase at least 50 times in the next ten years to come. The uniqueness of Big data that distinguishes it from conventional data technologies lies in that Big data is more focused on entire datasets with large redundant data. The limitations in computing power and data collection approaches prohibit conventional data technologies from using a large quantity of semi or unstructured data. Data mining in an entire dataset without delicate and complex sampling is only possible with the emergence of Big data technologies. Conventional data processing tends to outcome results with causality relationship. When working with Big data, causality is not necessary since only the genuine relationship matters. The inherent mechanisms dominating how datasets are correlated to each other is of much less significance compared to how the relationship is described and utilized. Thus, numerous opportunities and possibilities arising from Big data expand to every

business activity with its unique but powerful technological advantages. Big data analytics have three application contexts: data mining, visual analytics and predictive analytics. In 2011, McKinsey Global Institute published a report on Big data to evaluate the potential application of Big data in various industries in the US. The report correctly pointed out that among many traditional and emerging sectors, finance will benefit the most from potential applications of Big data technologies (McKinsey, 2011a). As one of the most information-dense sectors, finance has long been embracing every evolution of information technology. Customer information and transaction data are the core assets of financial businesses. As data collected has been evolving from simple personal information to comprehensive datasets, financial businesses are facing substantial future risks as much as potential opportunities. Conventional financial institutes, e.g. banks and security firms are being challenged by multiple competitors ranging from Internet business giants as Google and Alibaba who are launching their financial service platforms to emerging financial organizations as Lending club and other FinTech companies. Traditional business models in various services provided by financial business companies are either transforming and innovating or being eliminated from the market. The impact of Big data on financial service providers is overwhelming. However, studies on how these impacts are affecting the business models, pushing them to innovate onto a new stage or render them obsolete, are still insufficient.

A business model defines the core logic of value creation in business activities (Ghaziani and Ventresca, 2005). The business model innovation (BMI) has been a focal point in researches on the study of innovation and followed by CEOs who wish to achieve significant market share/profit growth by more than product innovation (Amit and Zott, 2012). Innovation of a new product or service generally requires huge investment without a guarantee of future return, hesitation on which drives the entrepreneurs as well as general managers to adopt BMI as a primary task or complementary alternative method to product innovation. Apart from prototyping new products or services, many start-ups in FinTech are designing their business model at an early stage. Studies on the designing of business models in FinTech often tend to focus on the research body of the business ecosystem, i.e. in a more macro context (Leong *et al.*, 2017). It is now necessary to call upon a study concerning the BMI in FinTech to comprehend current FinTech trend in the finance sector and to pave

the way for the future profound archetypes of designing and innovating business models in FinTech industry. Gassman et al., (2013) concluded that a business model contains four central dimensions including the Who, the What, the How with an amended element of Value to provide a clear framework as the base of BMI analysis (Gassmann, Frankenberger and Csik, 2013). The Who indicates the customer group that the business model serves; the What concerns the customer value proposition; the How illustrates the processes and activities utilized in building and distributing value; and Value relates to the revenue model with cost structures and revenue mechanisms. The innovation of business model in the FinTech sector is immense throughout all segments mentioned above. Although the tech in FinTech has always been frontier technology from Big data years ago to Blockchain in recent two years, data technology, in general, is indisputably among the very foundation of FinTech regarding its origin and innovation trajectory. Accessible and affordable Big data analytics witnessed the onset of FinTech. Many technologies such as Blockchain and AI, despite their generating fever across technology and finance community, are affecting FinTech in a fuzzy way due to their short time of mature application. Many of these technologies can also be categorized as related to Big data. To extract the essence of how IT technology specifically data technologies are driving the BMI in FinTech, a study on the manner of Big data impacting on FinTech BMI can serve as a superb sample as its foundational position in FinTech industry.

1.2 Research Question

The purpose of this paper is to fill the research gap that has been mentioned above and to shed light on how the utilization of Big data technologies disrupt and innovate the business model of the FinTech industry in China. In this respect, the main research question is set as follows:

RQ: How business model innovation is driven by Big data: The case of FinTech in the context of China

The main research question can be split into three sub-research questions to help answer the main research question:

1. What are the underlying driving forces for business model innovation in the FinTech sector in China?

2. What is the role of Big data in business model innovation in the FinTech sector in China?

3. What kinds of business model innovation are happening in the FinTech sector in China?

The objective of this research is to deliver a contribution on how Big data can be a powerful assistant that empowers the innovation of business model in the FinTech industry, particularly related to the Chinese market. This dissertation also aims to provide practical suggestions for FinTech start-ups in China on how to leverage Big data technologies in their data analytics to smooth the process of value creation, capture and value delivery. The realization of the research objective is proposed to be reached through a comprehensive and in-depth literature review followed by a multiple case study on four most representative FinTech firms in China. A conclusion concerning the application of Big data technologies in FinTech will be delivered to benefit both academic researchers and practitioners. Additionally, possible limitations concerning the paper and recommendations regarding future research directions will be proposed.

1.3 Research Design and Delimitations

This paper concerns mainly about the impact of Big data technologies on the BMI of FinTech industry in China. This topic is chosen with attention to the fact that China is becoming the next global hub of FinTech adoption and innovation. Research subject in this dissertation is the FinTech industry in China market with coverage on other hot-spots of FinTech such as India. Among many frontier technologies related to FinTech, the author chose Big data to shed light on based on prerequisite work of co-occurrence analysis. The author's academic background with a major in service management and minor in social data science also inspires the author to conduct a thesis project incorporating both disciplines. The core of this dissertation is on the impact of Big data technologies on FinTech BMI. Thus details of Big data such as the implementation of Big data (for example utilization of Hadoop and MapReduce) are not covered in this dissertation.

1.4 Thesis Structure

This master thesis is composed of seven chapters and is divided into a theoretical part and an empirical part. The first chapter concludes the research background of this master thesis by giving a short introduction of FinTech, Big data technologies and BMI. This chapter also shows the necessity for this research by pinpointing the research gap existing in current studies. Research questions and

delimitations are elaborated at the end of this chapter. The second chapter consists of a systemic literature review on the historical development of relevant issues and theories applied in this dissertation. The third chapter illustrates the framework of analysis utilized by the author in the multiple case study. The forth chapter introduces the research methodology applied in this thesis, including the collection method of data (multiple case study in this dissertation) and the analysis method of data. The fifth chapter concerns data analysis and interpretation; while the sixth chapter briefly discusses the findings of the case study. A conclusion that answers the research question is elaborated in chapter seven. The limitations of the research findings, recommendations for future academic work and implications for other emerging FinTech markets are presented in the final chapter.

2. LITERATURE REVIEW

This part of the dissertation is to clarify conceptual issues regarding the term "FinTech" and review on the evolution progress of FinTech from its infant stage as part of digital financial services. From the perspective of the ever-changing relationship between technology and finance, it is the author's objective to summarize the definitive characteristics of FinTech in various contexts. By reviewing the function of FinTech embodied services and products in finance, this part of the literature review is also to construct theoretical foundations for the following research. Theories on Big data impacting the finance sector, in general, is reviewed together with theoretical foundations of BMI.

2.1 THE ORIGIN AND CONCEPTUALIZATION OF FINTECH

2.1.1 FROM DIGITAL FINANCE TO FINTECH

Ever since the maturity of informational and computational technologies, the finance industry has been adapting itself to fit the rapid-developing information age. Until recent years, this process has been defined as digitalization of finance which entails all electronic products and services based on information technology (IT) in the finance sector. The evolution of digital finance has reached a milestone which marked the birth of FinTech.

FinTech is not entirely a novel concept considering that most concepts in the domain of FinTech have existed for a long time. The origination of FinTech stems from the digitalization of finance. Applications of front-line IT in finance especially in the banking sector can date back to 1970s when Automated Teller Machines (ATMs) began to redefine how banking industry was interacting with their customers (Chen and Tsou, 2007). This process which has been lasting for decades bred many financial services and infrastructures that are currently being used every day. For example, the electronic trading system introduced by NASDAQ in 1971, the home banking introduced by Citibank in the 1980s. During this period, applications of IT in the finance sector are mainly defined as E-finance or digitalization of finance. Financial institutes have long been early adopters of information technologies (Shahrokhi, 2008). Many have studied how technology especially advancements in IT have impacted on the finance industry. Claessens, Glaessner and Klingebiel (2002) summarized that

impact from information technology on finance industry had in general two areas. The first area denotes that many financial services provided by traditional financial institutes are instead provided by many other non-financial organizations such as the Octopus Card in Hong Kong (China). The second area is that the financial market is transforming to be free from physical places (brick and mortar), thus making the financial market increasingly globalized. From the perspective of the relationship between IT and finance sectors, most researches have been focusing on the function of IT serving as in the process of financial innovation. White and Frame (2004), Tufono (2003) suggested that IT served as the underlying driving forces of financial innovation. Even on the function of IT in facilitating innovation of financial services, some have other opinions. Herbst (2001) argued that the development of E-finance could in effect hinder the innovation of e-commerce. He argued that one key component in E-finance, i.e. e-cash had not lived to people's expectation of it on accelerating e-commerce development. This idea is challenged by many factual, empirical studies in recent years. Furst (2002) reported that despite the adoption of novel IT technologies were in general associated with profit growth, many *de novo* banks who were conducting business entirely on IT technologies (i.e. without any physical branch) did not succeed at all. Whereas the divergent opinions on how IT has been affecting financial services, most of these studies reckon IT as a tool facilitating the evolution of financial services. In most of the studies during this period, IT-enabled service innovations were recognized as decorations of financial service innovation rather than the foundation of financial services.

As mentioned at the beginning of this part of the dissertation, FinTech is not entirely a novel idea comparing to e-finance and digital finance, both of which have been discussed intensely during the past decades (Allen 2002). E-finance and digital finance are always used as quasi-synonyms (Gattenio, 2002). Gomber (2017) and Banks (2001) summarized key business functions in digital finance or e-finance are digital financing, digital investments, digital money, digital payments, digital insurances and digital financial advice. All the business mentioned above functions are coinciding with most core segments of FinTech. Dorfleitner (2017,p.7) summarized segments of FinTech as Financing including crowdfunding and credit scoring, asset management, payments, insurance (also referred to

as InsurTech) and other trivial areas. An interesting question here is how FinTech differs from digital finance or e-finance.

Many researchers tried to provide a rigorous definition of FinTech. Dorfleitner (2017) suggested that it was impossible to provide a restrictive definition of FinTech in either academic context or on the legislation level FinTech is operating. Zavolokina (2016) published an interesting study on how FinTech as an emerging term was perceived in both academia and mass media. His study outlined three mainstream definitions of FinTech when this term is being used: companies operating FinTech business especially start-ups (e.g. Lee and Kim, 2015), financial services provided by traditional financial institutes (e.g. Dapp *et al.*, 2014) and IT technologies used in finance sectors in general which is the same as the definition of e-finance and digital finance. Schueffel (2016) tried to provide a scientific definition of FinTech by conducting a semantic analysis. By subtracting features highly correlated with FinTech in multiple contexts, he defined FinTech as a "new financial industry that applies technology to improve financial activities". Gomber (2017) views FinTech as another synonym for e-finance and digital finance with more emphasis on IT technology. He specifically mentioned one feature of early FinTech companies that most of them were originated from IT companies especially IT giants as Google and Facebook. One pillar supporting these notions on defining FinTech can be traced back when FinTech was first mentioned, by the chairman (John Reed) of Citicorp in the 1990s. FinTech was presented as a pioneering banking project utilizing multiple front-line IT technologies, which was motivated by the enduring insistence of Citicorp on adopting new technologies (Kutler, 1993). What should be noted here is that the first to use FinTech or apply FinTech implications was a traditional financial institute. It is safe to conclude from the reviewed literature that FinTech does not refer to one single industry or one type of companies. As Puschmann (2017) put it, FinTech is an umbrella term covering any service or product even certain department in one financial institute. Once they fit into the characteristics of FinTech, it is well within the scope of any research on FinTech. From the perspective of relations between finance and IT technology, the author suggests that FinTech is built upon the IT technology especially those who have been explosively developing over the past years. Unlike digital finance or e-finance in the early literature which regarded IT technologies as tools innovating or altering functions of traditional financial

services, FinTech takes IT technology especially the data science as underpinning structure of its business operations. A typical repository of the IT technologies referred to here can be made in according to the co-occurrence analysis conducted by the author of this dissertation. The repository includes but is not limited to AI (Artificial Intelligence), Big data, Internet (mobile Internet and Internet of Things, i.e. IoT), distribution technology including Cloud Computing and Blockchain, Cyber Security technologies including biometric technology and encryption technology.

2.1.2 From Financial Disintermediation to Financial Intermediation

Apart from discussing the role of IT from the perspective of innovation enabler in financial services, many studied the role of IT technology innovation and adoption in financial disintermediation. The author of this dissertation views this as another perspective to review how FinTech can be defined. In many literatures on the topic of FinTech, researchers typically define FinTech as a booster of financial disintermediation. However, as one trace back to literature discussing e-finance or digital finance, the role of IT innovation in financial disintermediation is hard to define. According to Allen (2002), financial disintermediation has been an automatic process since the 1960s. Drastic disintermediation has not always correlated with technology bursts. Domowitz (2001) pointed out that banks and other intermediators could utilize IT technology innovations to re-intermediate. Clemons and Hitt (2000) conducted a comprehensive review of the transparency, disintermediation and differential pricing of financial products and services in the context of Internet banking. Their work suggested that the relation of financial disintermediation process and Internet relevant technology innovations were complex. Disintermediation can happen and has already happened for many local banks, the course of which would be accelerated by the rapid advances of IT technologies but is also deeply correlated with many other factors. However, re-intermediating is highly possible for many players with adoption of novel IT technologies. French and Leyshon (2004) proposed a model addressing the issue on IT technologies' effect on financial disintermediation and re-intermediation. They disambiguate the general financial disintermediation process into two sub-types: (1) financial disintermediation which was mainly driven by regulatory and political changes; (2) electronic disintermediation which was occurring in a broader context not limited in financial sectors and was driven by technology advances. They argued that disintermediation was one phase in disintermediation to re-intermediation

process. The first phase in disintermediation is driven by IT technologies to reduce information/transaction cost and creates higher liquidity, featured phenomena in this phase is that more efficient market intermediators displace market incumbents. The second phase, i.e. re-intermediation is featured with new intermediators emerging, and original market incumbents utilize IT technology to re-intermediate, both of which are characterized as modes of re-intermediation. Although many are discussing the potentiality of FinTech replacing traditional finance institutes thus acting as dis-intermediator (Li, Spigt and Swinkels, 2017; Zalan and Toufaily, 2017; Finkle, 2018), their analysis did not exceed the scope of the first phase in the model proposed by French and Leyshon. From the function of IT technologies in financial dis-intermediation, they share similar opinions with Clemons and Hitt. From multiple business reports conducted by major consulting groups, e.g. E&Y, McKinsey, Deloitte, BCG etc., many large banks incubating FinTech start-ups or projects are in the first phase of re-intermediation i.e. disintermediation (Deloitte, 2016; Ernst & Young, 2017; Mckinsey Global, 2017; Morel *et al.*, 2018). It is safe to suggest that FinTech as financial disintermediator, as is dominating in current research body of FinTech, is only one phase of FinTech to re-intermediate in the long-term. From above-reviewed literature and business reports, FinTech can be defined from the perspective of its role in financial dis-intermediation and reintermediation. Key characteristics of FinTech in this regard is that FinTech is either *en route* in the evolution from assisting financial disintermediation or re-intermediating by itself.

To sum up, any company or start-up, any service or product, any branch or subsidiary even department of some primary financial service providers can be discussed in the domain of FinTech as long as it fits into the characteristics summarized from a technology perspective and financial dis-intermediation perspective.

2.1.3 FinTech in China

Puschmann (2017) differentiated evolution phases of FinTech in the past decades by focusing on the strategic, organizational and systematic function of FinTech. He proposed a five-phase model starting from the 1960s and forecasting up to 2020s. Phase four and five which emphasized on provider and customer oriented digitalization is well conforming to the characteristics mentioned above, which is the current phase we are in. His model, however, does not apply to developing economies, e.g. China.

Numerous reports or newsletters have been focusing on China as a global FinTech Hub (DBS and EY, 2016b; Cliff Sheng, Jasper Yip, 2017; Lu and Tian, 2017; Alyst, 2018). An evolution model which fits the China dynamic was proposed by Shim and Shin (2016). From the author's co-occurrence analysis in this dissertation, it is manifestly clear that China is playing a vital role in the global FinTech industry. Study of China FinTech industry is beyond a hot topic across both academic and mass media domains, it is also isolated with many other FinTech studies in other developing economies as FinTech in China is showing a distinctive pattern (Wang, 2016). The co-occurrence also indicates that China FinTech is more correlated with Silicon Valley rather than being a control group when analyzing FinTech in western countries. Chen (2016) compared several sector leaders in FinTech between the United States and China. China's top third-party online payment service provider Alipay has more than 450 million users which is several times larger than the entire global user count of its rival PayPal. China's top financing FinTech company Ant Financial issued more than US$ 100 billions in past years, which is larger than loans granted by all the leading financing FinTech companies (e.g. Lending Club and Sofi) combined from 2009-2016. What is even surprising is that Ant Financial accomplished this with its "310" principal (or user experience criteria), i.e. three minutes to apply, one second to receive and zero personnel to interfere. In the field of wealth management, more than 280 million accounts have invested in online money market product Yu'E Bao with total assets of more than US$ 100 billion. These examples again prove that the FinTech industry is a topic worth discussing. The boost of China's FinTech industry is phenomena. From an academic perspective, even partially accomplishing to understand this FinTech boost phenomenon in China might lay the foundation for future research on possible routes of finance service innovation (Wang, 2016).

2.2 Big data Technology in Finance as FinTech

2.2.1 Big data Development and Impact on Finance

Big data is revolutionizing both society and industry. The potential of Big data in reshaping economy in a broader sense has not yet been fully recognized (Gantz and Reinsel, 2011b). This part of the literature review aims to summarize on how Big data relevant technologies are redefining the

financial industry and how the leadership in both traditional financial institutes and emerging FinTech companies are comprehending Big data in the sense of revolutionizing financial sector. As one of the most dynamic countries embracing Big data technologies, the current development of China's Big data industry is reviewed highlighting the function of Big data in the finance sector.

Being an information-dense industry, the finance sector has not always been intuitively correlated with high-tech in the past. First thing comes to mind about financial institutes as banks have always been fancy and somehow intimidating brick buildings. However, as one investigates the definitive characteristics of Big data, i.e. the 3Vs, i.e. volume, velocity and variety, not many industries can produce and utilize data as financial services in a sense that fits the 3Vs so nicely.

Definition of Big data has been rapidly evolving since it was first mentioned in the 1990s (Cox and Ellsworth, 1997). As the techniques used in the domain of Big data such as data storage technologies have evolved drastically with the increasing volume of data in Big data, the definition of Big data has been evolving ever since. Laney (2001) was the first to define Big data using 3Vs. Volume refers to the size of data; Velocity refers to the high speed of inputting and outputting of data; Variety refers to the diversity of sources and types of data. Early adopters of Big data technology as IBM and Microsoft added veracity as the fourth V into the definition of Big data (Reinsel, Gantz and Rydning, 2017). Veracity in this regard refers to the chaos and trustworthiness of data. Many researchers are now defining Big data in a 4Vs model with alternations of the fourth V (Philip Chen and Zhang, 2014; Gandomi and Haider, 2015; Rodríguez-Mazahua *et al.*, 2016). Mckinsey and Oracle bring Value as the fourth V into Big data emphasizing that hidden value in a large volume of data is one essential characteristic of Big data (McKinsey, 2011b; Oracle, 2013). Some suggest Visibility or Vaticination should be added (Kanellos, 2016). As one can easily foresee, the definition of Big data will continue its evolution to adapt its ever-increasing application contexts.

In the business world, the value generated by Big data is based on its function in the decision-making process. Insights extracted from Big data rely on efficient analysis as the degrees of either 3Vs or 4Vs are boosting over time have been recognized by many researchers (Hsinchun Chen, 2012; Waller and Fawcett, 2013; Chae, 2015). Labrinidis and Jagadish (2012) suggest a five-stage model of extracting valuable information from Big data. The five stages can be further categorized into two sub-processes:

(1) Data management; (2) Data analytics. Data management includes three stages: acquisition and recording of data; extraction, cleaning and annotation of data; integration, aggregation and representation of data. Data analytics include two stages: modelling and analysis; interpretation. To review every technology used in Big data analytics is beyond the scope of this paper. The author summarizes key analytic technologies that are predominantly adopted by social Big data analysis and financial service providers. Big data analytics in this regard include three type of analytical technique sub-sets: Data mining (text/audio/video mining), Data visualization and Predictive analytics (Sagiroglu and Sinanc, 2013).

DATA MINING

Data mining especially text mining have already proven itself to be a high potential technique in financial services (Chung, 2014; Wu *et al.*, 2014). Data mining refers to the process of revealing hidden information from Big data through various algorithms (Zhang *et al.*, 2015). Data mining is usually implemented in two phases: discovery and search. The patterns of data extracted from the discovery phase can be used in the search phase (Jadhav, He and Jenkins, 2017). Data mining application in finance sector includes in principal five aspects: (1) Credit rating; (2) Loan prediction; (3) Anti-money laundering; (4) Financial statement analysis (financial fraudulence detection); (5) Customer analysis (customer behaviour analysis/customer sentiment analysis).

Credit rating/evaluation is a key process in the banking business. Various mathematical models have been developed for scoring the creditworthiness of individuals, organizations even governments. Data mining with Big data has been an enabler for more precise, agile and risk-resistance credit scoring. Numerous techniques based on data ming with Big data such as SVMs, Decision Trees, Neural Network, Machine Learning and k-Nearest Neighbours are now being used to construct robust credit scoring models (Chen and Li, 2010; Kim and Sohn, 2010; Zhou, Lai and Yu, 2010; Ping and Yongheng, 2011; Yu *et al.*, 2011; Hens and Tiwari, 2012; Wang and Ma, 2012; Harris, 2015). It is now well concurred that data mining with Big data is to be the essential credit scoring technique foundation. Hybrid intelligent computational techniques have proven to be more promising than any single technique used alone, which is now the direction many researchers are working on. Loan default prediction has been an essential task for risk management of banks and many other financial

institutions performing debt business. Techniques based on Big data mining for loan prediction are roughly the same as those used in credit scoring as they are essentially to accomplish similar purposes. The difference lies in that loan prediction is often dealing with imbalanced datasets and needs to be conducted way ahead of the time when the loan is granted (Choi *et al.*, 2017).

Financial fraud including money laundering, credit card fraud and cooperate fraud has been a great concern for many financial institutes (Ngai *et al.*, 2011; Simser, 2012). Detected and undetected insurance fraud alone is estimated to represent up to 10% of all claims expenditure of insurers in Europe (Insurance Europe, 2013). Financial fraudulence detection has been a vital process to prevent the devastating consequences, for example, J.P Morgan suffered significant loss after disclosure of financial fraudulence of Enron. The key method in financial fraudulence detection is to identify fraudulent data or fraudulent behaviour from large amounts of fuzzy data, which is precisely the advantage of Big data mining techniques. Many methods of using Big data mining have been developed for financial fraud detection. Techniques as Logistic Model, Neural Network and Bayesian Belief Network have been tested to yield cogent results of financial fraud detection (Spathis, 2002; Kirkos, Spathis and Manolopoulos, 2007; Moon and Kim, 2017).

Customer behaviour analysis is typically conducted through text analysis (sentiment analysis specifically). Sentiment analysis is to analyze opinionated data from growing data possession of businesses with data source from social media and customer interaction activities (e.g. online questionnaires) (Gandomi and Haider, 2015). As an increasing number of businesses are capturing multiple dimensions of opinionated data from their customers, Big data mining has been serving as a key part of profit growth (Liu, 2012). Other than Big data mining based on textual data, video and audio data can also be used to analyze customer behaviour. For example, some have proposed that data extracted from surveillance cameras in shopping centres can be used for tracking customer shopping habits which might change traditional retail promotion strategies (Liang *et al.*, 2004).

DATA VISUALIZATION

Data visualization is to present data in certain systematic forms including attributes and variables for the unit of information (Khan and Khan, 2011). Visualization of data allows users in the business world to view and comprehend disparate data from a customized perspective. Managers have

recognized huge potential benefits from data visualization for years. According to a report conducted by Oracle, more than 60% of excellent financial service provider managers reckon data visualization as an essential financial skill (Oracle & AICPA, 2017). Characteristics of Big data are creating a new barrier for performing efficient data visualization. As data visualization is not simply presenting data in certain graphical and vivid form, the key point of data visualization is to provide interactive data presenting platforms. Scalability and dynamic in performing Big data visualization are the main challenges (Wang, Wang and Alexander, 2015). Data visualization in Big data era is required to provide an overall view as well as customized filtering and zooming on demand. Effective Big data visualization can facilitate decision makers in financial institutes on discovering hidden patterns of customer behaviours and the relationship between various customer groups. As in the case of using social network data, user connections and relationships are almost impossible to be viewed either in the textual or tabular format of data. With Big data visualization, valuable information such as potential customer groups and their correlations can emerge to business managers who are invoking these datasets (Kim, Ji and Park, 2014). Many data processing solution providers are now integrating Big data analytics with data visualization as direct visualization might not be as effective as expected. Solution providers such as IBM has launched many products as IBM InfoSphere and IBM SPSS Analytic Catalyst embedded with visualization engine RAVE for comprehensive visualization of Big data from the business world (Keahey, 2013). Visualization of Big data is now playing a key role in Big data industry as it's a technique offering readily available Big data analytics to front-end users. However immense the Vs of Big data might be, the value of Big data analytics can only be retrieved through human decision making. Visualization is the means to offer universally accessible Big data analysis to users who are not even in the profession of data science.

PREDICTIVE ANALYSIS

Predictive analysis of Big data is among one of the most fascinating applications of Big data. Predictive analysis is concerned with forecasting and statistical modelling to determine future possibilities (Matthew, 2013). Predictive analysis is just emerging in recent years, practical application of predictive analysis has been proven to be effective in finance sectors ranging from stock prediction to sales prediction for many years (McAfee and Brynjolfsson, 2012). Big data-based

predictive analysis becomes even powerful, enabling the business operators to examine not just what could happen in the future but also what might have occurred in the past. It is a combination of the qualitative and quantitative method for both forecasting (e.g. stock share price) and optimizing current systems (e.g. supply chain management) (Ryu, 2013; Tsai, 2014; Wang *et al.*, 2016). One distinct characteristic of predictive analysis based on Big data is that although many current models are still built on statistical methodologies, the statistical significance of the output analysis results are not necessarily required as predictive algorithms are dealing with a massive population of data. Instead of extracting features with statistical significance from data, Big data predictive analysis can reflect the majority of the data collected. Siegel (2013) listed several examples showing how companies such as Norwegian telecommunication company Telenor and U.S. Bank have experienced profit growth from deploying Big data predictive platforms. They managed to claim substantial customer retention through predictive analysis based on huge data collected from customers. Predictive analysis based on Big data still faces tremendous challenges due to high heterogeneity and noise/signal ratio in Big data. Many are building more supplicated predictive models to cater demands from finance sectors (Jeble, Kumari and Patil, 2016).

2.2.2 Big data in China

As put by Kirstin Gillon, IT manager of ICAEW, " China provides an excellent learning environment about the opportunities to learn Big data – the sheer size of China and its rapid adoption of mobile technology" (Enterprise Innovation, 2018). The population and Internet penetration rate in China alone can excite infinite imagination on the Big data in China, especially in the finance sector . China has also targeted the Big data industry prosperity as one of the key national strategies in the next decade to come. President of China Xi Jinping emphasized on both NPC (National People's Congress) and CPCC (Chinese People's Political Consultative Conference) the significance of accelerating the development of Big data industries in China (Liangyu, 2017). Putting the political overtone aside, which has been discussed by many mass-media reports, this act alone would easily remind of the Information Superhighway strategy proposed in Clinton's administration. The research on Big data in China still lacks concrete studies elaborating on how this industry is boosting and facilitating other industries from health care to scientific research. The research on Big data in finance sector of China is also in its early stage, most of the literature the author reviewed from China's academic database

are focusing on e-finance or Internet finance without digging into the function of Big data in the finance sector. The author found some literature directly related to the study on the role of Big data in Chinese finance sector. Most of these studies tend to focus on the role of Big data is serving in subdivisions of FinTech as credit scoring or risk management (Ying and Mingxiong, 2013; Weidi, 2015).

2.3 Business Model Innovation

2.3.1 Origin and Development of Business Model

This part of the literature review is to clarify the issue that how business model should be defined or dimensionalized. The author reviewed how the definition of business model has been developed over time and how the innovation of business model is being comprehended from multiple angles.

The concept of the business model has been increasingly attractive in many domains varying from information management to strategy designing (Wirtz *et al.*, 2016). One reason is that every enterprise is adopting no less than one business models implicitly or explicitly. Another particular reason lies in that business model is typically associated with competitive advantage build-up or expanding capability of certain business (Johnson, Christensen and Kagermann, 2008). Due to its vast coverage in various domains, the definition of the business model is often ambiguous even conflicting in some cases (Florén and Agostini, 2015; Marolt *et al.*, 2016). Also, the term business model itself is often alternatively replaced by many synonyms such as business ideas, business concepts (Magretta, 2002). Osterwalder (2005) suggested possible connections between technology and the term business model and called for more research on clarifying the body of this term. Some went even further claiming that to view the business model as a concept is self-delusional and the concept of business model would be murky at best (Porter and Gibbs, 2001). The simplest way of defining a business model might be from the discussion of Birkinshaw and Goddard (2009), in which they described the business model as "how the company makes money".

Massa (2017) suggested three types of interpretations of the business model: (1) Business model as attributes of real firms, which has a real impact on business operations; (2) Business model as cognitive/linguistic schema; (3) Business models as a formal representation of how organizations function. The first type of interpretation is derived based on empirical evidence from real firms. The

function of the business model in the view of researchers is to serve as classifications of real-world organizations on observed variables. Many studies elucidate business model from the perspective of what activities real firms are performing and what are the outcomes of respective activities (Casadesus-Masanell and Zhu, 2010; Dahan *et al.*, 2010; Markides and Oyon, 2010; Zott and Amit, 2010; Roome and Louche, 2016). The resemblance in these studies lies in that they agree on the notion of a business model requiring the involvement of value-adding activities. The debate is mostly centred on what type of activities is to facilitate the value-adding process. The second type of interpretations is to address the issue that managers do not operate real systems as physical systems of the value proposition. When the business model is used as a tool for value creation by managers, the interpretation of business model is often reshaped and reconstructed by managers' own experience and comprehending of the business model. Researchers focusing on this interpretation of business model definition tend to view business model as a narrative tool for value creation. Magretta (2002) and Doz and Kosonen (2010) concluded that business model was a cognitive system illustrating theories of how the firms react (set boundaries and organize internal structures), the business model was essentially narrative story helping the understand how enterprises work. Martins (2015) suggested that business model was a reflection of managerial mental modes or schemes concerning organizational structures in pursuit of value creation. Perkmann and Spicer (2010) suggested that narratives constructed within business model served not only as a device to simplify cognition but also a communication tool for an external audience such as venture capital investors (e.g. creating analogies of the firm's business model with successful business model existing).

The third type of business model is proposed by scholars who are trying to simplify the definition of the business model via a formal conceptual method. Most of the work regarding this type of business model is based on the already laid foundation of some widely accepted notions on business model archetypes comprising some basic core elements as concluded by Wirtz (2011). He published a review on the development of the business model and concluded that three core elements or most covered elements in most academic literature are necessary for defining a business model, including strategic components, customer and market component, value creation components (Wirtz *et al.*, 2016). The ultimate goal of many works conducted in this regard is to clarify every essential component in the

business model and to eliminate any non-relevant components. Most popular work among managers and business school students is the business model canvas which embodies core components covered in the work done by Osterwalder (2010) and Wirtz (2011). Adoption of the term business model has been somehow connected with the development of technology especially IT technologies in recent years with the emergence of e-commerce (McGann and Lyytinen, 2002; Andersson *et al.*, 2006; Reuver, Haaker and Bouwman, 2007; Clemons, 2009; Huarng, 2013). Many of these researchers have been shifting their focus from technology-oriented perspective towards strategy-oriented business model development (Zott and Amit, 2008; Demil and Lecocq, 2010; Teece, 2011; Desyllas and Sako, 2013). By far, although the development of the well-defined construction of business model theory is still in its infant stage, many converging views and similar understandings have been established (Osterwalder, Pigneur and Tucci, 2005). To apply which exact form of the definition of the business model is always dependent on the research domain and perspective of respective researchers. The author summarizes that business model, from the perspective of this dissertation, is the abstraction of complex dimensions of business activities in a firm converging to its core elements which reflects the value creation process.

2.3.2 Conceptualization and Dimensionalization of Business Model Innovation

The business model is not static, as can be easily deduced from the failure of many once great companies (e.g. Nokia in the mobile phone business and Kodak in photography business) and rising of many new entrants in business (e.g. iTunes music service by Apple and web search index-based advertisement by Google). Evolution of business model is to some extent even more important than reaching a rigorous definition of the business model (Hedman and Kalling, 2003; Chesbrough, 2007). The history of business has taught people that no business model can last forever. Tidd, Bessant and Pavitt (2013) found out that of the 12 companies made up of Dow Jones Index, only GE survives today. The inability to renew or innovate their business models is typically found in the failed firms (Florén and Agostini, 2015). Supplementary to these historical facts, the cases studied by many researchers stress the significance of BMI to create, deliver and capture value (Zott and Amit, 2008;

Sosna, Trevinyo-Rodríguez and Velamuri, 2010; Teece, 2010). The difficulty in innovating business model lies in its inherent distinction with product or service innovation, the process of which is often more intuitive as for profit growth or firm expansion. According to Sorescu et al., (2011), however, business model innovators earned four times greater than those who only consider and commence product or service innovation. Giesen (2007) and Zott (2011) also found out that financial outperformers put twice more emphasis on BMI. Koen (2011) suggested that the BMI was a new type of innovation which resembled but differed from another type of innovations such as product or process innovation. Conceptualization of BMI in many studies is hence based on the well-developed groundwork from defining another type of innovations. Wirtz (2011) suggested that any change in two or more elements in the business model to create value differently can be defined as BMI. According to Gambardella and McGahan (2010), BMI occurs when the firm is commercializing its underlying assets.

Studies on BMI have been conducted from many perspectives ranging from the driving force for firms to adopt BMI (Bucherer, Eisert and Gassmann, 2012; Carayannis, Sindakis and Walter, 2015), the types of BMI (Florén and Agostini, 2015) to the core elements of business model that can be innovated (Mahadevan, 2004). From a survey study published by IBM, the most crucial motivation for firms to conduct BMI is to achieve cost reduction and higher flexibility of business (Pohle and Chapman, 2006). Based on previous researches on the definition of the business model, many studies clarified the sources of BMI from an internal view and external view. They intend to refine the BMI theory by identification of internal opportunities and external threats pushing the business model to innovate (Sorescu *et al.*, 2011; Bucherer, Eisert and Gassmann, 2012). By pinpointing on which level of core elements in the business model are innovating, these studies managed to differentiate between different types of BMI. Other researches have sought methods to distinguish incremental BMI and radical, disruptive BMI based on open innovation theory proposed by Chesbrough (2006). Foss and Saebi (2016) conducted a systematic review addressing to current research gap in this field, i.e. the conceptualization and dimensionalization of BMI. They confined the theory of BMI by setting several boundary conditions through reviewing the inter-correlation between BMI with entrepreneurship, servitization, open innovation and sustainability. Peter Ping Li (2012, 2013) summarized that BMI

occurs only in two dimensions, i.e. the dimension of value capture and value creation. In his studies aiming to integrate disruptive innovation theory and BOP (Bottom of Pyramid) theory with BMI by analyzing the mechanism dominating the catching-up or leapfrogging of latecomers in emerging markets, he argues that value delivery and value proposition are often conducted in the purpose of value capture and value creation. Bucherer et al., (2012) proposed a systematic model for BMI by identification of the origins of innovation (from the perspective of internal and external opportunities), the innovation process and organizational implementation, organizational anchoring (on which levels in the management of one firm is involved in BMI), the degree of innovativeness (market breakthrough, radical, incremental or industry breakthrough). Based on his study Marolt et al.,(2016) developed a refined analysis model to simplify the process of BMI analysis. They refine the model into three core elements: origin, core elements and type of BMI with the amendment of the type of BMI referring to a sustainable business model research by Schaltegger (2012). Their analysis defines the core elements of BMI as Who (target customers), What (value proposition) and How (value delivery). Many subsequent studies on BMI in financial services are conducted on the basis of their work with correction on the interpretation of elements in the model (Ngoufack, Nuyebga and Haneef, 2018; Bouwman, de Reuver and Nikou, 2017; Nowiński and Kozma, 2017; Polkowski, Dutta and Savulesucu, 2017).

A new paradigm of BMI in recent years is the BMI driven by data science (centred on Big data technology) (Muhtaroglu *et al.*, 2013). From the perspective as viewing BMI from the incremental or disruptive dimension, the role of IT technology especially Big data technologies have been evolving according to many empirical studies. Studies in this regard can trace back to many works conducted on strategic information systems (Bresnahan and Trajtenberg, 1995; Picot, Reichwald and Wigand, 2008; Gable, 2010). These studies, though some conducted with a discussion of Big data analytics, were mostly focused on the micro-level of BMI, i.e. the organizational level. Beyond this set of views, some argue that Big data, together with many other data technologies, are "incremental enhancements" of current business models (Loebbecke and Picot, 2015). However, as one can easily sense even from one's daily life witnessing the rising of many FinTech companies and new IT giants gaining profits

with the unprecedented business model (e.g. online payment service provider PayPal and Alipay), the disruptive innovation force brought by Big data is obvious. Many have realized the power of Big data reshaping current business models in many industries including advertising, entertainment, finance and education (Markides and Oyon, 2010; McKinsey, 2011b; Schultz and Satzger, 2016; Bouwman et al., 2018). Nonetheless, empirical studies on how Big data is affecting BMI especially in the context of one specific industry-FinTech industry which hatched many novel business models are still needed for a comprehensive understanding of BMI.

2.3.3 Business Model Innovation of FinTech

Although FinTech is the latest innovation domain in the finance sector, study on BMI in FinTech industry is deficient. Many business models adopted by FinTech players are based on existing successful business models from the finance sector (Song, 2015; Philippon, 2016). A product such as PayPal and Alipay is not entirely unfamiliar to users as transactions with online banking has been existing for years. However, a disruptive innovation brought by FinTech is displayed from real statistic figures (Chiu, 2016). At this stage of FinTech development, it is not yet the timing to rigorously develop a business model for general purposes, as due to the ambiguity of the business model itself and broad coverage of FinTech in business. Many also use the business model and business ecosystem in FinTech as synonyms (Lee and Shin, 2018). As the purpose of this study is to shed light on the evolution of the FinTech industry in China, looking forward to offering suggestions for FinTech development in other markets. Using the well-acknowledged BMI model to investigate on the innovation in the business model is much more practical in such background. Understanding of BMI in Big data age in Chinese FinTech industry can facilitate the comprehensive financial innovation nor just in China but also in many mature markets.

3. FRAMEWORK OF ANALYSIS

This dissertation refers to the revised work of Marolt *et al.*, (2016) as the base of BMI analysis on How FinTech BMI in China is driven by Big data. As summarized in the literature review section, rigorous differentiation of elements in the business model is often hard to achieve. Guided under the purpose of this dissertation is to achieve which is to comprehend the role of Big data has been serving in FinTech BMI in China and provide pragmatic hints on how FinTech can be promoted in emerging markets, the author revises the model with emphasis on generic value delivery innovation. The core elements of BMI are simplified to fit into a broader context by defining the Who as a targeted customer, the What as key products and the How as value creation, capture and delivery network. The framework of analysis is as depicted in Figure 2.

The characteristics of BMI are identified and discussed in three progressive dimensions: origins of BMI, core elements of BMI and types of BMI.

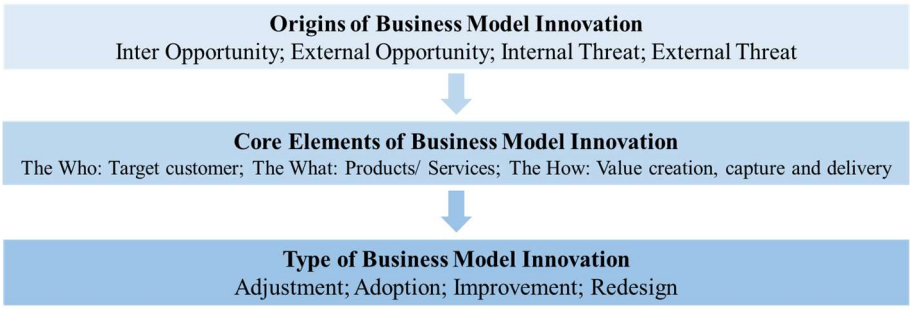

Figure 2. Framework of Analysis

3.1 ORIGINS OF BUSINESS MODEL INNOVATION

The innovation of business model can be activated by various triggers from different sources. According to Bucherer Eisert and Gassmann (2012), two types of distinction are made to group the origins of BMI into four categorizations: internal threat (e.g. inefficient organizational structure, lack of resource or financial instability), internal opportunity (e.g. improvement of internal processes), external threat (e.g. intense competition, governmental regulation changes or market shift) and external opportunity (e.g. changes in key technologies). The first distinction is made to differentiate whether the organization is forced or capture the opportunity to innovate its business model, while the second distinction is made between internal and external origins (Bucherer, Eisert and Gassmann,

2012). Noteworthy, the idea that innovations can only be activated by one factor is quite debatable. In other words, there can exist more than solely one source of innovation at the same time. The enterprise may support multiple business models depending on their lines of business. The fact that the sole source of innovation can lead to various innovated business models regarding different facets of one enterprise makes the problem even complex. It should also be noted that the specific trigger can be an opportunity for one firm yet a threat to another (Marolt *et al.*, 2016). For example, in the case of regulation change induced BMI, some firms might adapt themselves to survive in the new regulatory environment, others might benefit from the regulation change itself to gain profit growth.

3.2 Core Elements of Business Model Innovation

As stated above, the extensive literature on the business model has not reached a consensus on the components of a business model. Core elements of BMI of this research are retained from above-mentioned frameworks consisted of three key aspects: the Who; the What and the How (Mahadevan, 2002). The Who aspect indicates the specific customer group served. The What suggests the value proposition (key product/service devised). The What defines the products and services delivered by the enterprise that is valuable to the customer group. The How configures the value chain which concerns the value creation, value capture and value delivery. With in-depth analysis into three core elements of BMI, an integrated picture of the BMI of chosen organizations can be configured.

3.3 Type of Business Model Innovation

The changes in core elements of business innovation may concern the foundational decisions upon the business operations or slightly strategic adjustment. Thus, it is quite necessary to concern what types of innovations were underway to further investigate the impact of Big data. The four categorizations proposed by Schaltegger, Lvdeke-Freund and Hansen (2012) of BMI is adopted by this research and elaborated in the below.

Adjustment: the minor changes of business model elements, excluding the change in value proposition; i.e., readjustment of customer relationships

Adoption: the changes made to match a competitor's value propositions; which may involve the adoption of products and services

Improvement: the substantial changes of business model elements, excluding the alteration in value proposition; e.g., the approach of customer relationship and operation infrastructure

Redesign: changes that result in a completely new value proposition which is substantially different from the existing value proposition, e.g., the offering of new products and services

4. METHODOLOGY

This section outlines the methodological reflections employed in the study by clarifying the philosophy choice of research, research approach, research design, data collection, data analysis, as well reliability and validity of the research. The purpose of this chapter is to critically justify the results of the chosen research method in the light of alternative and repetitive research design.

4.1 THE PHILOSOPHY OF SCIENCE

Philosophy of science concerns vital assumptions that mirror the researcher's way of knowledge development and understanding, and it is through these assumptions that the basis of rules and principles are formed to develop our research strategy and the specific choice of methods related to research strategy (Saunders, Lewis and Thornhill, 2009). The choice of philosophy stance will play a crucial role in guiding us through the whole research process and understanding the research results. In this paper, the social constructionism ontology will be set as the philosophical stance to reflect the author's view regarding the formulated research question.

The social constructionism ontology views reality as being socially constructed under subjective human perceptions (Saunders, Lewis and Thornhill, 2009), which indicates a relative understanding of social phenomena as consequences of human social actors due to the diversity of social actors and their social interactions. The purpose of this research is to find out how Big data impact the business model of the FinTech sector within the Chinese market. As discussed in the literature review, FinTech and business model are terminologies with specific interpretations under specific contexts through years of research, which indicates their subjectivism when talking about them by different researchers under different contexts. As the Chinese market is chosen as the case to shed light on, the discussion about the impact of Big data on the BMI of FinTech sector will acknowledge the specificity of China as a given context, which makes social constructionism ontology suitable for our purpose of the research. In other words, outcomes of the research may vary from researchers' perspectives as social constructionism is undertaken in this study.

4.2 Research Approach

Equally important as the philosophical guiding stance is the chosen of the research approach. Taking into consideration the above questions, as well as the structural and procedure of this research, inductive research approached is employed in this study instead of a deductive approach. The deductive approach applies a top-to-down logic with a research strategy designed to test a given theory. However, the inductive approach develops theories from empirical observation of the reality and induce general inferences from particular instances (Collis and Hussey, 2013).

Relevant literature reviews on related theories and academic researches concerning research questions serve as the theoretical foundations for further contextualized case comparisons. The co-occurrence analysis and the multi-case study are employed to delimitate the research scope, collect data and develop new theories as a result of the data analysis. The inductive approach hence will be undertaken to generalize theories on the impact of Big data technologies on the BMI of FinTech sector in China underpinned by theoretical foundations and comparative multi-case study findings. Moreover, since BMI of FinTech with a specific focus on Big data analytics is a relatively new area which has only limited existing academic literature, an inductive approach appears to be more appropriate (Saunders, Lewis and Thornhill, 2009).

4.3 Research Design

4.3.1 Purpose of the Research

The purpose of the research can be classified into exploratory, descriptive and explanatory (Saunders, Lewis and Thornhill, 2009). The objective of this study is to discuss the role of Big data technologies in the BMI of FinTech sector in China scientifically, therefore providing an academic contribution to an emerging area and market. As well, the intention of this paper to answer the following primary research question:

RQ: How business model innovation is driven by Big data: The case of FinTech in the context of China

The main research question has been split into three sub-research questions to help answer the primary research question:

1. What are the underlying driving forces for business model innovation in the FinTech sector in China?

2. What is the role of Big data in business model innovation in the FinTech sector in China ?

3. What kinds of business model innovation are happening in the FinTech sector in China?

It has been clear through the literature review work that there are very limited of existing academical studies relating the concepts of Big data with BMI in FinTech. Thus, this paper will be based on an exploratory study in nature. The explorative approach is more valuable when there is limited knowledge in the understudied area and when the research question is aimed to provide a better understanding of a particular research body (Jeppesen, 2005).

However, the boundaries between the three approaches are not always distinct. Though the research question has indicated the explorative nature of this study, there are still some explanatory and descriptive elements as well, as this dissertation also explains the underlying forces, process and metrics of BMI, and describes the specificities of driven forces of the Chinese FinTech sector.

4.3.2 Research Strategy

There are several research strategies that are usually applied in the research: experiment, case study, experiment, survey, grounded theory, action research and ethnography (Saunders, Lewis and Thornhill, 2009). After defining the purpose of the research, an appropriate research strategy which can solve the chose research question scientifically should be deployed.

A case study is regarded as a valuable tool when questions on “How” and “Why” are being raised, as the researcher barely has control over the understudied area and focus on a real-life context (Yin, 2009a). A case study is also widely acknowledged as an empirical strategy in investigating particular phenomenon within its specific contexts by using various sources of evidence (Robson, 1993). It can be argued that the FinTech sector of China is a real-life context or a particular phenomenon which are worthy of attention. Given the uniqueness of the research question, this research undertakes a case study approach. Specifically, a holistic multiple-case strategy is deployed, as four companies in four leading FinTech areas are selected and compared to answer the chosen research question.

Moreover, a case study approach can prove to be useful when the investigator wants to explore existing theories and provide some lights for future researches (Saunders, Lewis and Thornhill, 2009). In this study, the existing theory of BMI will be used to explore the impact of Big data technologies on FinTech sector in China, and new insights will be built based on the current framework of measuring the innovation of business model.

However, using the case study as a research strategy may have some intrinsic limitations. One of the drawbacks is that it is biased and inaccurate, which could be due to the general lack of academic literature with precise procedures on guiding researchers to properly deploy case study method in their researches (Yin, 2009a). In other words, the researcher's limited capability in conducting case study may result in the biases and inaccuracy. With the guidance of a supervisor and previous literature, the researcher can relatively reduce the limitation. Another concern regarding the case study is that it lacks scientific generalization. Scientific generalization is hard to be realized based on a single case study. Scientific facts are typically generalize based on a series of experiments with strict conditioned controls. However, it has been argued that case studies are also generalizable like experiments to theoretical propositions but not to populations (Yin, 2009a). Thus, the multiple-case study approach is deployed as a relatively appropriate research strategy here.

4.3.3 Case Company Selection

The logic underlying the application of multiple-case studies is replication, specifically saying, a literal replication or a theoretical replication (Lee, 2006; Yin, 2009b). In other words, selected cases must be able to produce either similar results or contrasting results but for predictable reasons (Lee, 2006). The intention of this research is to discuss the role of Big data technologies in the BMI of FinTech sector in China, and the research is following such a theoretical rationale when choosing the cases. The case companies are chosen from FinTech sector in China, and all have specialization in the utilization of Big data technologies in their services and products.

All the four cases are organizations within the FinTech sector or have some businesses operating within FinTech sector in China. This context sets the frame for the overall case study for this research. The selection of cases is through a two-step process. Each case has been selected based on the combination of the theoretical and purposive sampling method. In the first step, the researcher

planned to select all cases based on the result of the co-occurrence analysis (See Figure 3). Thereby, samples are selected based on their representation of important theoretical constructs (Patton, 1990). The researcher got three cases from co-occurrence analysis namely Ant Financial, Tencent Financial and Baidu Financial, all of which have strong intercorrelation with both Big data and FinTech in co-occurrence. Due to the limitation of co-occurrence analysis (see Appendix 1), the pivots of their business all focus on digital payment segment, which indicates the utilization of Big data technologies to fertilize the similar business models. Thus, no contrasting results can be stemmed from multiple-case studies. Since Ant Financial, a payment empire running a business including Alipay and belonging to Alibaba, is the one that has the strongest connection to both FinTech and Big data, hence the researcher settled down with the first case as Ant Financial.

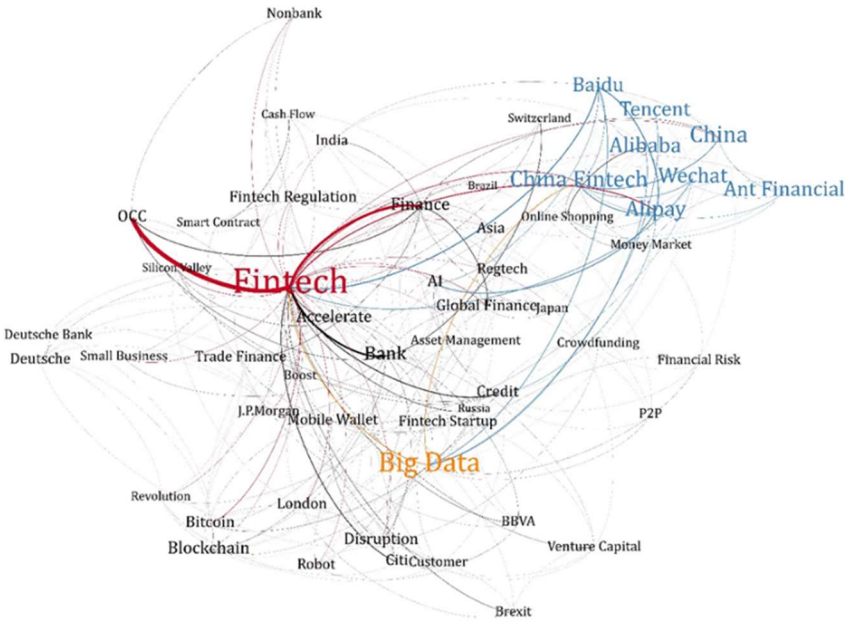

Figure 3. Partial Graph of Co-occurrence Results with Focus on China

In the second step, the research was guided by the purposive sampling logic. As the aim of the research is to gain an in-depth understanding on the role Big data is playing in the business innovation process of organizations within FinTech sector, the three other cases were selected through three other biggest sub-segments under FinTech breakup. Thus, we can collect more meaningful and beneficial results through the comparison of different BMI. With inspiration from existing literature, there are eight segments covering whole FinTech industries with different weights, namely payments (21%), data analytics (3%), transactions and capital markets (15%), lending (32%), regtech and cyber

security(6%), wealth(7%), blockchain and digital currencies(4%), insurances(12%)(DBS and EY, 2016a; EY, 2017; KPMG, 2017). With Ant Financial positioned in the payment area, other three cases are organizations with largest market shares according to the above industry reports in the transaction and capital market, lending and insurance areas and have successfully utilized Big data technologies to promote their businesses. Noteworthy, the result of case selection is based on sectorial breakup and based on co-occurrence analysis are consistent on the choice of Ant Financial, which enables more robust conclusions. The case companies selected, and their core parent segments are listed below (See Table 1):

Table 1. Case Selection Results

	Company Name	Sectorial Breakup	Weights
Case 1	Ant Financial	Payments	21%
Case 2	Lufax	Transaction and Capital Markets	15%
Case 3	ZhongAn	Insurance	12%
Case 4	QuDian	Lending	32%

4.3.4 Time Horizon

There are two alternatives when deciding time horizons for the research: longitudinal and cross-sectional. The longitudinal study involves continuous observation of one unit of analysis over a prolonged period. To the opposite, within the cross-sectional study, a unit of analysis is observed at a given point.

Given the nature of research question, this research undertakes a longitudinal approach to observe how Big data technologies impact the business model of FinTech sector; it appears necessary for the research to study the evolution and revolution of business model over the entire period that characterized a current business model of FinTech sector. By doing so, a valid and reliable comparison and interpretation of phenomenon can be produced to answer the research question.

4.4 Data Collection and Processing

Secondary data are commonly utilized when case studies are applied. As FinTech is a cutting-edge understudied area of multi-subjects with forwarding potentialities and tremendous practical value, the thesis tries to relate FinTech with BMI with particular concerns regarding Big data technologies to broaden academic merits and explore practical significance. As previously mentioned, four cases are chosen through the combination of theoretical and purposive sampling to conduct a systematic comparison on their innovation of business model based on the adjusted model above.

Thus, a large amount of secondary data is collected, filtered and analyzed carefully from each dimension to build an integrated framework for analyzing BMI and seek related answers to the research question. Yin has noted that obtaining sources from different channels as many as possible will make a good case study as the various sources are highly and mutually complementary (Yin, 2009b). The secondary data here are gathered by desk research through the preliminary investigation of relevant resources such as scientific publications, business reports and webpages.

The analysis of the cases regarding differences and commonalities between BMI is based on the framework introduced above to encourage discussion. The whole framework is breaking down into three building blocks: origins of BMI, core elements of BMI and type of BMI. Then, through a systematic and scientific comparative study between four cases, the researcher might be able to encourage some new insights regarding the research question in the role of Big data in the BMI process of FinTech in China. Both qualitative and quantitative data are utilized to generate the discussion. However, there exist different approaches to code qualitative and quantitative data. The need to code data stems from the researcher's necessity to answer the research question and interpret it understandably. There exist three major approaches to data coding: opening coding, axial coding and selective coding (Corbin and Strauss, 2008). Opening coding concludes the process of examining, conceptualizing and categorizing data based on their features and dimensions. Axial coding always serves after open coding to refine and differentiate concepts to encourage argumentative and motivational insight to manifest the unique context. Moreover, selective coding is the procedure to relate other categories to the selected core category. During the data processing and analyzing process, linear processing of information including one or more phases of decoding is typically not sound

enough. To ascertain the credibility, reliability and rigour of the analysis, data coding as well as analyzing the need to be conducted several times across different phases and dimensions (Corbin and Strauss, 2008). In this paper, three data coding approaches have been all undertaken. The first two sub-research questions are solved by open coding, whereas, the third sub-question concerns axial coding. Building on the above, selective coding is utilized to address the major research question by validating and connecting all previously identified categories to the core one.

4.5 Addressing Issues of Reliability and Validity

Issues of reliability and validity regarding the credibility of the research have been universally present throughout social science studies. Reliability and validity are dimensions to minimize the potentialities of getting wrong results (Saunders, Lewis and Thornhill, 2009).

Reliability refers to whether consistent results will be yield through repeated data collection and analysis procedure (Saunders, Lewis and Thornhill, 2009). Overall, it is of high importance to maintain a chain of records throughout the whole research so that the data is traceable and verifiable for the outsiders. As mentioned above, multiple sources of data are utilized here to for their complementarity and interconnectivity. Thus, all the secondary data are stated advertently in the reference list with clear attribution. Some sources can be acquired via CBS library, REX and other legitimate websites with publicly open access. Noteworthy, a co-occurrence analysis was conducted in the beginning to explore the inter-relationship between the key elements tentatively and filter out the case for the research initially. The detailed results and procedures of the co-occurrence analysis are put in Appendix 1. All analyzed data has been collected, processed and elucidated in a transparent and scientific manner to ascertain the reliability of the whole research.

Validity is concerned whether the findings match the objective of the thesis (Saunders, Lewis and Thornhill, 2009). As the research undertakes a social constructivism ontology, the validity of this research is mainly depended on how the research may be interpreted the results. Even though the whole research is based on compiled data, the researcher tries to make a systematic, in-depth and integrated discussion revolved around the observed phenomena to assure the validity of the study. Additionally, generalizability, also referred to as external validity, concerns whether the findings may be fit into other research settings. As this research is meant to study a specific issue on the role of Big

data on the BMI of FinTech in a focused locality of China, hence generalizability is not an expected attribute and address fewer concerns.

5. Case Study Analysis and Findings

This section conducts a multiple case study based on four cases, namely Ant Financial, Lufax, ZhongAn and QuDian. Background information will be given first to provide a general understanding of four organizations. Then a multiple case study based on framework of analysis will be conducted to compare the origins, the core elements and the types of the BMI to investigate the role of Big data in the FinTech BMI in China.

5.1 General Characteristics of the Cases

Ant Financial

Ant Financial (Ant Financial Services Group), founded in 2014, is the largest online payment services provider in China now with services expanding to other areas including wealth management and online banking. As a subsidiary corporation of the Chinese Alibaba Group, Ant Financial, with a valuation of $150 billion, is recognized as the highest valued FinTech company in the whole world (Kane Wu, 2018). In existence for only four years, Ant Financial has been regarded as the amalgamation of Alibaba's effort in pushing the development of innovation in FinTech over the last decade (Greeven and Wei, 2017). With the vision of "Bring small and beautiful changes to the world" and the mission of "Bring the world equal opportunities", Ant Financial is constantly committed to "Leverage the power of Internet and Big data", "Empower financial institutions to create ecosystem", as well " Serve SMEs and individual customers with safe and convenient inclusive financial services" (Alibaba Group, 2017). Ant Financial began its domination of the mobile and online payment sector in China as Alipay, which is founded in 2004 and acknowledged as the predecessor of the current Ant Financial. The scope of its businesses currently covers the payment, wealth management, financing, insurance and credit referencing with various services ranging from Alipay, Ant Fortune, MYbank, Zhima Credit, Ant Financial Cloud, Yu'e Bao and Insurance.

The expansion of Ant Financial's empire can be traced back to the establishment of Alipay by its parent company of Alibaba in 2004 as a safeguard to facilitate the online transactions on Alibaba. By 2006, more than 40 major Chinese banks with over 66000 China Post's locations agreed to establish a comprehensive strategic partnership of cooperation with Alipay, so that users of Alipay can fund

their accounts at any post across the whole country (Greeven and Wei, 2017). Afterwards, the lack of efficient online payment infrastructure made Alipay an indispensable tool penetrating into urban regions of China at an impressive speed, backed by the low-price logistics services. In the year of 2007, the active users of Alipay reached over 50 million, surpassing the number of total credit card users of 30 million in China, and the number of active users doubled in 2008. In 2009, Alipay introduced its first mobile payment application. In 2011, Alipay obtained the license to operate as a nonbank payment system from the central bank of China after groping for the road of the precession for six years. 2014 was a remarkable year for the born of Ant Financial with the support of some prominent financial institutions after the restructuring of Alipay and the divestiture of Alibaba's loan businesses for small and medium enterprises (Zhu *et al.*, 2017).

Positioning itself as inclusive finance provider for individuals and SMEs, Ant Financial leverages the Internet and Big data to enhance the quality and efficiency of existing financial services, unfolding various financial services rather than resorting to the conventional financial systems. Zhima Credit was launched in the ensuing year as a social credit scoring system, combined with the set-up of Ant Credit Pay to provide small portion loans for individuals. Other services such as Ant Fortune for wealth management, Ant Financial Cloud for cloud services of financial institutions were rolled out consecutively. Ant Financial completed an astounding B series of Financing of US$ 4.5bn in 2006 to fuel its rural and international expansion. Till 2017, Ant financial has served 2bn global consumers in accumulative ten years covering over 70 countries and regions (Alibaba Group, 2017). Alipay has 520mn annual active users compared to 203mn active accounts of PayPal (Alibaba Group, 2017). Cumulative users achieved an unprecedented 330mn with a YoY (Year over Year) AUM (Asset under Management) growth of 17% per active user under the partnership of over 100 asset management companies and over 2600 fund products (Alibaba Group, 2017). The annual active users of Zhima Credit and Ant Credit Pay reached 100mn with 73% frequent users surpassing 46mn credit cards in circulation issued by China Merchants Bank (Alibaba Group, 2017). The development timeline of Ant Financial can be found in the appendix (see Appendix Figure 11).

By penetrating into every aspect of daily life, Ant Financial could generate more complete and dynamic data through the whole ecosystem. As in its Big data-based credit scoring system, data of

one consumer can be originated from its online shopping behaviour, bank loan default history and analyzed to create dynamic scoring of its worthiness. Big data analysis platform is now supporting the data analytic system in entire Alibaba ecosystem. In the single's day (November 11th) in 2017, data processed rate in Ant Financial Big data platform reached 322 PB/h. As Ant Financial was not involved in the BI (Business Intelligence) industry before, the process of Ant Financial to build applicable Big data analysis system had to start from the point zero. However, such experience in building entire Big data platform accommodating ecosystem in Alibaba has endowed engineers and managers in Ant Financial to comprehend Big data application in finance from a practical level, i.e. they had to fit Big data analytics to demand from various sectors in entire e-commerce ecosystem. Till now, the coverage of Big data analysis platform--Deep Insight has covered 54% of personnel in Ant Financial, which forms the vast majority of Ant Financial workers who need Big data analysis for their own tasks. Ant Financial is now pushing to provide Big data analytic infrastructure to all FinTech players through open-access platforms and open-source toolkits.

In the context of its own financial service prototyping, its world-class Big data technology enables Ant Financial to continuously employ data to feed the ecosystem, revamping the existing infrastructure of the financial sector and drive innovation through incubating innovative financial services to serve the underserved market segments.

LUFAX

Lufax (Shanghai Lujiazui International Financial Asset Exchange), founded on 2011 as an associate of China PingAn Group, is the largest one-stop wealth management platform ever for the online transaction of financial assets in China with the core business of P2P lending. Lufax constantly works on using technologies such as Big data and Machine Learning to establish advanced risk assessment and accurate risk control systems to provide more convenient and efficient low-cost financing and wealth generation services for its clients. Though Lufax has only P2P lending services at its initial stage, it started to transform itself towards a broader wealth management platform by collaborating with fund management companies, insurance companies and financial license holders to roll out more services for underserved market segments. Currently, Lufax occupies a 22% market share in the P2P lending sector with more than 30mn active users, and over US$ 43bn outstanding loans with an

expected yield of 8.4% (Harvard Business School, 2018). With an estimated value at US$18.5bn after financing in early 2016, Lufax attempted to file a listing to raise US$60bn through an initial public offering in Hong Kong Stock Exchange (Reuters, 2018a). Lufax, with its gargantuan estimated market price, becomes China's second most valuable FinTech firm straight after Ant Financial and one of the top three most valuable FinTech companies around the world.

Lufax's legitimate credit data has served as a key asset for its expansion and penetration. By leveraging advances in Big data, Lufax establishes its unique KYC system (Know Your Customer) and KYP (Know Your Product) to precisely match the product risk with the risk tolerance of users to realize intelligent recommendation for individual investors. Customer Big data in PingAn in the last decade in various financial services have paved the way for Lufax to lead in automated wealth management consulting. Lufax is the leading player in providing end-end customized automated wealth management in China.

ZHONGAN

ZhongAn (ZhongAn Online Property & Casualty Insurance), jointly founded by Ant Financial, Tencent and PingAn in 2013, is the first and largest completely Internet-based insurance technology (InsurTech) company with the mission of "Making financial life warmer". The three companies behind ZhongAn have granted ZhongAn privileged access to their massive troves of user data. With the proactive utilization of Big data, Cloud Computing, and Artificial Intelligence to collect extensive information, ZhongAn is able to gain an in-depth understanding of their users and tap unmet needs by rolling out specific services such as dynamic pricing, automated claims settlement and risk management based on various scenarios (ZhongAn Insurance, 2018).

ZhongAn Technology was launched in 2016 by ZhongAn with a special focus on leveraging the potentialities of technological advances to serve customers better, as well exporting and monetizing InsurTech capabilities to other insurers that are under the disruption of technology. With its rapid expansion in both scale and speed, a colossal business ecosystem was developed with the collaboration of 307 partners in 2017 to provide insurance products ranging from consumer finance, health, lifestyle consumption, travel and automobiles (ZhongAn Insurance, 2018). ZhongAn filed an application for IPO in Hong Kong Stock Exchange in 2017 and raised US$ 1.5bn for its further

development. In 2017, the accumulative users of ZhongAn have hit an astonishing 432mn (ZhongAn Insurance, 2018).

QuDian

QuDian (QuDian Inc.), founded in 2014, is a promising online micro-loan provider for small consumer credit in China with all transactions facilitated through mobile devices. It committed itself in utilizing of Big data-enabled advances to delivery personalized lending services for consumers who are underserved by conventional financial systems. Lack of credit data of young college and white-collar consumers and lack of operational efficiencies of obsolete banking systems have created enormous demands of small credit in China, which in opposite provide a favourable environment for QuDian to prosper in China. So far, QuDain has a cordial working relationship with over 1000 brands offering merchandise of 14 categories covering from electronics, home appliances, watches, etc. (Reuters, 2018b) Noteworthy, QuDian is an important partner of Ant Financial's giant ecosystem through facilitating transactions on Alipay consumer interface. With Big data enabled capabilities, QuDain can understand their underlying borrowers from perspectives such as purchasing behaviour and payment behaviour. Then it can formulate credit profiles with regards to the consumer's intention and the ability of credit payment. Thus, personalized credit products can be offered instantaneously with customized credit payment policies. QuDian has filed for an IPO at the NYSE in 2017 to raise up to US$900mn primarily for its strategic acquisitions, and borrower management (Felix Yang, 2017). Till 2018, QuDian has facilitated over 130mn transactions on their platform by providing micro-credit (Xiao and Ge, 2018).

The key indices of four case companies are summarized as below: (see Table 2). All the statistics are retrieved from the author's own data collection. Figures in Table 2 are valid till July 2018.

Table 2. Key Indices of Four Cases

Company	Core Service Segment	Valuation/ Market Cap (in billion USD)	Annual Revenue 2017 (in billion USD)	Market Share (in respective segment)	Registered Users (in million)
Ant Financial	Payment	**150.00**	**9.00**	**31.50%**	**622.00**
Lufax	Transaction and Capital Markets	**18.50**	**0.53**	**22.00%**	**33.00**
ZhongAn	Insurance	**2.00**	**0.78**	**31.60%**	**300.00**
QuDian	Lending	**1.64**	**0.20**	**N/A**	**62.00**

5.2 Comparative Analysis

5.2.1 Origins of Business Model Innovation

The innovation of business model can be triggered through diverse approaches. Nevertheless, there exists one common driver providing most of the external impetus for the innovation of business model of four FinTech organizations--Big data technologies. As China is leapfrogging towards the largest economy in the world, technologies are also advancing by leaps and bounds, providing people with more mature and extensive digital infrastructure and more ubiquitous connectivity. Meanwhile, the portable devices such as smartphones and tablet computers have provided the universal and persistent presence of access towards the Internet. By the end of 2017, people in China with access to the Internet has ballooned to around 772 million (Statista, 2018). Driven by the government projects of "Smart City" and "Wireless City", a dramatical escalation in the number of Internet users is anticipated. Pervasive Internet access has resulted in data abundance, which in turn leads to the prosperity of Big data technologies. Emerging Big data technologies have provided four companies with external opportunities to leverage the endless market potentiality that lurks out there beneath massive data streams. Ant Financial carves Big data technologies in their mission to declare their ambition in utilizing it to create a dynamic and uncharted digital ecosystem. ZhongAn uses Big data technologies to produce customized insurance service in different life scenarios. Lufax recognizes Big data technologies as an opportunity to improve the inefficient wealth management to give more accurate and targeted advice to optimize their interests by matching personal financial status with appropriate financial products; Big data provided QuDian with opportunities to establish a credit scoring system based on customer consumption behaviour and give optimized advice on payment by instalment. Combined with specialized and underserved customer focused demands, Big data technologies are able to solve existing problems and roll out new services.

Ant Financial

Another origin of Ant financial comes initially form the under-banked and unbanked SMEs and individuals with unmet demands. According to MSME Finance GAP (SME Finance Forum, 2017), 58% of more than 11mn formal SMEs in China are financially constraint due to lack of access to

traditional financial systems. As in a developing economy, SMEs are one of the most powerful momentum in driving the Chinese economic growth. SMEs account for 60% of GDP, 80% of urban employment and 50% of fiscal and tax revenues in China (DBS and EY, 2016a). Elimination of the narrowed financing gap and the hindered financing channels that plague the development of SMEs is of crucial importance in poverty reduction, social harmony and economic growth. SMEs in China are largely underfunding compared to large state-owned corporations in China. Making up over 60% of economic output, formal SMEs in China receive only 20% of loans issued by traditional banks (Harvard Business School, 2016). Due to the archaic financial system of banking systems in China, it is overwhelmingly difficult for SMEs to receive bank-disbursed loans without qualified collateralizable assets and detailed transaction records. Even if SMEs can successfully receive assistance through bank loans, the financial cost is much higher than that of large organizations. As banks are moving a little up ladder to take higher risks due to risk concerns caused by relatively opaque financials and low operational stability of SMEs, they will instead charge SMEs a higher risk premium through raising interest rates. The extending finance gap between SMEs and large corporations results in the burgeoning but unfulfilled demands of borrowings of SMEs. Besides the unmet needs of SMEs, ballooning individuals with more idle balances to deploy in China's transition towards a domestic demand-driven economy is not well served by China's comparatively lagging financial systems either (Lardy, 2016). The appetite of the wealthier cohort for investing and consumption is swelling continuously.

Additionally, establishing accessible and agile banking networks in rural areas is one of most significant issues during the progress of advancing the urbanization in China (see the appendix Figure 12 for the banking system of China). However, it consumes a tremendous amount of time and capital in directing such a huge project, and this attempt in bolstering the underserved rural residents met with little success so far (see Appendix Figure 13 for the Internet user distribution in China). The ignored demands of SMEs and individuals collectively creates external opportunities for FinTech players such as Ant Financial to revolute the existing business model of financial services. Beyond that, traditional financial systems have run into the problem of resemblance in products and services. Homogeneous and monotonous financial products and services are rolled out but with no attention

being paid to customers' actual needs and experience. EY conducted a survey based on over 2000 Chinese individuals to uncover the beneath elements of their changing perceptions from banks to nonbank financial players. It shows, individuals in China tend to be more satisfied with non-banks when it comes to customer experience, functionality and product innovation (see Appendix Figure 14 for the customer attitudes towards non-banking providers).

Diminishing expectations in the traditional banking sector and unmet demands of SMEs and individuals create external opportunities for non-traditional FinTech player Ant Financial. Ant Financial took these chances by creating an exceptional breadth of services with technology-centred support such as Big data.

LUFAX

Consumers in China tend to be more tech-savvy due to the continuous momentum of the digitalization tide. The ubiquitous use of portable devices has created a wealth of data, and the sheer volume of available data offers the external opportunity for Lufax to utilize the Big data technology and Big data enabled technology such as Artificial Intelligence to discover new business value lurking beneath the massive datasets and boost the efficiency of the current business model.

Besides the newly generated data, the main driver for the innovation of Lufax is the internal opportunity provided by its well-resourced parent company--PingAn. As China's largest and oldest life insurance provider, the scope of business of PingAn spreads across insurance, banking and wealth management. However, the stodgy businesses no longer can satisfy the ambition of PingAn. It tries to reach its tentacles into the FinTech sector in China with the assistance of advanced technologies. Hatched by PingAn, Lufax is considered as its attempt in its transformation towards an online financial powerhouse (South China Morning Post, 2018). Lufax can pick mature fruits form PingAn's decades of data accumulation, user foundation and brand reputation from PingAn 's vast territory in insurance, banking, and wealth management. At the end of 2017, PingAn 's Internet users reached 436mn, and retail finance users hit 166mn (PingAn, 2018), ranking as the most valuable insurance brand globally regarding brand investment, brand equity and brand performance with a brand value of US$26155mn in 2018 (PingAn, 2018).

China is in its transformation into the domestic consumption-driven economy, which will, in turn, boost the need for consumer lending. However, the underdeveloped securitization infrastructure is lagging behind the tide. The standardized and homogenous financial products provided by traditional financial service providers cannot feed the growing diversified needs of Chinese retail consumers. Bank deposits and financial products provided by banks are two common choices of investments for Chinese people. As the Chinese government lowered the interest rate due to its insufficient domestic demand in 2009, other investment alternatives with higher yields are needed by retail consumers.

Another external opportunity comes from its competitors, roughly 4335 platforms were scrambling to share a piece of the action in the asset management sector. While the whole market is quite fragmented with different priorities and filled with problematic platforms (as those who failed to comply with regulations). Lufax sees the opportunity in creating a one-stop platform to connect and collaborate with various segments under asset management regarding working with over 300 institutions. The internal and external opportunities have jointly constituted the origin for the BMI of Lufax.

ZHONGAN

China has featured some opportunities ultimately leading to more dynamic and breathtaking settings for BMI of insurance. Regulatory environment favouring the development of online insurance and revenue unrevealed in the addressable market of insurance industry comprises of major driving forces of the BMI of the insurance sector

As the Chinese government pins online services including online insurance as a new growth engine for the national economy, measured regulatory approaches have been undertaken to boost the innovation of the business model. The China Insurance Regulatory Commission has remained committed to approving online-only insurance licenses and encouraging innovation of disruptive products in an orderly manner (Swiss Re Institute, 2017). China Insurance Regulatory Commission gave online insurers with the permission of distributing insurance products in some provinces even without a formal license, as a licensed presence is an essential requirement to operate in those areas under traditional regulations. Beyond that, accommodative regulations that cover product disclosure,

risk management, website management and online marketing are rapidly formulated to adapt to new circumstances.

Another external opportunity is an underserved insurance market. China is one of the largest insurance markets with continuous growing momentum; anyhow traditional insurance carriers expedite products that only encompass several timeworn themes such as critical illness and automobile. The insurance penetration rate ranks just 49th around the world, which has a significant mismatch compared to its market size. Tailored and diversified insurance products designed for everyday life scenarios are sought by the current generation.

The above greenfield opportunities create a fertile spawning ground for the origin of ZhongAn. By integrating the critical technologies including Big data in its business, ZhongAn has a colossal repository of data which makes its BMIs possible.

QuDian

An untapped market is the major driver of BMI behind QuDian. Due to lack of credit scoring as well as inefficiency and rigidity of traditional banking systems, young workers and college students have nearly bare access to bank credit for some extra discretionary money. The market potential of the young and mobile active generations is seriously underestimated or even ignored. A more flexible option is urged to invigorates microloans in terms of business model to fulfil the increasing purchasing demand of young individuals.

Noteworthy, aggravating product homogenization resulted from the absent innovative capability of traditional credit issuers is another external opportunity for the origin of new credit scoring systems (Hui and Weimin, 2017). Personalized credit services based on the financial status of each customer have become an irresistible trend. Besides, the cumbersome and bureaucratic procedures of credit application also make conventional credit more inaccessible for the young. Cutting through the red tape is the common aspirations of people who want to borrow. Above external opportunities combined with Big data and Big data-enabled technologies, the perspicacious FinTech player QuDian is originated and rockets to popularity by expediting personalized credit.

The origins of BMI for four companies are illustrated as below: (see Table 3)

Table 3. Origins of BMI

Case Company	Mutal origin	Exclusive origin
Ant Financial	Big data & Big data enabled IT technologies	Underbanked SMEs and Uncredited Individuals
Lufax		Underserved individuals & organizations in Wealth Management
ZhongAn		Generic underserved Chinese insurance market and Policy favoring online insurance development
QuDian		Uncredited yong individuals with demand of financing channel

5.2.2 Core Elements of Business Model Innovation

The "Who" Question

Ant Financial

Ant Financial has their businesses mainly operated in China, and it tries to reach its tentacles to other countries in helping them build their local version of Internet financial service platforms. Foreign nations which are still at their infant stage of inclusive financing are welcomed by Ant Financial to share their vision in transforming traditional financial structure. The majority of customers are SMEs and individual consumers. SMEs and individual customers are at the base of the economic pyramid who make the most of contribution of the national economy and social stability. Ant Financial is committed to better tap into the market potential of the previously unnoticed clients. The sheer number of population and SMEs can generate the juggernaut size of data that contains market potentials unleashed only by Big data technologies.

Lufax

Lufax offers a broad set of online wealth management services to both individuals and corporates. Emerging middle-class with raising awareness and demands for wealth management comprises of the major customer segment of Lufax. Additionally, amidst the burgeoning middle class is a disproportionately large presence of digital-savvy consumers who exhibit a higher financial risks

tolerance and a greater propensity to spend than the older generation (DBS and EY, 2016b). Their requirements and reliance on the heterogeneity of wealth management services, as well as real-time and client-centric customer experience have made them a loyal customer base of Lufax. Besides Lufax's consumer business, Lufax also offers a matchmaking platform for corporates and financial institutions by linking up institutional investors with disposable wealth with borrowers including SMEs. Over 3500 products in tradable securities, mutual funds, insurance and fixed-income products sourced from financial institutions are provided on their online platforms, offering retail investors and corporates with various choices to invest. Interconnected platforms with broad product portfolio produce and consume real-time data at a quantum rate, indicating a more effective solution with the transformative power just as Big data to be adopted.

ZhongAn

Unlike traditional insurers who are still tied to legacy infrastructures, ZhongAn is the first truly online insurer which has digitalized their entire business model from service design to claims processing with the technological support of Big data technologies. Their extensive customer base is mainly comprised of tech-savvy individual clients. By moving the focus from property risks to more personalized consumption risks that involve in lifestyle consumption, travel, health consumer finance, and automobile, over 60% of ZhongAn's clients are mainly the younger generation with the increasing power of consumption that aged between 25 to 30. The biggest shareholders behind ZhongAn are Alibaba, Tencent and PingAn. A large percentage of ZhongAn customers are users of the above platforms. This unique network of distribution partners forms the user base of ZhongAn to a great extent. The synergies through the partnership of Alibaba, PingAn and Tencent provide ZhongAn with the unique and large user base to facilitate its Big data analytics.

QuDian

As an online micro-credit provider insuring small and short-term consumer credits, QuDian's dominant customers are the young individuals unserved and underserved by the conventional financial institutions due to their lack of sufficient credit records. With the need for discretionary spending, the users served by QuDian are mostly the youngers aged from 18 to 35 who are still during their transition from school to the workplace. Thus, with limited disposable income, they become

major clients of the microloan. In addition, QuDian is excessively relied on Alipay for acquiring users. Ant financial's Alipay is a critical source of customers for QuDian. QuDian has a strategic partnership with Alipay to open a dedicated channel on the Alipay interface. Thus, the majority of its borrowers are active users of Alipay, nearly two-thirds of its micro-lendings are facilitated on the Alipay platform (Bill Alpert, 2017).

The summary of the "Who" question can be found below: (see Table 4)

Table 4. Summary of the "Who"

Case company	Target Customer	Comment
Ant Financial	Individual customer & SME	Underbanked individuals and SMEs as majority of customer base
Lufax	Individual customer & SME & Organization	Individual customers and organizations as majority of customer base
ZhongAn	Individual customer	Tech-savvy midlle class as majority of customer base
QuDian	Individual customer (Youth)	College students and workplace freshmen as majority of customer base

THE "WHAT" QUESTION

ANT FINANCIAL

As evolved from Alipay, Ant Financial builds its entire service ecosystem centred on online payment. Till now the major profit of Ant Financial still channels from Alipay service fee (Wildau, 2016). Three major services provided by Ant Financial as introduced in the case introduction part of this chapter (Alipay, MYbank and Yu'e Bao) form the core services of FinTech system in Ant Financial. The foundation enabling Ant Financial to establish this system in only two years is its immense and direct involvement in Chinese financial service markets over the past decade. The original function of Alipay was only designed to facilitate the online payment in Taobao (2C) and Alibaba (2B) by filling the missing link in trust-building between people from both customer and seller sides. After the integration of multiple financial service providers in Alibaba which brought force Ant Financial, Ant Financial has been an enabler of the financial service provider in every aspect of daily life. Its application scenario has well extended beyond the original online payment requirement in Alibaba e-commerce system and is expanding to payment in-store and services ranging from payment in online

car-hailing to transactions in public services (payment of electricity bill for instance). Ant Financial is to leverage its advantage in years of experience in e-commerce to provide customized financial services for everyone in China. The key services of Ant Financial can be found in the appendix (see Appendix Table 8 and Figure 15 for key services and products of Ant Financial).

LUFAX

Lufax offers an online platform LU.com integrating its three major services: P2P lending platform Puhui facing individuals; Chongqing Exchange facing organizational asset management (focusing on local government financing in China); Qianhai Exchange facing institutional asset management (focusing on cross-border financing of Chinese companies). Originated from the one of the largest wealth management company—Ping An, Lufax has access to data generated from actual insurers and investors. Its parent company PingAn also serves as a potential endorsing power behind Lufax. The fact that Lufax is invested by PingAn can significantly enhance customer's confidence when using financial services provided by Lufax as a P2P lending platform is now facing regulatory issues and unpredictable default risk in China. With years of experience of PingAn in offering wealth and risk management for Chinese local governments, Lufax was able to start with a professional team taming the funds from institutional sides. As the most valuable data asset in China (data from the government) is rarely made open access, Lufax has the opportunity of gathering such data through its 2B asset source Qianhai Exchange and Chongqing Exchange. Unlike Ant Financial who is deliberately building daily scenarios of using Ant Financial, Lufax is pushing its data technology advancement to cover the entire finance sector in China, as what PingAn has been doing in the past decades.

ZHONGAN

As the first and only fully online insurance distributor, ZhongAn is a great master tailoring the niche products which encounter the routine pain points of people's daily life. Initially started with a shipping insurance product for merchants on some popular e-commerce platforms such as Alibaba's Taobao and Tmall, ZhongAn continuously expands its business towards five major market segments rolling out over 300 insurance products: lifestyle, travel, consumer finance, health and automobile. Typical lifestyle insurance covers e-commerce shipping returns, e-commerce shipping damage, phone damage and online payment account fraud. While, the star products under travel sector are flight delay

insurance, flight ticket change insurance and hotel cancellation insurance. Under the circumstance that the airport disturbances are so frequently happened and will cause great loss to passengers, travel insurance alleviates the problem through offering compensation for any unexpected schedule changes. Noteworthy, ZhongAn even carves out some specific health insurance against some specific diseases such as diabetes and cancer. ZhongAn also offers some interactive health insurance product such as "Walk to Wellness". By engaging users in the servicing process, ZhongAn can aggregate personal data on some critical indicators of some illness and connect it to its health insurance products (DBS, 2017). Through constant expansion of its product portfolio, ZhongAn penetrates all life scenarios to address the fundamental people's frustration on the uncertainties.

QuDian

As a pure online platform, QuDian offers both cash credit service (through LaiFenQi platform) and merchandise credit service (through QuFenQi platform). Digital cash credit comprised of 94% of its transaction volume, compared to the 6% of merchandise credit volume (QuDian, 2018). For cash credit service, the prospective borrowers can apply for unsecured lines of cash credits with short maturity on the QuDian platform and get cash disbursed into their Alipay accounts once approved. Cash drawdowns can also be repaid through Alipay accounts. To complement its cash credit products, merchandise credit services are expedited for prospective borrowers to finance their purchase of merchandise via QuDian's marketplace on an instalment basis. Partnering with over 480 merchandise suppliers and more than 1000 consumer brands, an expanding range of price-premium products ranging from home appliances to accessories and outdoor products are offered to fulfil the growing demand of its target customers (Qudian, 2017).

The key value proposition (key products/services) of four case companies are illustrated as below: (see Table 5)

Table 5. Summary of the "What"

Case Company	Core product	Ecosystem	Affiliated Ecosystem
Ant Financial	AliPay	Ant Fortune (One-stop personal investment and wealth management) Yu'e Bao (Money market fund) Zhima Credit (Social credit scoring system) MYbank (Internet banking) Ant Credit Pay (Online consumer credit portal for short-term credit services) Insurance (Insurance service platform) Ant Financial Cloud (Cloud technology platform)	Alibaba Group -Tmall (Premium Online shopping platform-2C) -Taobao (Online shopping platform-2C) -Alibaba (E-commerce platform-2B) QuDian ZhongAn; etc…
Lufax	Lu.com	PuHui (2C wealth management) Chongqing Exchange (2B risk and wealth management-primarily government financing) Qianhai Exchange (2B risk and wealth managemetn-primarily cross-boarder financing)	Ping An; etc…
ZhongAn	Lifestyle insurance (Shipping return insrance & Flight delay insurance)	Consumer finance (Credit gurantee and Consumer financing platform) Health (Clinic visits/Online Clinic visits/Dynamic pricing/Specific desease and Children Helath) Motor & Other (Comprehensive Motor insurance/Tyre damage)	Ant Financial; Tencent; PingAn; etc...
QuDian	Cash credit scoring (Laifenqi-literally meaning "Come and pay in installments")	Laifenqi (Cash credit scoring) Qufenqi (Merchandise credit scoring)	Ant Financial; etc…

THE "HOW" QUESTION

ANT FINANCIAL

At the time of Alipay, Ant Financial was mainly focusing on investing in technologies to consolidate its leading place in the market as sound/face recognition for mobile payment. After its official establishment in 2014, Ant Financial started to invest in almost any financial service which requires green-light license from the regulatory authority (Crunchbase, 2018). One key service of Ant Financial--its money market fund Yu'e Bao was launched at this time with the merging and acquisition of Tianhong Asset management. Yu'e Bao was devised to manage residual money in Alipay account under a relatively flexible regulatory environment at that time. It was also the first product from Ant Financial to transform from payment service provider to financial service provider. Users can invest or purchase multiple fund products in Yu'e Bao, which paves the way for Ant Financial to expand into business areas such as insurance and wealth management. Despite the

dissenting voices against Yu'e Bao, it has been rapidly growing as the government is pushing financial innovation from top-down. After its transition from payment service provider to wealth management, Ant Financial evolved into a new phase with infinite possibilities. The fundamental idea to expand its ecosystem was to penetrate into scenarios, i.e. scenarization (Ant Financial, 2016). Scenarios proposed by Ant Financial is now covering subjects from dinning to medical services (see Appendix Figure 16 for Ant Financial's scenarios).

Ant Financial has attributed the success of it in FinTech largely to scenarization. Any product designed in Ant Financial is useless unless it can fit into certain scenarios. Prototyping in the context of scenarization offers Ant Financial the capability of enhancing product awareness and customer stickiness, which in turn produced massive data for the company to utilize in other contexts. With data collected from multiple scenarios, Ant Financial is able to build a comprehensive credit system, i.e. Zhima Credit. As the operating credit system for individuals in China can hardly be described as perfect, Zhima Credit by Ant Financial offers the possibility for setting up a genuine credit system that covers almost every person in China. This system provides tailored services for creditworthy customers, which could significantly reduce the unnecessary cost generated during transactions. This system can again drive the users to stick to services in massive scenarios provided by Ant Financial, which formed into a closed loop (Chen, 2018). As data is the essential asset in Ant Financial, multi-dimensional and real-time data generated in the credit scoring process in different scenarios can be used for other overlooked applications such as what Ant Financial is concentrating on currently -- the rural business. Ant Financial is expanding its ecosystem not just in China but also overseas. Driven by the bonus appreciated during the scenarization process, Ant Financial is now pushing to gather and use data from its global market to build entire ecosystem based on its core services like online payment and credit scoring (Tim Tsang, 2016). It has now grown far beyond a single mobile app or an online payment platform. It can be easily foreseen that Ant Financial will survive even the whole payment system is overthrown at some point by technology advancement such as biometric enabled payment. Ant Financial is also investing in many "scenarios" that has not met its requirement of the user base in mobile and online market such as Internet-enabled health service and online education.

As put by the CEO of Ant Financial, Ant Financial is redefining the Internet finance in a whole new dimension as Finlife (Finance in massive scenarios) and TechFin (Ecosystem growth driven by data). To address the issue of how Ant Financial is innovating in the value creation, capture and delivery process within its FinTech ecosystem, the core idea of scenarization needs to be elaborated as this notion is what drives Ant Financial to innovate in technology especially Big data and what pilots the direction of investment of Ant Financial. The basic concept of scenariozation is to design product or service under the context of certain using scenarios. One scenario can be one online transaction on e-commerce platform or payment for delivery of take-out. The objective of embedding the service or product designed into certain scenarios is to provide customized and cross-platform user experience, thus retrieving data with higher dimensions. If customers and business operators are the nodes of the entire data set, the scenarios are the edges connecting and tagging these nodes. Data generated in one specific scenario can be analyzed for grouping the customers with surprising accuracy, which enables users of such data to locate a certain type of targeted customers. Such data can be used for pinpointing customers or categorizing existing customers for accurate and customized marketing. For example, car insurance is typically priced based on the value of the car to be insured. However, the driver or the owner of the car is the key factor affecting the loss ratio. Drivers with impulsive driving habits (data of which can be generated from the driver's navigation app) would be more likely to be compensated by the insurance company even the car itself might not be expensive. With the help of analyzed data from other scenarios, a driver with fine driving habit could get a larger discount when purchasing car insurance even when insuring a luxury car.

As a matter of fact, the original motive power for former Ant Financial (i.e. Alipay) to embrace Big data technology was simply the volume of data they were dealing with was way too gigantic. Realization of the power and value of Big data and relevant technologies in various scenarios inspires Ant Financial to go even further on creating value delivery network in its FinTech ecosystem. Big data generated in massive scenarios already existed (such as online shopping platform Taobao and Tmall) or invested by Alibaba itself (such as Didi car-hailing and E'leme take-out delivery) can be used to tag and group users for deeper level analysis in other applications. Ant Financial established a novel financial cloud platform without any predecessors in China. It is the key part of value creation

and delivery process in FinTech ecosystem of Ant Financial, as being cross business and cross scenario integrating platform. These financial cloud platforms enable engineers from Alibaba and other players in the market to extract on-demand insights from real-time and multi-dimensional Big data generated in the Ant Financial ecosystem. Such a platform with much lower technique requirement from engineers can significantly lower the entry barrier of using Big data from Ant Financial for any business managers involved or intending to participate in the FinTech ecosystem of Ant Financial. Capability to establish this data centred FinTech ecosystem and promote it to partners is rooted form its enduring effort in guaranteeing security and availability of data collected and analyzed.

Since its establishment, Alipay has been very cautious, and prude on the security of data as massive data collected by Alipay and its partners are directly correlated to the privacy of their users. Ant Financial is now lobbying with other cooperators to achieve strict legal data regulations regarding security of using Big data. Its technology advancement in Big-data based fraud risk management allows each node in its value delivery network to fully share and utilize Big data, in turn generating more data with higher dimensions for greater value capture. Bearing this in mind would help one rethink the role of financial cloud Ant Financial is building in its ecosystem. From the technology part, it serves as a sound and reliable cloud computing platform for both Ant Financial and its partners to analyze Big data with reliable access. Looking from the bigger picture, the financial cloud is to define industry standard in Big data analytics. Ant Financial is pioneering in safeguarding the collection, analysis and insight output of Big data from its entire ecosystem. For example, in the dining business, Ant Financial can safely allow its users of financial cloud lab to match and analyze data from Alipay to commence customized marketing strategies, data created in dining scenarios based on other O2O services can be again used for more accurate customer segmentation in the financial cloud platform. Establishment of such Big data-based cloud service requires talented experts in many sub-areas including sentiment analysis and data mining, many of which are the technology exerting points Alipay and Ant Financial has been investing for years. Such a platform is to reinforce its leading place in Chinese FinTech market by igniting value burst in the whole ecosystem. As in the example mentioned in the insurance business, it will no longer be a necessity for the managers to re-

organize their business to adapt Big data analysis. They can use without violating any personal privacy information massive data from Ant Financial cloud platform, data stored and analyzed in which were impossible for the insurance company to collect before. A customer with better creditworthiness is also rewarded with higher discount and easier access to financial services such as personal wealth management which was not originally designed by traditional financial institutes for every ordinary person. In the meantime, data dimension and value are not depleted in this process, customers and business partners involved provide massive data as well as more scenarios revealing the hidden value of such data, the process of which can shift value delivery and capture for Ant Financial and its partners in financial business.

If the financial cloud is to link every individual user and SMEs and renovate the delivery system involved in every 2O business, the credit scoring system is to reshape the financial landscape in China. As put by the leadership of Alibaba and Ant Financial, a comprehensive credit scoring system in China is their everlasting vision for financial service in China. Prototyping of this system has experienced trials and errors since the Alipay time. Now its leading place in using Big data to analyze creditworthiness of both enterprises and individuals allows Ant Financial to expand into the market currently described as "financial dessert" by many analysts. Ant Financial is now expanding its business line deeper into China, i.e. the rural areas and out of China, i.e. the international market. The internalization of Ant Financial is beyond the scope of this dissertation. Agricultural finance in China has long been the top issue in government policy-making process. With the rapid development of China's telecom industry, access to the mobile Internet is as easy as electricity and drinkable water in most rural areas in China. This is the technology foundation for Ant Financial to promote inclusive finance through farmers. More than US$15bn is invested in the agriculture sector in China with the profitability to be relatively lower than other sectors. Lower profitability further prompts farmers to abuse loans granted, which leads to higher default rates. With its inclusive crediting system, Ant Financial can provide farmers with WangnongLoan specifically designed for the rural market. Farmers can get up to 500,000 RMB (about US$72,768.9) loan simply based on their credit score in Ant Financial without any collateral. The maturity of the repayment is flexible ranging from 6 months to 24 months. Around this credit scoring system-based loan granting platform, more services based

on various scenarios are tailored for farmers such as Rural Taobao for online agricultural products selling and WangnongPay for online and offline payment. Now Ant Financial is providing loan service (WangnongLoan), insurance service (WangnongInsurance) and payment service (WangnongPay) to farmers and business operating in the agriculture sector, encompassing a financial service ecosystem covering the financial need from agriculture sector which has been long unnoticed by traditional financial services. Key building block in this system is the credit scoring system built on its leading Big data analysis capacity in Ant Financial. Big data is now enabling Ant Financial to explore possibilities of connecting rural market into its grand FinTech system. Ant Financial is cooperating with many supply chain providers especially those who play a significant role in the "Appliance to the countryside" campaign launched by Ministry of Finance years ago, in which process many home appliance manufacturers gained enormously in supply chain management in rural areas. By linking these supply chain providers with farmers and e-commerce ecosystem of Alibaba, Ant Financial gains data originated in financial service scenarios in agriculture which are highly correlated with need from financial service provider from downstream (insurance company using Ant Financial platform for instance). It also allows Ant Financial to re-organize logistic system of agricultural products with its Big data analytics experience originated from Alibaba, thus increasing customer sickness to Ant Financial's agricultural financial services.

The role Big data is serving in the process of Ant Financial building financial cloud, stepping into the rural financial market and linking customers to business is fundamental. Big data enables Ant Financial to recognize scenarios of data collection and analyze data from multi scenarios, which is deeply rooted in its excellence in data mining technology reservoir. Being an early adopter of Big data technology allows managers of Alipay and later Ant Financial to emphasize on the security of collecting and using Big data at the very early stage. Ant Financial now has gone far beyond simply benefiting from Big data, regulations and industry standards in Big data industry are much based on the pioneering work of Ant Financial. FinTech ecosystem built by Ant Financial based on Big data is helping individuals to gain more convenience in daily life (services are now being created in many unnoticed scenarios such as bike sharing), the SMEs to connect to more customers with accurately tailored products and services, the people who have not yet enjoyed bonus from Internet industry

boost in China (farmers for instance). The entire value creation, capture and delivery system in the FinTech ecosystem of Ant Financial is built up by Big data technologies and will keep innovating with the development of Big data technology.

LUFAX

As the author summarized in the literature review part, definitive characteristic of FinTech lies in the foundation of such service/product/start-up being information technology especially data enhanced technology. If Ant Financial is seen as more focusing on the Tech side, Lufax is what traditional financial service giant launched to compete against IT giants in China (Alibaba, Baidu, Tencent etc.) in the Fin side. As the leading financial service provider in China, PingAn group has already obtained licenses in almost every financial service under regulation. Its business expands from its core business in insurance to wealth management and securities. Data in PingAn group has been an important asset, especially in its insurance business. Holding the world's most valuable insurance brand, PingAn insurance is managing US$148bn by September 2017 (Malloy, Cohen and Woo, 2018). Data generated within such amount of assets has motived PingAn to transform from a capital-driven company into a technology-driven company during the past decades. To gain better value creation and capture in its core business of life insurance, Big data and Cloud Computing have been a priority in company's strategy landscape ever since the maturity of technology (Bien Perez, 2017). Before the era of FinTech, what PingAn has to consider as principal competitors are the traditional financial institutes in China, among which PingAn is in the leading place in terms of technology such as Big data enabled risk management and user experience customization. The burst of FinTech start-ups (especially start-ups focusing in P2P lending) and IT giants as Alibaba entering FinTech business denote the timing that PingAn is to continue its growth and profitability in a much greater battlefield. To fully leverage the power of technology such as Big data, Lufax was founded associated to PingAn Group. The advantage of Lufax is deeply rooted in PingAn's experience in credit assessment and wealth management. Lufax consists of three asset sourcing channels connected by one uniform platform. Three sourcing channels are dedicated for business 2C, 2B and government directed fundraising. The 2C channel is Puhui (literally meaning inclusive) which has been operated by PingAn for over a decade. Numerous credit assessment data and personal finance data has been

accumulated in the repository of PingAn. Big data enabled credit scoring in Lufax can render a higher level of redundancy in risk management with such volume of consumer data, setting aside that PingAn has been investing in Big data for years. The data analysis capacity inherited by Lufax allows Puhui to revise their credit models using actual borrower data, significantly enhancing its risk management capability. As an experienced player in the market, Puhui owns more than 200 physical branches offline. Debt collection can be more efficient comparing to its competitors only committing business online. Such an advantage allows Puhui to combine its strength in Big data with the mature O2O business model developed during the last decade to lower the ratio of fraudulence. The 2B and government asset sources offer Puhui with accessibility to the highest value asset in China, the volume of which is totalled around US$630mn. By incorporating the institutional asset sources in Lufax's FinTech ecosystem, high-quality assets from institutions can be distributed to hidden customer never been recognized. As in the case of China, the high-quality asset is valuable not only based on its true value, information of such asset is of high value also as information barrier in China's financial market is relatively high comparing to the US and Europe. Information asset gained in dealing with institutional assets are what Lufax really desires. Unlike Ant Financial who is trying to promote financial life for everybody through Big data technology, Lufax is trying to seize the most valuable data in China's financial market and locate customers with high quality.

Within the value creation, capture and delivery in Lufax, what it has always been emphasizing on is the financial service DNA. PingAn has more than 300 financial products on the shelf and is one of the most experienced dealers in China. What Lufax is renovating in the value chain firstly is to enhance its customer experience by the implementation of Big data platforms. By automated risk assessment from its cloud computing platform, loans and insurances facing individuals can be granted within seconds and no longer require the customers to step into their branches upon application. The P2P platform in Lufax can be more specific than ever in pinpointing unrevealing borrowers for those who require flexible wealth management. With wider accessibility and a higher level of risk management guaranteed by Big data analysis, Lufax can help smooth the fund channelling process in China. Automated transaction is never simply a matter of cost reduction in Lufax; it allows the larger volume of AUM (assets under management) in PingAn to be invested into scenarios which was not

even noticed by its real person dealers. Products and services in PingAn with minor profitability are also being channelled to customers with increasingly accurate user portraying by Big data analysis. Targeting the customers with the higher intention of adopting wealth management and assets unregistered with higher demand of being managed require the essential deployment of the Big data analysis. By far Lufax has achieved to refine their KYC (Know Your Client) and KYP (Know Your Product) systems using Big data gathered from other dimensions such as investor behaviour which was impossible to acquire by questionnaires. The new automated KYC and KYP systems form the pillar of "robo-advisor" system in Lufax, in which system investors are linked to financial products with an appropriate rating in Lufax's platform. The investments are more conservative with the risk level to be controlled at much lower level. The "robo-advisory" system also allows Lufax to offer tailored financial products regarding each investor at large scale and in short notice.

Lufax, born from PingAn, has long been early adopters of data technologies. Adoption and agile deployment of Big data-based systems enables Lufax to create and channel value to the most appropriate customers. Its products are reaching out to customers who have never used PingAn financial service. It is serving the individuals and SMEs who have a higher-level demand for financial products and financial institutes who seek value in some hidden assets.

ZhongAn

ZhongAn is at the forefront among the emerging disruptive and tech-oriented insurtech players by harnessing Big data analytics nearly at every stage of its value chain, including product design, underwriting and claims management.

Typical insurance value distribution process can be seen as an inside-out approach based on a linear model with brokers at the front end to market homogenous insurance products and carriers to underwrite and manage claims in the back. However, this out-of-date business model which served only a small portion of customers in China has been streamlined by ZhongAn's ecosystem partnership model. Typically, ZhongAn's value chain can be summarized as product design, product distribution, insurance underwriting, policy administration and claims management. The individuals can enjoy the insurance services provided by ZhongAn through its website, mobile application and its partners' platform. By simple registration, the clients can choose from the wide broad of ZhongAn's insurance

products to suit their personal demands and fill in the required and related information for the next step of underwriting. Noteworthy, the insurance products of ZhongAn are underwritten by ZhongAn but offered through its various partners. Though the internal policy administration enabled by technological gadgets such as Big data analytics, ZhongAn is able to delivery personalized, automatically and scenario-based claim management when things are running into the frustrating situations. The nodes that differ ZhongAn from traditional insurance merchants are imbedded in their product design, product distribution, and claims management.

For the product design, ZhongAn has altered the fusty mindset of traditional insurance organizations be shedding more lights on nonlife insurance. As a matter of fact, the nonlife insurance products offered previously have their nearly entire emphasize on those events that occur infrequently but once happened will incur major impact in policy holder's life. High insurance premiums were charged, making it not affordable for most people. ZhongAn pioneers an alternative vision of nonlife insurance by focusing on the real pain points of people's daily life with the technological assistance of Big data. As the author has mentioned above, ZhongAn is established through the partnership of three giants, respectively Ant Financial, Tencent and PingAn. Exceptionally benefited from the powerful backers that domains the FinTech sector, ZhongAn is able to tap into a vast trove of data of three shareholders with privileged access for their product design. Apart from external data, numerous historical transactions constitute the internal data about customer behaviour. A massive combination of external dan internal data acquired enables ZhongAn to conduct a data mining and data prediction on various potential changing scenarios to gain powerful insights into people's ubiquitous concerns. Innovative products such as phone damage insurance, fight delay insurance which have never existed before are gaining popularity in addressing real-life problems. Besides ZhongAn's scenario-based policies, Big data also enables the labour-light value distribution, with numerous analysts and actuaries being replaced by the implement of Big data analytics. Thus, Big data analytics furtherly results in lower insurance premiums to be charged. Premiums are so low that they can be paid from pocket money, hence given the name of ZhongAn 's business model of "pocket insurance" (Insead Knowledge, 2018). The data mining technologies also enable ZhongAn to constantly mine into the customer personality under the consensus with customers, so that it can enlarge the application scenarios of its

insurance products. As a crucial section of product design, insurance pricing and underwriting rules are also significantly impacted by Big data analytics. Various models and analysis such as claim analysis and correlation model are implemented with the aid of Big data technologies. Thus, ZhongAn can price its insurance products in a dynamic and real-time base. For example, the e-commerce shipping return and damage insurance are common value-added services at checkout on the mainstream e-commerce platforms now. Insurance premiums for shipping return and damage are dynamically calculated through mining into the data provided by ZhongAn's e-commerce partners, such as the merchant's reputation, the nature of goods and the purchaser's transaction records. Then, the predictive analysis allows an estimate of the risks of shipping return and damage. Thus, personalized and dynamic pricing of insurances based on dedicated Big data analytics can be offered to different customers.

For the product distribution, ZhongAn integrates the insurance service through bridging the gulf between the insurance provider and the online ecosystem. By forging collaboration with over 307 partners, ZhongAn leaps over the traditional boundaries of insurance products and deeply integrates into China's growing Internet economy. Insurance products currently are supplied through the online platforms of ZhongAn's ecosystem partners as part of a wider proposition, rather than a solo purchase bought in isolation. Alibaba's Tmall and Taobao offer add-on shipping return insurance and shipping damaging insurance at checkout to improve customer's purchasing satisfaction, while Ctrip offers travel-related insurance such as travel accident insurance fight delay insurance and hotel cancellation insurance provided by ZhongAn in the various travel package. The partner-integrated business model of ZhongAn is enabled through its highly specialized and effective utilization of Big data analytics. The strong data analytic capability allows ZhongAn to identify the dynamic demands of consumers from different partners and incorporate insurance services into the partner's online ecosystem. The integration of previously uninsurable risks into the various systems alleviates the real-life concerns based on different scenarios, and therefore promote the growth of ZhongAn's partner ecosystems. Nevertheless, data aggregated from its partners comprises of the core input for deep analysis and further prediction. This has created a virtuous cycle, in which all parties are beneficiaries.

For claims management, risk control and fraud detection have always been the central pivots. ZhongAn uses Big data analytics to make accurate risk predictions pooling its immense datasets on consumer behaviour. While it also results in more accurate fraud detection through understanding the patterns of user behaviour. Traditional insurance risk management puts emphasize on several simple indicators such as the annual income and the physical examination result, while multidimensional Big data analytics allows ZhongAn to see some unnoticed and embedded indicators from what can be effectively utilized for risk management. Apart from risk management, ZhongAn also masters Big data technologies to reduce the occurrence of fraud. By comparing the facilitated claim cases with those on-going cases based on hybrid data mining modes, ZhongAn can discover more abnormal and suspicious conduct, and then furtherly verify its legitimacy under underwriting rules. Beyond that, Big data analytics allows a standardized and unified risk rating, so that all clients are sequenced based on their rating. Therefore, ZhongAn can give higher priorities to customers who concern higher risks, promoting the claim management competency.

A generally more viable and affordable full stack tailored offering to consumers facilitated by Big data, along with ecosystem-based growth model by advancing win-win cooperation and seamless claims management, empowers ZhongAn's extraordinary grip on the insurance market. While other traditional insurance providers are still struggling with digital distribution and technology-enabled upgrade their portfolios, ZhongAn is already a leader at ecosystem-oriented innovation by leveraging data analytics.

QuDian

The primary mission of QuDian is to leverage the power of Big data technologies to personalize credit scoring and make it accessible to the unserved and underserved groups in China. The massive market potential as not exploited before now is being tapped with the power of Big data.

QuDian offers a convenient and user-friendly credit approval and servicing process to their customers through several steps. Purely automated online process enables QuDian to provide a simple but superior experience to its clients. Within seconds, prospective borrowers can receive the decision on their credit limits and repayment provisions. The Online business model of QuDian is illustrated through following steps: online application, data verification, credit decisioning, credit utilization,

serving and collection (see Appendix Figure 17 for the application process of QuDian). The first step is the online registration. Qudian's users and users channelled by Alipay initiate the application for the short-term credit after registration with the submission of their valid required information such as personal ID, phone number, and address for authentication. The very next thing after registration is the identity verification and fraud detection based on a broad range of external and internal variables. Typical internal data includes users' historical behaviour as they complete their registration, the submitted credit application, and repayment and delinquency performances accumulated from the previous facilitated transactions. While, typical external sources cover the clients' social network stability, online transaction records on certain leading Chinese e-commerce platforms and credit analysis provided by other parties such as the Ant Financial's Zhima Credit and the official anti-fraud service providers' PBOC score. Upon running a solid data verification, the applicants proceed to the next stage of credit assessment based on its proprietary credit assessment model and risk management system. Two different credit scoring methods are developed by Qudian for new borrowers and borrowers with facilitated credits on the platform, respectively A score and B score. A score incorporates data from external and internal sources of the new users to better evaluate the credit quality of potential borrowers. While B score system is utilized to better distinguish the creditworthiness of the applicants based on their previous credit records with QuDian. Once approved, the prospective borrowers can move forward and apply for the drawdown of their credit. Before the disbursement of the requested credits, the credit assessment model and risk management system of QuDian will review the submitted documents and conduct a re-evaluation on the creditworthiness to ensure the qualification of the borrower. The users will receive drawdowns within seconds after the approval of their requests. a personalized repayment schedule and payment reminder services will be automatedly be arranged to lower the delinquency rate. The application for the merchandise credit is roughly the same as the cash credit except that there are no particular credit limits for merchandise on its marketplace. By profiting from the interests generating from the cash credits and the merchandise credits, Qudian also charges for its intermediary services from its merchandise suppliers. The whole online model of QuDian is based on its robust credit assessment model and rigorous risk management system fueled by its highly effective and versatile master of Big data analytics. Basically,

QuDian utilizes Big data analytic technologies to analyze underlying patterns between the consumers'' consumption behavioural data and their willingness and ability for the credit repayment. Typically, the clients' behavioural data will never be taken into consideration during the risk assessment of traditional financial institutions. At the end of 2017, the accumulative borrowers of QuDian reached a spike of 6.9mn, among which 88.5% are repeated borrowers (QuDian, 2018). Massive data generated by the borrowers constitutes the core input of its Big data analysis and thus establish a solid system for credit assessment and risk management. For such analysis, data mining is extensively deployed to sift through the significant amount of data in its warehouses to derive associations between the credits profiles of the prospective borrowers and its underlying credit exposure. By deeply digging into the data extracted from the external and internal channels such as online transaction habits, historical records to honor an agreement and credit scoring provided by other parties, Qudian can establish credit profiles and assess the risks of inbound applicants with minimal labor cost. Then, predictive analysis assists Qudian in upending the traditional product-specific mindset to a more customer-specific mindset by rolling out more personalized services based on a more dynamic and meticulous understanding of the clients' financial risk profiles. As well, predictive analysis can help QuDian to forecast the borrowers' repayment willingness and possible delinquency rates so that QuDian can maximize their profits by the optimal fund allocation through the accurate match of risk profiles and credit limits. Combined with blacklist data form other institutions, QuDian can predict the possible defaulter and conduct a close monitor on them to control the default risk. Beyond that, Big data analytics also engage to perfect its credit servicing and collection process via continuous testing, validating, re-evaluation and optimization in response to changes in their funding partners or risk profiles of their clients.

By taking advantage of Big data, QuDian is able to offer the unserved and underserved Chinese younger generation with affordable and customized credit services instantaneously based on the users' online data exhaust. Plenty of solutions covering the whole value chain are enabled with the power of Big data technologies, leading to a significantly better-tailored user experience and the innovation of business model of QuDian .

The summary of the "How" can be found as below (see Table 6 and Figure 4). Table 6 summarizes the "How" by breaking the value chain down into value creation, value capture and value delivery movement. However, the boundaries between these three phases are blurred, some activities may cover more than one phases such as the claim management of ZhongAn Insurance. It is also unrealistic and unnecessary to pinpoint every activity in the certain process of the value chain. Nonetheless, it is quite evident that four organizations have different emphasizes on the different phases of the value chain. Figure 4 generalizes the dynamic virtuous cycle of utilization Big data to roll out business insights to fit customers into various scenarios, and customers, in turn, feed more dynamic data (data with more dimensions) into Big data pool. Scenarios for the customers to use products/services are piling up. One reason is the consumer economy transformation process in China (i.e. customers require a higher level of customized services in many aspects of daily life), the other reason is that Fintech players tend to create or invest on more scenarios which increase their market share through higher user stickiness. With increasing scenarios that Fintech can place their product/service in, data with more dimensions can be collected into the data pool, generating business insights with diversified value, which can be injected in the process of product/service design and generate more scenarios for products/services. The Big data analytics platform, in such process, evolves to be smarter (capacity to analyze the larger volume of data at a higher speed in colossal dimensions) and more readily accessible. Such process forms to a positive feedback loop, enabling Fintech players to innovate at holistic value chain and providing customers with better-customized user experience. Partnership and cooperation with the government on financing and regulatory decision making empower the Fintech players to utilize data from external sources, which further amplifies this Big data enabled positive feedback loop. The above-described process as illustrated in Figure 4 is what the author proposes as a generic BMI mechanism of Fintech in China from the perspective of Big data (the "Tech") interacting with Fintech.

Table 6: Summary of the "How"

Engine of Innovation / Process of Innovation / Case Company	Value Creation	Value Capture	Value Delivery
Ant Financial	Scenario-based product/service prototyping Financial cloud computing platform Social credit ccoring and cisk management		
Lufax	Big data analysis on historical data inhetied from PingAn ecosystem & Big data based KYC/KYP Robo-advisor system & Financial service devising experience in 2B/2C/2 Government		
ZhongAn	Cutomized insurance product design & Dynamic product pricing system & Partnership ecosystem with Alibaba/Tencent/JingDong Novel insurance product (Phone damage etc.) devising Big data-based risk control and management-claim management		
QuDian	Dynamic credit scoring (Speciallity at user without histocrical credit data) Agile system on product pricing and marketing		

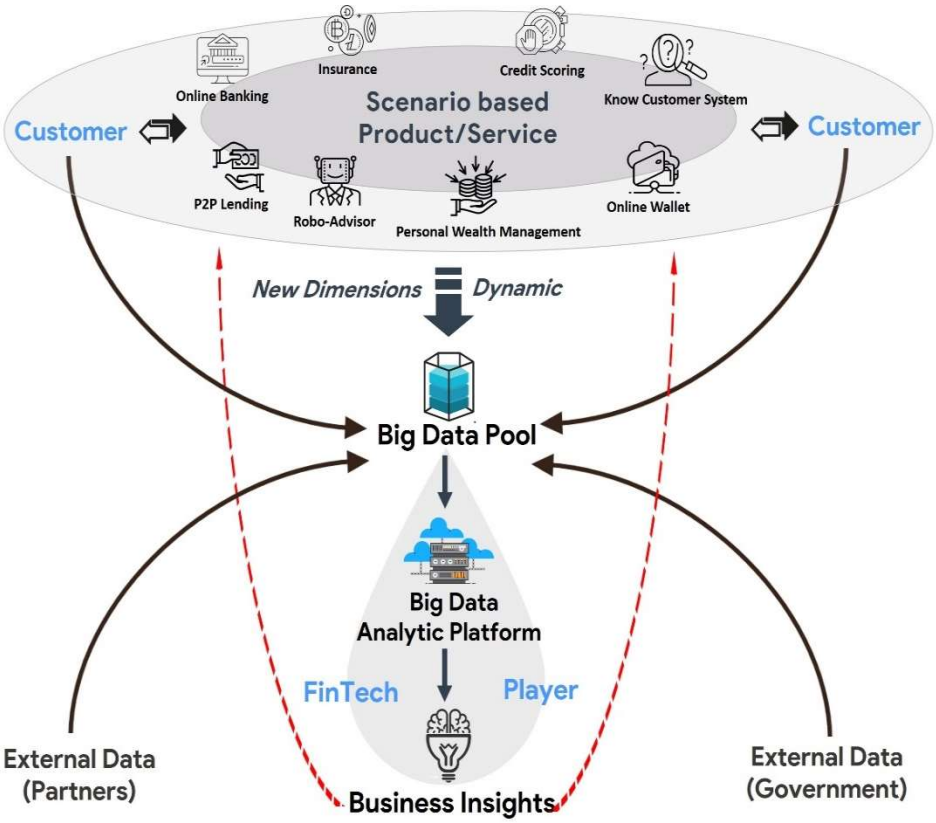

Figure 4. Virtuous Cycle of Big Data Movement

5.2.3 Types of Business Model Innovation

After the in-depth analysis on the core elements of a business model of four selected firms among the buoyant Chinese FinTech sector, it should be obvious that the whole landscape of the financial industry has been reshaped through those first movers. Based on our categories on types of BMI, the innovation of Ant Financial, Lufax, ZhongAn and QuDian can all be classified to business model redesign type. Ant Financial is redesigning its value proposition with its working experience in payment service to offer genuine inclusive financial service to everyone, from working class to businessman, from farmers to travelers to abroad. Underlying the power of Big data has set Ant Financial on the course to explore spontaneous data generation and collection for real-time and multi-dimensional analysis. With its cloud computing platform, Ant Financial is reaching out to individuals and SMEs who were undeserved customers in Chinese financial market as well as financial

institutions and large state-owned companies who urge the need to comply their business using Big data. By far the 2C business is still dominating in FinTech ecosystem of Ant Financial, it is not hard to foresee that grand vision of Ant Financial is to provide FinTech infrastructure in the Tech part with its Big data analysis power for the FinTech industry in China. Being leading in the Chinese financial market for years, PingAn might be the one that suffers most from regulatory uncertainty and immatureness of financial market. Lufax is able to redesign the whole service distribution process in PingAn and sell its products to customers who did not realize they had wealth management demand. What makes Lufax even more advantageous in the market is its agility comparing to most traditional financial institutes. Big data-based exchange platforms built by Lufax allow it to refine the general value delivery network originated from PingAn by channelling funds at a significant scale and controllable risk level. What drives Lufax to keep investing in data technology is the realization of data as assets, this is the reason why Lufax is not even planning to profit from its 2B platforms. Lufax is refining its financial service delivery network with Big data and AI, providing robust financial infrastructure in its FinTech ecosystem from the financial part.

As they are upfront market players with major dominance of its respective market segments, and thus has to redesign the whole business model of the current value proposition to the underserved customers. For ZhongAn, the increasingly connected ecosystem, along with the expertise in the utilization of Big data analytics, providing not only cornerstones to innovate the value chain of insurance with more affordable, accessible and personalized insurance products. For QuDian, with the acquisition of non-financial data on customers and adaptation on Big data technologies on credit assessment and risk management, it could considerably expand its business to the unreached lendable populations in China and offer superior user experience for the neglected.

The table in the below summarizes the type of BMI of four organizations with different highlights (see Table 7).

Table 7. Summary of Type of BMI

Case Company	Type of BMI	Remark
Ant Financial	Business Model Redesign	Redesign business ecosystem on online payment service to serve as scenario-based Tech infrastructure
Lufax		Redesign value delivery network with financial products from Ping An and Lufax itself
ZhongAn		Redesign insurance service ecosystem
QuDian		Resesign social credit scoring service for young generations

6. DISCUSSION

FinTech, a self-explanatory umbrella term, is a symbol reflecting the dynamic relationship of finance and technology in particular data technology. One can easily grasp the essence of FinTech even at first glance at it, which is the combination of Finance and Technology. A rigorous definition of the term, however, is hard to be sought. The author's literature review section offers one broad generalization of FinTech as an academic term leaving room for future revision: FinTech is defined by the weight of IT technology (Data technology specifically) embedded within the financial services provided by either a grown enterprise or a start-up even one newly set-up department affiliated to them. What singles out FinTech from infinite enterprises and start-ups offering financial services lies in that FinTech is defining its service or product based on massive utilization of IT technology. IT technology in this context has taken the leading place in this constant innovation of the finance industry. Bearing this in mind, screening of markets with the tremendous potential of being the leading player in global FinTech industry would naturally coincide with one of the two criteria: 1) well-developed IT infrastructure for the data technology to boost finance sector; 2) demand and capability of driving financial innovation. Chinese financial market is among the few who meet both criteria with years of dedication in building a comprehensive nationwide IT infrastructure and the significant market gap in financial services. This uniqueness of Chinese financial market is the very reason why China is particularly interesting in this study.

Being the world's largest economy with growing Internet (including mobile Internet) penetration rate, China is wielding its unparalleled policy resources on mobilizing Big data industry to become a fundamental part of all industries. The modernization of the Chinese financial market under the condition that China is experiencing an economic transition period forms the other pillar supporting the boost of FinTech together with a substantial portion of underserved customers in the financial market. This to a certain extent elucidates the discrepancy between FinTech in Chinese market and FinTech in other markets as North America and western Europe. As in the case of China, most FinTech innovators are motivated by scenario-based applications and policy changes. Whereas in the case of the United States, FinTech players tend to build up technological superiority as a top priority,

i.e. more technology driven. It also enlightens on why India and other emerging markets as Russia and Brazil are among the most FinTech-popular markets as shown from the author's own co-occurrence analysis. Distinctive features in Chinese financial markets has brought forth peculiar FinTech industry, exemplifying a novel route of financial innovation for other emerging markets as well as embryonic sectors.

Despite the widely accepted fact that FinTech is disrupting and disintermediating Chinese financial market, the author still holds the opinion that FinTech in China is *en route* from financial disintermediator to facilitate financial reintermediation. In studies on FinTech in China, it is safe to say that all literature is studying the research body under the background of FinTech as financial disintermediator. However, FinTech platforms turn into another form of financial intermediator has been predicted in the P2P lending market in the United States (Vallee and Zeng, 2018). Balyuk and Davydenko (2018) conducted a return analysis of loan data concluding that they observe the P2P lending platforms in the United States are evolving into new credit intermediators. It is not surprising that Big data together with AI and other frontier IT technologies are becoming centralized marketplace in the new era. Big data enabled automated transaction as loan application grant, without investor possessing any personal information of borrowers, leads the investors to a "either in the market and follow the instructions of the platform (decision-making of which is based on data with a number of variables) or not investing at all" situation. This phenomenon is a far cry from what people are portraying of the novel online P2P platforms. As the FinTech platforms become the sole source for storing and analyzing data, users of such platforms will have no choice but to follow the automated generated advises. The author suggests that FinTech, as in the context of financial disintermediation, is either evolving into a new paradigm of reintermediator alone or be remaining in the process of financial disintermediation together with conventional financial institutes.

The central bank of China has announced several guidelines and regulations on the FinTech industry from insurance to online payment, the content of these regulations covers from detailed technological utilization (e.g. the method of protecting information privacy) to general industry development policy. Though the stance of regulatory authority is taking has been eased over past years, which facilitated the boost of FinTech in China, it is now a consensus that direct and strict regulations should be posed

on FinTech companies. Justification of this possible policy change is a result of two combing forces: the lobby from conventional financial institutes (e.g. state-owned banks) and structural risk in some FinTech platforms (e.g. bankruptcy of many P2P lending platforms in China). Such momentum is hindering the process of FinTech disintermediating finance sector in China. However, one intriguing phenomenon here is that the government also intends to use the power of the Tech in FinTech (i.e. RegTech) to regulate FinTech industry.

Experiencing the boost of information with readily available data analysis technologies, it is easier for one to recognize the prominence of Big data and relevant technologies in finance sector than realizing how these technologies have tangled with the innovation of financial services. Permeation of Big data into each element of BMI, as illustrated in this study, compose one of the key characteristics of FinTech BMI in China. The author emphasizes on that major impact of Big data technology is on the general value creation, capture and delivery network innovation in Chinese FinTech industry. Big data is facilitating FinTech players on reaching out to customers as well as service scenarios notably overlooked by traditional financial institutes, unfolding infinite possibilities for every player in the value creation, capture and delivery network. Booming of customized financial experience from P2P lending to online insurance assessment is indispensable subject to the financial innovation initiated by Big data technology. One term repeatedly occurred in the case study is scenarization, defined by that prototyping of product or service in many FinTech players in China are inspired by specific application scenarios. The author suggests that this is likely due to the explosion of data technology deployment in China are aggregated in time and in the industry segment. Unlike the United States, Big data-centric data technologies in China were adopted by companies from multiple industries in a very short period, i.e. around 2013. Such explosion of data technology requires the companies adopting them to prioritize on locating the missing link between profitability and data technology. The solution most Chines FinTech players have reached, as shown in the case study, is to discover even to create scenarios for Big data application. Many have experienced profit or market share growth by virtue of scenarization process, during which they gained the most valuable asset way beyond their original vision-gigantic volume of multi-dimensional data generated by actual users involved in massive scenarios. The scenarios such as mobile payment in retail stores, renting sharing

bikes for commuting, apply for loans from online platforms etc. couple into an ecosystem of FinTech covering universal financial activity of Chinese. The author suggests that BMI of FinTech in China is enabled and refined by Big data, driven and inspired by scenarization, embedded within ecosystem construction.

Evolution direction of FinTech industry in China is almost impossible to forecast as the regulatory volatility is rather high within the Chinese financial market. Identification of some clues implying the roadmap of FinTech evolution is notwithstanding possible. Findings from case studies in this study implicitly bring about the possible divergence of Chinese FinTech market leaders. As already put by leadership in Alibaba, Ant Financial will focus on the Tech dimension of FinTech, leaving the Fin part to be complemented by partners with experience in providing financial services. Reports on Lufax and PingAn group also confirm the attitude of Lufax to be more Fin centred as it has well-developed experience in providing financial products over a decade and cooperating with policy-makers in government. Despite the fact that FinTech is fundamentally dependent on the application of IT technology especially data technology, the choice on which course to set on is rooted in the existing business model one FinTech player is adopting. Technology-driven companies as Alibaba and Google tend to ride on the wave of FinTech with their technological superiority to disrupt current business models in the finance sector, financial service-driven companies as PingAn and multi-national banks tend to strength their advancement as a financial service provider by the adoption of novel data technology. As stressed by many including this study, innovation of business model is not just inevitable but also a continuous process driven by multiple factors. The future of FinTech is, as the author of this dissertation can foresee, is a complementary course involving above mentioned two types of FinTech evolution directions. Traditional financial institutes and novel FinTech players together with IT giants are to allocate their strengths and to build entirely new business models in the finance sector.

7. CONCLUSION

This section answers the research question based on the results from the multiple case study. Besides, the limitations of the research will be discussed, and related recommendations for future academic work will be elaborated. Additionally, the author also tries to briefly generate its implications from this research on the Chinese market for other emerging countries who are still struggling with existing financial business models such as India.

7.1 CONCLUDING REMARKS

This dissertation has undertaken a multiple case study on four case companies, each of which has the largest market cap in the leading four FinTech segments in China, the overarching purpose of the dissertation is to answer the initial research question:

How business model innovation is driven by Big data: The case of FinTech in the context of China

To answer the research question, three additional sub-questions are employed in the investigation of the underlying driving forces of BMI, the role of Big data in the process of BMI and the types of BMI respectively.

The research shows that the uniqueness of the Chinese market has provided a fertile ground for the bloom of FinTech. Generally, affordable and approachable access to Internet and mobile Internet services is available to the sheer population number, creating a blast of data streams for the prosperity of Big data technologies in the analysis and prediction of personal behaviors. Apart from that, the financial infrastructure of China is significantly lagging behind its process of urbanization, leaving numerous customers underserved and even unserved by the incumbent financial systems. Together with the Chinese transformation into a domestic consumption-oriented economic, the burgeoning middle level with increasing disposable funds cannot be satisfied with the homogenous products provided by the traditional financial institutions anymore. The heady mix of above explains the origins for BMI through Big data.

By implanting Big data analytics into three core elements of BMI, Chinese FinTech players are revolutionizing many facets of the financial services. Addressing the unmet demands of customers can help FinTech organizations in constantly fetching data for mining into the unleveraged

associations hiding underneath mass data. Big data can be served to roll out more dynamic services with significantly better matching accuracy and more friendly customer experiences. Increasing innovative scenario-based services are expediting to solve the real concerns of the modern time. In turn, facilitated transactions will inject more data with multiplying dimension into the customer data pool. Noteworthy, the collaborative relationship between the FinTech corporates in China help them to progress in an ecosystem-based model. Ecosystem-oriented growth enables them to capture and feed data in a mutually supportive manner, which conversely results in an expotential increase in data volume and diverse channels for services distribution. Briefly, a virtuous and sustainable circle has been established with the assistance of Big data technologies through dynamic data feeding mechanism between the three core elements of BMI. Hence, China's FinTech sector is ripe for financial inclusion.

One of the early ideas on this dissertation is to conduct an evolutionary analysis on how Fintech players are deploying specific Big data technologies and more importantly, the timing when thy deploy certain technology and consequences of such activities (e.g. different portions of R&D employment or profit growth). The author found it almost impossible to carry out such a study as Fintech players are leading the evolution of Big data technologies instead of simply utilizing mature technologies. As implied from the positive feedback loop comprising of scenario-based product/service (as shown in Figure 4), the author suggests that Fintech players in China are co-evolving with Big data technology. Fintech players are adding more dimension of Big data generated; data analyzed subsequently help to create more scenarios for the customers to use specific product/service and the Fintech players to gain an advantage in either market share or profit growth.

Nevertheless, the incorporation of Big data technologies into finance has overthrown the traditional business model of financial services and underpinning the success of China's FinTech dominance. Currently, China's FinTech sector displays a brand-new visage with full of vigor and vitality. As the potential for growth continues, China is poised to move beyond the point of disrupting business models. Leapfrogging developed nations in FinTech, China is expected to discover the unexploited land of financial services through its extensive experience.

7.2 LIMITATIONS

Admittedly, the research findings of this study contain several limitations rooted in the chosen research method and analysis framework. First, the results of this study are heavily determined by the author's interpretation of material collected due to the social constructionism ontology is chosen as a start point of whole research. Thus, the subjectivism is indicated when discussing FinTech and BMI by different researchers under the specific context of the Chinese market. Apart from that, the research solely relies on the collection of secondary data. Though the co-occurrence analysis is conducted to narrow the scope of the study and to select the case primarily, no primary data is included in the comparative case study. The lack of primary data may hinder the deeper exploration of the topic. As a result, a certain extent of inevitable bias is present in the data analysis and interpretation. Secondly, the bias may stem from the case selection. A two-step process based on the theoretical and purposive sampling method has been undertaken to sift the cases. Though the author selected the most representative four cases among the major nine emerging FinTech segments in order to keep the paper reasonably concise under the length limitations, different results may still occur if alternative cases in selected segments or more cases from other FinTech segments with different selection criteria are studied. Last but not the least, a framework developed on the base of two previous research frameworks is utilised in the multiple case study on account of its greater generalization and empirical sophistication comparing to other literature the author reviewed. Hence, giving emphasis on the origin, core elements and types of BMI is likely to depict a holistic and comprehensive picture of the role of Big data is playing, but different results are still highly possible once other BMI analysis frameworks are applied. Additionally, the research highlights the role of Big data in reshaping the relationship between financial services and technology; bare attention has been paid to how organizations keep abreast of the lasted wave of advanced technologies through open innovation by deploying multiple resources due to the space limit. Briefly, the ingrained limitations have resulted in this research as the interpretation of personal analysis rather than proven facts that can be generalized to depict the relationship between Big data analytics and BMI of FinTech in other economic regions.

7.3 Recommendations for Future Work

The body of this research is still an uncultivated land with enormous potential that deserves more academic and practical attentions. Here are some recommendations for future work.

As the author has mentioned in the limitations, different criteria in the case selection procedure may lead to different results. Hence, it is indicated that in the future a more comprehensive analysis based on whole FinTech industry can be conducted to gain more powerful insights into the role of Big data in the innovation of business mode. Or, alternative dimensions rather than market caps may be applied to select case.

Technologies, by trickling at first, now have become a rushing power flooding into the FinTech sector. The utilization of Big data analytics into financial services has displayed a disruptive power in driving the innovation of business model in FinTech industry. Big data remains its massive potential in leveraging a burgeoning volume of information, but which technologies are likely to be the next frontier for the new wave of innovation. Thus, as to future research, it may be recommended to shed lights on other advanced technologies such as Blockchain and Cryptocurrency that are advocated by current FinTech players to see how these technologies exert their power in promoting BMI.

Moreover, the marriage of finance and technologies has created unprecedented opportunities for organizations from various walks of life. However, from this research, it is not hard to find out that different FinTech players have different emphasis on the financial services and technologies. The relationship between “Fin” and “Tech” may determine the direction of evolution or even revolution of these organizations. Aggregated data generated by FinTech companies and the expertise in utilizing technologies may provide as the fundamentals for those companies’ expansion of current business operation and exploration of the unreached “blue ocean”. Thus, another interesting field of research to be studied may be the investigation of the relationship between the different emphasis of “Fin” and “Tech” and the corresponding routes of development.

7.4 Implications for the Other Emerging FinTech Markets

China is a successful FinTech leading player through spearheading an unprecedented penetration of Big data technologies into the BMI of FinTech sector, with India poised to follow. Same as China, India is a developing economy with sheer population size and ubiquity of Internet with the historical

FinTech adoption rate of 52% (surpassed only by China) and the expected FinTech adoption rate of 80% (the highest among all markets) (EY, 2017). However, the penetration of financial institutions is at the low level due to it rudimentary infrastructure, leaving enormous tech-literate population underserved and unserved. Moreover, India is at the frontier in biometric digital IDs with 1.17 billion Indians under registration with a digital ID, and its government has initiated an unprecedented demonetization of 86% in circulation high-value currency notes (The Knowledge@Wharton, 2017). Together, those initiatives help to speed up the tide of FinTech innovation in India. With so many in common, the research on how Big data impact the innovation of business model of FinTech in China has some meaningful implications for India.

Apart from perfecting the infrastructure for general informationalization, FinTech players in India should consistently work on acquiring data through squeezing unrevealed value form its colossal unbanked population by providing generally affordable and accessible services. Incorporated with its own biometric authentication, FinTech players in India can develop personal profiles for individuals with accumulated data for further Big data analytics such as fraud and risk management. Thus, together with their highly specialized capability in data science, they should find out underneath opportunities to roll out scenario-based services to alleviate the real pain points. Innovative data-driven solutions can overcome the barriers of inadequate infrastructure, insufficient operation efficiency and unsound credit scoring of traditional institutions. At this stage, their experience in outsourced SaaS industry can prove useful in customizing Internet services for its own financial services. With adequate ability to scale up, leading players in the FinTech sector in India can choose to support each other through dynamic and circulatory data feeding by taking an ecosystem-oriented approach. Through forming an amorphous agglomeration, inclusive financial services can be offered dynamically through more approachable services and multi-channel service distribution based on the ecosystem. Lastly, domestic giants with leading consciousness on the power of technologies, together with the wise Indian government with high willingness to innovate, should actively and bravely invest on FinTech start-ups and providing related supports for them to blossom.

BIBLIOGRAPHY

Alibaba Group (2016) *2016 Investor day report on Ant Financial*. Available at: https://www.alibabagroup.com/en/ir/pdf/160614/12.pdf.

Alibaba Group (2017) *Alibaba Investor Day*. Available at: https://www.alibabagroup.com/en/ir/investorday (Accessed: 26 August 2018).

Allen, F., McAndrews, J. and Strahan, P. (2002) 'E-finance: An introduction', *Journal of Financial Services Research*, 22(1–2), pp. 5–27. doi: 10.1023/A:1016007126394.

Alyst, A. N. (2018) *China Fintech Sector*.

Amit, R. and Zott, C. (2012) 'Creating Value Through Business Model Innovation', *MIT Sloan Management Review*, 53(53310), pp. 41–49. doi: 10.2139/ssrn.1701660.

Andersson, B. *et al.* (2006) 'Towards a Reference Ontology for Business Models', pp. 482–496. doi: 10.1007/11901181_36.

Anf Financial (2018) *Ant Financial Service*, *Ant Financial*. Available at: https://www.antfin.com/index.htm?locale=en_us (Accessed: 12 September 2018).

Ant Financial (2016) *Ant Financial Company Presentation*. Available at: https://www.alibabagroup.com/en/ir/pdf/160614/12.pdf (Accessed: 2 September 2018).

AskCI Consulting (2018) *Internet users in the rural areas of mainland China from 2013 to 2018*, *Statista*. Available at: https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/265158/number-of-Internet-users-in-rural-areas-in-china/ (Accessed: 13 September 2018).

Balyuk, T. and Davydenko, S. (2018) 'Reintermediation in FinTech : Evidence from Online Lending platform', *Ssrn*.

Banks, E. (2001) *e-Finance: the electronic revolution in financial services*. John Wiley & Sons, Inc.

Bien Perez (2017) *Chinese insurance titan Ping An to take on Internet giants as it evolves into a tech powerhouse*. Available at: https://www.scmp.com/tech/leaders-founders/article/2102567/chinese-insurance-titan-ping-take-Internet-giants-it-evolves (Accessed: 2 September 2018).

Bill Alpert (2017) *Banker Bulls Still Like Qudian, Despite China's Crackdown - Barron's*. Available at: https://www.barrons.com/articles/banker-bulls-still-like-qudian-despite-chinas-crackdown-1511807042 (Accessed: 27 August 2018).

Birkinshaw, J. and Goddard, J. (2009) *What Is Your Management Model?*, *MIT Sloan Management Review*. Available at: https://sloanreview.mit.edu/article/what-is-your-management-model/ (Accessed: 31 July 2018).

Bouwman, H. *et al.* (2018) 'The impact of digitalization on business models', *Digital Policy, Regulation and Governance*, 20(2), pp. 105–124. doi: 10.1108/DPRG-07-2017-0039.

Bouwman, H., de Reuver, M. and Nikou, S. (2017) 'The impact of Digitalization on Business Models: How IT Artefacts, Social Media, and Big Data Force Firms to Innovate Their Business Model', in. Kyoto: International Telecommunications Society (ITS) (14th International Telecommunications Society (ITS) Asia-Pacific Regional Conference: 'Mapping ICT into Transformation for the Next Information Society', Kyoto, Japan, 24-27 June, 2017). Available at: http://hdl.handle.net/10419/168475.

Bresnahan, T. F. and Trajtenberg, M. (1995) 'General purpose technologies "Engines of growth"?', *Journal of econometrics*. Elsevier, 65(1), pp. 83–108.

Brookings (2018) *What's happening with China's fintech industry?* Available at: https://www.brookings.edu/blog/order-from-chaos/2018/02/08/whats-happening-with-chinas-fintech-industry/ (Accessed: 22 July 2018).

Bucherer, E., Eisert, U. and Gassmann, O. (2012) 'Towards Systematic Business Model Innovation: Lessons from Product Innovation Management', *Creativity and Innovation Management*, 21(2), pp. 183–198. doi: 10.1111/j.1467-8691.2012.00637.x.

Carayannis, E. G., Sindakis, S. and Walter, C. (2015) 'Business model innovation as lever of organizational sustainability', *The Journal of Technology Transfer*. Springer, 40(1), pp. 85–104.

Casadesus-Masanell, R. and Zhu, F. (2010) 'Strategies to fight ad-sponsored rivals', *Management Science*. INFORMS, 56(9), pp. 1484–1499.

Chae, B. (2015) 'Insights from hashtag #supplychain and Twitter analytics: Considering Twitter and Twitter data for supply chain practice and research', *International Journal of Production Economics*. Elsevier, 165, pp. 247–259. doi: 10.1016/j.ijpe.2014.12.037.

Chen, F.-L. and Li, F.-C. (2010) 'Combination of feature selection approaches with SVM in credit scoring', *Expert Systems with Applications*, 37(7), pp. 4902–4909. doi: https://doi.org/10.1016/j.eswa.2009.12.025.

Chen, J.-S. and Tsou, H.-T. (2007) 'Information technology adoption for service innovation and firm performance', *Proceedings - ICSSSM'06: 2006 International Conference on Service Systems and Service Management*, 1(3), pp. 472–477. doi: 10.1109/ICSSSM.2006.320508.

Chen, L. (2016) 'From Fintech to Finlife: the case of Fintech Development in China', *China Economic Journal*, 9(3), pp. 225–239. doi: 10.1080/17538963.2016.1215057.

Chen, L. (2018) 'Ant Financial (A)'. Harvard Business School, pp. 1–31.

Chesbrough, H. (2007) 'Business model innovation: It's not just about technology anymore', *Strategy and Leadership*, 35(6), pp. 12–17. doi: 10.1108/10878570710833714.

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

Chiu, I. H. Y. (2016) 'Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets-Policy Implications for Financial Regulators', in *J. Tech. L. & Pol'y*, pp. 1–55.

Choi, T. *et al.* (2017) 'Recent Development in Big Data Analytics for Business Operations and Risk Management', *Ieee Transactions on Cybernetics*, 47(1), pp. 1–12. doi: 10.1109/TCYB.2015.2507599.

Chuen, D. L. K. (2015) *Handbook of digital currency: Bitcoin, innovation, financial instruments, and big data*. Academic Press.

Chung, W. (2014) 'BizPro: Extracting and categorizing business intelligence factors from textual news articles', *International Journal of Information Management*. Elsevier Ltd, 34(2), pp. 272–284. doi: 10.1016/j.ijinfomgt.2014.01.001.

Claessens, S., Glaessner, T. and Klingebiel, D. (2002) 'Electronic finance: Reshaping the financial landscape around the world', *Journal of Financial Services Research*, 22(1–2), pp. 29–61. doi: 10.1023/A:1016023528211.

Clemons, E. K. (2009) 'Business models for monetizing Internet applications and web sites: Experience, theory, and predictions', *Journal of Management Information Systems*. Taylor & Francis, 26(2), pp. 15–41.

Clemons, E. K. and Hitt, L. M. (2000) *The Internet and the future of financial services: Transparen cy, differential pricing and disintermediation*. Wharton School Center for Financial Institutions, University of Pennsylvania.

Cliff Sheng, Jasper Yip, J. C. (2017) *HITTING THE MOVING TARGET*.

CNNIC.n.d. (2017) *Penetration rate of mobile Internet users in China from 2007 to 2017*, *Statista*. Available at: https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/255552/penetration-rate-of-mobile-Inte rnet-users-in-china/ (Accessed: 13 September 2018).

CNNIC.n.d. (2018) *Internet user distribution in China from 2010 to 2017, by urban and rural regio n*, *Statista*. Available at: https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/265154/Internet-users-in-c hina-in-urban-and-rural-regions/ (Accessed: 13 September 2018).

Collis, J. and Hussey, R. (2013) 'Business research: A practical guide for undergraduate and postgra duate students'. Available at: https://books.google.com/books?hl=zh-CN&lr=&id=uPgcBQAAQBAJ&oi=fnd& pg=PP1&ots=haRk5qXbeu&sig=P73Ag2PhjDvY76c6jvg_pgVmz7c (Accessed: 22 July 2018).

Corbin, J. and Strauss, A. (2008) *Basics of qualitative research: Techniques and procedures for dev eloping grounded theory*. Thousand Oaks, CA: Sage.

Cox, M. and Ellsworth, D. (1997) 'Application-controlled demand paging for out-of-core visualization ', *Proceedings. Visualization '97 (Cat. No. 97CB36155)*, (July), p. 235–244,. doi: 10.1109/VISUAL.1997.6 63888.

Crunchbase (2018) *Ant Financial-Investments*, *Crunchbase*. Available at: https://www.crunchbase.com/o rganization/alipay/investments/investments_list#section-investments (Accessed: 2 September 2018).

Dahan, N. M. *et al.* (2010) 'Corporate-NGO collaboration: Co-creating new business models for dev eloping markets', *Long range planning*. Elsevier, 43(2–3), pp. 326–342.

Dapp, T. *et al.* (2014) 'Fintech–The digital (r) evolution in the financial sector', *Deutsche Bank Res earch", Frankfurt am Main*.

DBS (2017) *China Insurance Sector*.

DBS and EY (2016a) *The Rise of FinTech in China*.

DBS and EY (2016b) 'The Rise of FinTech in China', (November).

Deloitte (2016) *Driving FinTech innovation in financial services*.

Demil, B. and Lecocq, X. (2010) 'Business model evolution: in search of dynamic consistency', *Lon g range planning*. Elsevier, 43(2–3), pp. 227–246.

Desyllas, P. and Sako, M. (2013) 'Profiting from business model innovation: Evidence from Pay-As-You-Drive auto insurance', *Research Policy*. Elsevier, 42(1), pp. 101–116.

Domowitz, I. (2001) 'Liquidity , Transactions Costs , and Reintermediation in Electronic Markets', *J ournal of Financial Services Research*, 22(1–2), pp. 141–157.

Dorfleitner, G. *et al.* (2017) 'FinTech in Germany', in *FinTech in Germany*. 1st edn. Springer Intern ational Publishing, pp. 5–10. doi: 10.1007/978-3-319-54666-7.

Doz, Y. L. and Kosonen, M. (2010) 'Embedding strategic agility: A leadership agenda for accelerati ng business model renewal', *Long range planning*. Elsevier, 43(2–3), pp. 370–382.

Enterprise Innovation (2018) *Big data transforming Chinese businesses*, *Enterprise Innovation*. Availa ble at: https://www.enterpriseinnovation.net/article/big-data-transforming-chinese-businesses-22547440 (Access ed: 30 July 2018).

Ernst & Young (2017) *Unleashing the potential of FinTech in banking Contents*.

EY (2017) *EY FinTech Adoption Index*, *EY*. Available at: http://www.ey.com/GL/en/Industries/Financial-Services/ey-fintech-adoption-index.

Fan, S., Zhang, L. and Zhang, X. (2004) 'Reforms, investment, and poverty in rural China', *Economic Development and Cultural Change*. The University of Chicago Press, 52(2), pp. 395–421.

Felix Yang (2017) *The Cash Loan IPO Story, performed by Qudian, produced by Alibaba (Ant Finance) - Kapronasia*. Available at: https://www.kapronasia.com/china-capital-markets-research-category/item/904-the-cash-loan-ipo-story-performed-by-qudian-s-produced-by-alibaba-ant-finance.html (Accessed: 26 August 2018).

Finkle, V. (2018) 'Issue: Fintech Fintech'.

Florén, H. and Agostini, A. (2015) 'The Business Model Innovation Map : A Framework for Analyzing Business Model Innovation', *24th IAMOT Conference, Cape Town, South Africa, 8-11 June, 2015*, pp. 2192–2207. doi: 10.13140/RG.2.1.2357.3205.

Foss, N. J. and Saebi, T. (2016) 'Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go?', *Journal of Management*, 43(1), pp. 200–227. doi: 10.1177/0149206316675927.

Frame, W. S. and White, L. J. (2004) 'Empirical Studies of Financial Innovation: Lots of Talk, Little Action?', *Journal of Economic Literature*, 42(1), pp. 116–144. doi: 10.1257/002205104773558065.

French, S. and Leyshon, A. (2004) 'The new, new financial system? Towards a conceptualization of financial reintermediation', *Review of International Political Economy*, 11(2), pp. 263–288. doi: 10.1080/0969229042000167280 4.

Furst, K., Lang, W. W. and Nolle, D. E. (2002) 'Internet banking', *Journal of Financial Services Research*, 22(1–2), pp. 95–117. doi: 10.1023/A:1016012703620.

Gable, G. (2010) 'Strategic information systems research: An archival analysis', *The Journal of Strategic Information Systems*. Elsevier, 19(1), pp. 3–16.

Gambardella, A. and McGahan, A. M. (2010) 'Business-model innovation: General purpose technologies and their implications for industry structure', *Long range planning*. Elsevier, 43(2–3), pp. 262–271.

Gandomi, A. and Haider, M. (2015) 'Beyond the hype: Big data concepts, methods, and analytics', *International Journal of Information Management*. Elsevier Ltd, 35(2), pp. 137–144. doi: 10.1016/j.ijinfomgt.2014.10.007.

Gantz, J. and Reinsel, D. (2011a) 'Extracting Value from Chaos State of the Universe: An Executive Summary', *IDC iView*, (June), pp. 1–12. doi: 10.1007/s10916-016-0565-7.

Gantz, J. and Reinsel, D. (2011b) *Extracting Value from Chaos State of the Universe: An Executive Summary*, *IDC iView*. doi: 10.1007/s10916-016-0565-7.

Gassmann, O., Frankenberger, K. and Csik, M. (2013) 'The St. Gallen business model navigator'. IT EM-HSG.

Gattenio, C. A. (2002) 'Digitizing finance: Views from the leading edge.(Special Section: Digitizing Finance)', *Financial Executive*. Financial Executives International, 18(2), pp. 49–52.

Ghaziani, A. and Ventresca, M. J. (2005) 'Keywords and cultural change: Frame analysis of business model public talk, 1975-2000', *Sociological Forum*, 20(4), pp. 523–559. doi: 10.1007/s11206-005-9057-0.

Giesen, E. *et al.* (2007) 'Three ways to successfully innovate your business model', *Strategy & leadership*. Emerald Group Publishing Limited, 35(6), pp. 27–33.

Gomber, P., Koch, J.-A. and Siering, M. (2017) 'Digital Finance and FinTech: current research and future research directions', *Journal of Business Economics*. Springer Berlin Heidelberg, 87(5), pp. 537–58 0. doi: 10.1007/s11573-017-0852-x.

Greeven, M. J. and Wei, W. (2017) *Business ecosystems in China: Alibaba and competing Baidu, te ncent, Xiaomi and LeEco*, *Business Ecosystems in China: Alibaba and Competing Baidu, Tencent, Xiaomi and LeEco*. doi: 10.4324/9781315209142.

H2 and KPMG (2017) *2017 Fintech100*.

Harris, T. (2015) 'Credit scoring using the clustered support vector machine', *Expert Systems with A pplications*. Elsevier, 42(2), pp. 741–750.

Harvard Business School (2016) *Alibaba is disrupting a traditional Financial Services industry in C hina. – Technology and Operations Management*. Available at: https://rctom.hbs.org/submission/alibaba-is-d isrupting-a-traditional-financial-services-industry-in-china/ (Accessed: 26 August 2018).

Harvard Business School (2018) *Lufax: The World's Largest P2P Lending is Pivoting from Core Bu siness – Digital Innovation and Transformation*. Available at: https://digit.hbs.org/submission/lufax-the-worl ds-largest-p2p-lending-is-pivoting-from-core-business/#_edn2 (Accessed: 26 August 2018).

Hedman, J. and Kalling, T. (2003) 'The business model concept: theoretical underpinnings and empir ical illustrations', *European Journal of Information Systems*, 12(1), pp. 49–59. doi: 10.1057/palgrave.ejis.3 000446.

Hens, A. B. and Tiwari, M. K. (2012) 'Computational time reduction for credit scoring: An integrat ed approach based on support vector machine and stratified sampling method', *Expert Systems with Appli cations*. Elsevier, 39(8), pp. 6774–6781.

Herbst, A. F. (2001) 'E-finance: Promises kept, promises unfulfilled, and implications for policy and research', *Global Finance Journal*, 12(2), pp. 205–215. doi: 10.1016/S1044-0283(01)00028-X.

Hsinchun Chen, R. H. L. C. and V. C. S. (2012) 'Business Intelligence and Analytics: From Big D ata to Big Impact', *MIS Quarterly*, 36(4), pp. 1165–1188.

Huarng, K.-H. (2013) 'A two-tier business model and its realization for entrepreneurship', *Journal of business research*. Elsevier, 66(10), pp. 2102–2105.

Hui, G. and Weimin, Z. (2017) 'Individual Consumer Credit: Comparsion between China and Ameri ca', *Financial Forum*. Available at: http://www.cqvip.com/qk/81787a/200708/25485944.html (Accessed: 26 August 2018).

Insead Knowledge (2018) *ZhongAn's Micropremium Model: The Future of Insurance? | INSEAD Kn owledge*. Available at: https://knowledge.insead.edu/blog/insead-blog/zhongans-micropremium-model-the-futur e-of-insurance-9141 (Accessed: 2 September 2018).

Insurance Europe (2013) *The impact of insurance fraud*. Available at: https://www.insuranceeurope.eu /sites/default/files/attachments/The impact of insurance fraud.pdf (Accessed: 29 July 2018).

Jadhav, S., He, H. and Jenkins, K. W. (2017) 'An Academic Review: Applications of Data Mining Techniques in Finance Industry', *International Journal of Soft Computing and Artificial Intelligence*, 4(1), pp. 79–95.

Jeble, S., Kumari, S. and Patil, Y. (2016) 'Role of big data and predictive analytics', *International Journal of Automation and Logistics*. Inderscience Publishers (IEL), 2(4), pp. 307–331.

Jeppesen, S. (2005) 'Critical realism as an approach to unfolding empirical findings', *J Transdiscip Environ Stud*, 4, pp. 1–9.

Johnson, M. W., Christensen, C. M. and Kagermann, H. (2008) 'Reinventing Your Business Model. (cover story)', *Harvard Business Review*, 86(12), pp. 50–59. doi: 10.1111/j.0955-6419.2005.00347.x.

Kane Wu (2018) *China's Ant Financial raises $10 billion at $150 billion valuation: sources | Reute rs*.

Kanellos, M. (2016) *The Fourth V For Big Data*, *Forbes*. Available at: https://www.forbes.com/sites/ michaelkanellos/2016/10/11/the-fourth-v-for-big-data/#5304ea1f5909 (Accessed: 26 July 2018).

Keahey, T. A. (2013) *Using visualization to understand big data*, *IBM Business Analytics Advanced Visualisation*. Available at: https://pdfs.semanticscholar.org/3add/2d3d3ecf7641a4cc611deecb68403ed11b33.pd f.

Khan, M. and Khan, S. S. (2011) 'Data and information visualization methods, and interactive mech anisms: A survey', *International Journal of Computer Applications*. International Journal of Computer Ap plications, 244 5 th Avenue,# 1526, New York, NY 10001, USA India, 34(1), pp. 1–14.

Kim, H. S. and Sohn, S. Y. (2010) 'Support vector machines for default prediction of SMEs based on technology credit', *European Journal of Operational Research*. Elsevier, 201(3), pp. 838–846.

Kim, Y.-I., Ji, Y.-K. and Park, S. (2014) 'Social network visualization method using inherence relati onship of user based on cloud', *International Journal of Multimedia and Ubiquitous Engineering*, 9(4), p p. 13–20.

Kirkos, E., Spathis, C. and Manolopoulos, Y. (2007) 'Data mining techniques for the detection of fr audulent financial statements', *Expert systems with applications*. Elsevier, 32(4), pp. 995–1003.

Koen, P. A., Bertels, H. M. J. and Elsum, I. R. (2011) 'The three faces of business model innovati on: Challenges for established firms', *Research-Technology Management*. Taylor & Francis, 54(3), pp. 52 –59.

KPMG (2017) *The pulse of Fintech Q4 2017 - Global Analysis of Investment in Fintech*, *KPMG*. A vailable at: https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/02/pulse-of-fintech-q4-2016.pdf.

Kutler, J. (1993) 'Citibank is shedding individualistic image. Am Bank'.

Labrinidis, A. and Jagadish, H. V. (2012) 'Challenges and opportunities with big data', *Proceedings of the VLDB Endowment*, 5(12), pp. 2032–2033. doi: 10.14778/2367502.2367572.

Laney, D. (2001) *3D Data Management: Controlling Data Volume, Velocity, and Variety*, *Applicatio n Delivery Strategies*. doi: 10.1016/j.infsof.2008.09.005.

Lardy, N. R. (2016) 'China: Toward a consumption-driven growth path', in *Seeking Changes: The E conomic Development in Contemporary China*. World Scientific, pp. 85–111.

Lee, I. and Shin, Y. J. (2018) 'Fintech: Ecosystem, business models, investment decisions, and chall enges', *Business Horizons*. Elsevier, 61(1), pp. 35–46.

Lee, T. and Kim, H. (2015) 'An Exploratory Study on Fintech Industry in Korea : Crowdfunding Ca se', *2nd International conference on innovative Engineering Technologies (ICIET' 2015), Bangkok (Thaila nd)*, pp. 58–64. doi: 10.15242/IIE.E0815045.

Lee, W. S. (2006) 'Software evaluation research: Case study methodology designed research', *Univer sity of North Carolina at Charlotte, Department of Software and Information Systems. Last viewed June*, 16, p. 2006.

Leong, C. *et al.* (2017) 'Nurturing a FinTech ecosystem: The case of a youth microloan startup in China', *International Journal of Information Management*. Elsevier Ltd, 37(2), pp. 92–97. doi: 10.1016/j.ij infomgt.2016.11.006.

Li, P. P. (2012) 'Disruptive Innovation by Emerging Multinational Latecomers : The Mechanisms Un derlying the Trajectories of Catching-Up And Leapfrogging', *Emerging Multinationals Outward Investment from Emerging Economies*, (October), pp. 1–38.

Li, P. P. (2013) *Disruptive innovation in Chinese and Indian businesses: The strategic implications f or local entrepreneurs and global incumbents*. Routledge.

Li, Y., Spigt, R. and Swinkels, L. (2017) 'The impact of FinTech start-ups on incumbent retail ban ks' share prices', *Financial Innovation*. SpringerOpen, 3(1), p. 26.

Liang, Y. *et al.* (2004) 'System and method for object identification and behavior characterization ... ' Google Patents, pp. 1–34. doi: 10.1126/science.Liquids.

Liangyu (2017) *China Focus: China must accelerate implementation of big data strategy: Xi - Xinh ua | English.news.cn*, *XINHUANET*. Available at: http://www.xinhuanet.com/english/2017-12/09/c_13681389 0.htm (Accessed: 2 August 2018).

Liu, B. (2012) 'Sentiment analysis and opinion mining', *Synthesis lectures on human language techn ologies*. Morgan & Claypool Publishers, 5(1), pp. 1–167.

Loebbecke, C. and Picot, A. (2015) 'Reflections on societal and business model transformation arisin g from digitization and big data analytics: A research agenda', *Journal of Strategic Information Systems*. Elsevier B.V., 24(3), pp. 149–157. doi: 10.1016/j.jsis.2015.08.002.

Lu, T. and Tian, S. (2017) *Future of Finance The Rise of China FinTech*.

Magretta, J. (2002) 'Why Business Models Matter.pdf', *Harvard Business Review*, pp. 86–92. doi: 1 0.1016/j.cub.2005.06.028.

Mahadevan, B. (2002) 'A framework for Business Model Innovation', (January 2004), pp. 1–6.

Mahadevan, B. (2004) 'A framework for business model innovation', in *IMRC Conference, Bangalor e*, pp. 16–18.

Malloy, C. J., Cohen, L. H. and Woo, A. K. (2018) 'Lufax : FinTech and the Transformation of W ealth Management in China', pp. 1–24.

Markides, C. and Oyon, D. (2010) 'What to do against disruptive business models (when and how t o play two games at once)', *MIT Sloan Management Review*. Massachusetts Institute of Technology, Ca mbridge, MA, 51(4), p. 25.

Marolt, M. *et al.* (2016) 'Business model innovation: Insights from a multiple case study of Sloveni an SMEs', *Organizacija*, 49(3), pp. 161–171. doi: 10.1515/orga-2016-0015.

Martins, L. L., Rindova, V. P. and Greenbaum, B. E. (2015) 'Unlocking the hidden value of concep ts: a cognitive approach to business model innovation', *Strategic Entrepreneurship Journal*. Wiley Online Library, 9(1), pp. 99–117.

Massa, L., Tucci, C. and Afuah, A. (2017) 'A Critical Assessment of Business Model Research', *Ac ademy of Management Annals*, 11(1), pp. 73–104. doi: 10.5465/annals.2014.0072.

Matthew, W. S. E. F. (2013) 'Data Science, Predictive Analytics, and Big Data: A Revolution That Will Transform Supply Chain Design and Management', *Journal of Business Logistics*. Wiley-Blackwell, 34(2), pp. 77–84. doi: 10.1111/jbl.12010.

McAfee, A. and Brynjolfsson, E. (2012) 'Big data: The Management Revolution.', *Harvard business review*, (October), pp. 1–9. doi: 00475394.

McGann, S. T. and Lyytinen, K. (2002) 'Capturing the Dynamics of eBusiness Models : The eBusin ess Analysis Framework and the Electronic Trading Infrastructure', *15th Bled Electronic Commerce Confe rence eReality: Constructing the eEconomy*, pp. 36–54.

McKinsey (2011a) *Big data: The next frontier for innovation, competition, and productivity*.

McKinsey (2011b) *Big data: The next frontier for innovation, competition, and productivity*.

Mckinsey Global (2017) *The New Picture in Finance*.

Moon, W. and Kim, S. D. (2017) 'Fraud Detection of FinTech by Adaptive Fraud detection algorith m', in *Proceedings of The International Workshop on Future Technology*, pp. 36–40.

Morel, B. P. *et al.* (2018) *Fintech in Capital Markets 2018 : Boosting Productivity Through Technol ogy Innovation*.

Muhtaroglu, F. C. P. *et al.* (2013) 'Business model canvas perspective on big data applications', *Pr oceedings - 2013 IEEE International Conference on Big Data, Big Data 2013*, pp. 32–37. doi: 10.1109/ BigData.2013.6691684.

Ngai, E. W. T. *et al.* (2011) 'The application of data mining techniques in financial fraud detection: A classification framework and an academic review of literature', *Decision Support Systems*. Elsevier B. V., 50(3), pp. 559–569. doi: 10.1016/j.dss.2010.08.006.

Ngoufack, K. H. T., Nuyebga, E. T. and Haneef, S. (2018) 'ANALYZING AND COMPARING BU SINESS MODEL INNOVATION AMONG THE CATEGORIES OF SME'S IN AALBORG, DENMARK' .

Nowiński, W. and Kozma, M. (2017) 'How Can Blockchain Technology Disrupt the Existing Busine ss Models?', *Entrepreneurial Business and Economics Review*. Cracow University of Economics, 5(3), pp. 173–188.

Oracle (2013) *Bringing the Value of Big Data to the Enterprise*. Available at: http://www.oracle.com /us/products/database/big-data-appliance/value-of-big-data-brief-2008771.pdf.

Oracle & AICPA (2017) *Agile Finance: The New Operating Model for Modern Finance*. Available at: https://www.oracle.com/webfolder/s/delivery_production/docs/FY16h1/doc30/Agile-Finance-Revealed-Repor t.pdf?elq_mid=94856&sh=&cmid=WWMK160606P00031C0015.

Osterwalder, A. and Pigneur, Y. (2010) *Business Model Generation: A Handbook for Visionaries, G ame Changers, and Challengers*, *John Wiley & Sons*. John Wiley & Sons. doi: 10.1523/JNEUROSCI.030 7-10.2010.

Osterwalder, A., Pigneur, Y. and Tucci, C. L. (2005) 'Clarifying business models: origins, present, a nd future of the concept', *Communications of the Association for Information Systems*, 15(1), pp. 1–43. d oi: 10.1.1.83.7452.

Patton, M. Q. (1990) *Qualitative evaluation and research methods*. SAGE Publications, inc.

Perkmann, M. and Spicer, A. (2010) 'What are business models? Developing a theory of performati ve representations', in *Technology and organization: Essays in honour of Joan Woodward*. Emerald Grou p Publishing Limited, pp. 265–275.

Philip Chen, C. L. and Zhang, C. Y. (2014) 'Data-intensive applications, challenges, techniques and technologies: A survey on Big Data', *Information Sciences*. Elsevier Inc., 275, pp. 314–347. doi: 10.1016 /j.ins.2014.01.015.

Philippon, T. (2016) *The fintech opportunity*. National Bureau of Economic Research.

Picot, A., Reichwald, R. and Wigand, R. (2008) 'Information, Organization, and Management: The Corporation Without Boundaries', *Information, Organization and Management*. Springer, pp. 2–17.

Ping An (2018) *Company profile-About Us-About Ping An-Ping An*. Available at: http://www.pingan.cn/en/about/overview.shtml (Accessed: 26 August 2018).

Ping, Y. and Yongheng, L. (2011) 'Neighborhood rough set and SVM based hybrid credit scoring c lassifier', *Expert Systems with Applications*. Elsevier, 38(9), pp. 11300–11304.

Pohle, G. and Chapman, M. (2006) 'IBM's global CEO report 2006: business model innovation matt ers', *Strategy & Leadership*. Emerald Group Publishing Limited, 34(5), pp. 34–40.

PÓLKOWSKI, Z., DUTTA, N. and SAVULESCU, C. (2017) 'A HYBRID BUSINESS MODEL FR AMEWORK FOR IOT.', *Studia i Materialy Polskiego Stowarzyszenia Zarzadzania Wiedza/Studies & Pro ceedings Polish Association for Knowledge Management*, (86).

Porter, M. E. and Gibbs, M. ilustraciones (2001) 'Strategy and the Internet'. Harvard Business Scho ol.

Puschmann, T. (2017) 'Fintech', *Business and Information Systems Engineering*, 59(1), pp. 69–76. do i: 10.1007/s12599-017-0464-6.

Qudian (2017) *Registration Statement of Qudian Inc.* Available at: https://www.sec.gov/Archives/edgar /data/1692705/000119312517287443/d282719df1.htm (Accessed: 2 September 2018).

QuDian (2018) *InvestorRoom - Webcasts & Presentations*. Available at: http://ir.qudian.com/webc asts-presentations (Accessed: 2 September 2018).

Reinsel, D., Gantz, J. and Rydning, J. (2017) 'Data Age 2025: The Evolution of Data to Life-Critic al Don't Focus on Big Data; Focus on the Data That's Big Sponsored by Seagate The Evolution of Dat a to Life-Critical Don't Focus on Big Data; Focus on the Data That's Big'. Available at: https://www.se agate.com/www-content/our-story/trends/files/Seagate-WP-DataAge2025-March-2017.pdf (Accessed: 20 May 2018).

Reuters (2018a) *China's Lufax seeks $60 billion valuation with April Hong Kong IPO: SCMP | Reu ters*. Available at: https://www.reuters.com/article/us-lufax-ipo-valuation/chinas-lufax-seeks-60-billion-valuatio n-with-april-hong-kong-ipo-scmp-idUSKBN1F40DN (Accessed: 26 August 2018).

Reuters (2018b) *Qudian Inc (QD) Company Profile*. Available at: https://www.reuters.com/finance/stoc ks/companyProfile/QD (Accessed: 26 August 2018).

Reuver, M. de, Haaker, T. and Bouwman, H. (2007) 'Business model dynamics: a longitudinal, cros s-sectional case survey', *BLED 2007 Proceedings*, p. 28.

Robson, C. (1993) *Real world research: A resource for social scientists and practitioners-researcher s*, *Massachusetts: Blackwell Pushers*.

Rodríguez-Mazahua, L. *et al.* (2016) 'A general perspective of Big Data: applications, tools, challeng es and trends', *Journal of Supercomputing*. Springer US, 72(8), pp. 3073–3113. doi: 10.1007/s11227-015-1501-1.

Roome, N. and Louche, C. (2016) 'Journeying toward business models for sustainability: A conceptu al model found inside the black box of organisational transformation', *Organization & Environment*. SAG E Publications Sage CA: Los Angeles, CA, 29(1), pp. 11–35.

Ryu, S. (2013) 'Book Review: Predictive Analytics: The Power to Predict Who Will Click, Buy, Li e or Die', *Healthcare Informatics Research*, 19(1), p. 63. doi: 10.4258/hir.2013.19.1.63.

Sagiroglu, S. and Sinanc, D. (2013) 'Big data: A review', *2013 International Conference on Collaboration Technologies and Systems (CTS)*, pp. 42–47. doi: 10.1109/CTS.2013.6567202.

Saunders, M., Lewis, P. and Thornhill, A. (2009) 'Research methods for business students'. Available at: https://books.google.com/books?hl=zh-CN&lr=&id=u-txtfaCFiEC&oi=fnd&pg=PA2&ots=DwISCkOa6O&sig=zVkOJqYa9cynn7XP29nXpVpqfbk (Accessed: 22 July 2018).

Schaltegger, S., Lüdeke-Freund, F. and Hansen, E. G. (2012) 'Business cases for sustainability: The role of business model innovation for corporate sustainability', *International Journal of Innovation and Sustainable Development*, 6(2), pp. 95–119. doi: 10.1504/IJISD.2012.046944.

Schueffel, P. mname (2016) 'Taming the Beast: A Scientific Definition of Fintech', *SSRN Electronic Journal*, (December 2016). doi: 10.2139/ssrn.3097312.

Schuritz, R. and Satzger, G. (2016) 'Patterns of Data-Infused Business Model Innovation', *Proceedings - CBI 2016: 18th IEEE Conference on Business Informatics*, 1, pp. 133–142. doi: 10.1109/CBI.2016.23.

Shahrokhi, M. (2008) *E-finance: status, innovations, resources and future challenges*, *Managerial Finance*. doi: 10.1108/03074350810872787.

Shim, Y. and Shin, D. H. (2016) *Analyzing China's Fintech Industry from the Perspective of Actor-Network Theory*, *Telecommunications Policy*. doi: 10.1016/j.telpol.2015.11.005.

Siegel, E. (2013) *Predictive analytics: the power to predict who will click, buy, lie, or die*. 1st edn. Wiley Online Library. doi: 10.1016/B978-0-12-385930-3.00024-8.

Simser, J. (2012) 'Money laundering: emerging threats and trends', *Journal of Money Laundering Control*. Emerald Group Publishing Limited, 16(1), pp. 41–54.

SME Finance Forum (2017) *MSME Finance Gap*. Available at: https://www.smefinanceforum.org/data-sites/msme-finance-gap (Accessed: 26 August 2018).

Song, K. (2015) 'Investigation of Business Model on Fintech Payment System', *The e-business Studies*, 16(6), pp. 65–94.

Sorescu, A. *et al.* (2011) 'Innovations in retail business models', *Journal of Retailing*. New York University, 87(SUPPL. 1), pp. S3–S16. doi: 10.1016/j.jretai.2011.04.005.

Sosna, M., Trevinyo-Rodríguez, R. N. and Velamuri, S. R. (2010) 'Business model innovation through trial-and-error learning: The naturhouse case', *Long Range Planning*, 43(2–3), pp. 383–407. doi: 10.1016/j.lrp.2010.02.003.

South China Morning Post (2018) *Ping An Insurance to double dividend as profit soars 43 per cent | South China Morning Post*. Available at: https://www.scmp.com/business/china-business/article/2138078/ping-insurance-double-dividend-profit-soars-43-cent (Accessed: 26 August 2018).

Spathis, C. T. (2002) 'Detecting false financial statements using published data: some evidence from Greece', *Managerial Auditing Journal*. MCB UP Ltd, 17(4), pp. 179–191.

Statista (2018) *China: number of Internet users 2017*. Available at: https://www.statista.com/statistics/265140/number-of-Internet-users-in-china/ (Accessed: 26 August 2018).

Swiss Re Institute (2017) *Insurtech in China*. Available at: http://institute.swissre.com/research/library/Topic_Insurtech_in_China.html (Accessed: 26 August 2018).

Teece, D. J. (2010) 'Business models, business strategy and innovation', *Long Range Planning*. Elsevier Ltd, 43(2–3), pp. 172–194. doi: 10.1016/j.lrp.2009.07.003.

Teece, D. J. (2011) 'Achieving integration of the business school curriculum using the dynamic capa bilities framework', *Journal of Management Development*. Emerald Group Publishing Limited, 30(5), pp. 499–518.

The Economist (2017) *In fintech, China shows the way - The age of the appacus*. Available at: http s://www.economist.com/finance-and-economics/2017/02/25/in-fintech-china-shows-the-way (Accessed: 22 July 2018).

The Knowledge@Wharton (2017) *Why China Is Leading the Fintech Race - Knowledge@Wharton*. Available at: http://knowledge.wharton.upenn.edu/article/why-china-leads-the-fintech-race/ (Accessed: 6 Septe mber 2018).

Tidd, J., Bessant, J. and Pavitt, K. (2013) *Managing innovation. Hoboken*. NJ: Wiley.

Tim Tsang (2016) *How New Credit Scores Might Help Bridge China's Credit Gap | Center for Fin ancial Inclusion Blog*, *Center for Financial Inclusion*. Available at: https://cfi-blog.org/2016/06/06/how-new -credit-scores-might-help-bridge-chinas-credit-gap/#more-21411 (Accessed: 2 September 2018).

Tsai, B.-H. (2014) 'Examination of Ex-Dividend Day Trading Using Big Data of American Deposita ry Receipts', in *Advanced Cloud and Big Data (CBD), 2014 Second International Conference on*. IEEE, pp. 34–38.

Tufano, P. (2003) *Chapter 6 Financial innovation*, *Handbook of the Economics of Finance*. Elsevier Masson SAS. doi: 10.1016/S1574-0102(03)01010-0.

Vallee, B. and Zeng, Y. (2018) 'Marketplace Lending: A New Banking Paradigm?', *Ssrn*. doi: 10.21 39/ssrn.3102984.

Waller, M. A. and Fawcett, S. E. (2013) 'Data Science , Predictive Analytics , and Big Data : A R evolution That Will Transform Supply Chain Design and Management', 34(2), pp. 77–84. doi: 10.1111/jb l.12010.

Wang, G. *et al.* (2016) 'Big data analytics in logistics and supply chain management: Certain invest igations for research and applications', *International Journal of Production Economics*, 176, pp. 98–110. doi: https://doi.org/10.1016/j.ijpe.2016.03.014.

Wang, G. and Ma, J. (2012) 'A hybrid ensemble approach for enterprise credit risk assessment base d on Support Vector Machine', *Expert Systems with Applications*. Elsevier, 39(5), pp. 5325–5331.

Wang, L., Wang, G. and Alexander, C. A. (2015) 'Big Data and Visualization: Methods, Challenges and Technology Progress', *Digital Technologies*, 1(1), pp. 33–38. doi: 10.12691/dt-1-1-7.

Wang, X. (2016) 'FinTech in China ' s Capital Market Why FinTech is so Hot', pp. 9–13.

Weidi, P. (2015) 'Rview on the role of Big data in Internet finance', *Mnagagers (in Chinese)*, (7), p. 45.

Wildau, G. (2016) 'Ant Financial raises $4.5 bn in record fintech private placement', *The Financial Times. April*.

Wirtz, B. W. (2011) *Business model management*, *Instruments, D.P.,*.

Wirtz, B. W. *et al.* (2016) 'Business Models: Origin, Development and Future Research Perspectives ', *Long Range Planning*, 49(1), pp. 36–54. doi: 10.1016/j.lrp.2015.04.001.

Wu, X. *et al.* (2014) 'Data mining with big data', *IEEE Transactions on Knowledge and Data Engi neering*, 26(1), pp. 97–107. doi: 10.1109/TKDE.2013.109.

Xiao, L. and Ge, Y. (2018) *Fintech Focus: Qudian Adapts to New Environment - Caixin Global*. Available at: https://www.caixinglobal.com/2018-04-24/fintech-focus-qudian-adapts-to-new-environment-101238646.html (Accessed: 26 August 2018).

Yin, R. (2009a) *Case Study Research: Design and Methods*, *Sage Publication*.

Yin, R. (2009b) *Case Study Research: Design and Methods*. 4th edn, *Sage Publication*. 4th edn. Available at: https://rxvl7yxjt01.storage.googleapis.com/MDc2MTkyNTUzOA==01.pdf (Accessed: 22 July 2018).

Ying, L. and Mingxiong, L. (2013) 'Big data driven corss-discipline intergration in Finance sector of China', *Beijing University Business Review (in Chinese)*, 11, pp. 96–101.

Yu, L. *et al.* (2011) 'Credit risk evaluation using a weighted least squares SVM classifier with design of experiment for parameter selection', *Expert Systems with Applications*. Elsevier, 38(12), pp. 15392–15399.

Zalan, T. and Toufaily, E. (2017) 'The Promise of Finch in Emerging Markets: Not as Disruptive', *Contemporary Economics*, 11(4), pp. 415–430. doi: 10.5709/ce.1897-9254.253.

Zavolokina, L., Dolata, M. and Schwabe, G. (2016) 'FinTech – What's in a Name?', *International Conference on Information Systems*, (December), pp. 1–19. doi: 10.5751/ES-10144-230224.

Zhang, H. *et al.* (2015) 'The Application of Data Mining In Finance Industry Based on Big Data Background', *2015 IEEE 17th International Conference on High Performance Computing and Communications, 2015 IEEE 7th International Symposium on Cyberspace Safety and Security, and 2015 IEEE 12th International Conference on Embedded Software and Systems*, pp. 1536–1539. doi: 10.1109/HPCC-CSS-ICESS.2015.198.

ZhongAn Insurance (2018) *Who am I – ZhongAn Insurance*. Available at: https://www.zhongan.com/corporate/who/?lang=en (Accessed: 26 August 2018).

Zhou, L., Lai, K. K. and Yu, L. (2010) 'Least squares support vector machines ensemble models for credit scoring', *Expert Systems with Applications*. Elsevier, 37(1), pp. 127–133.

Zhu, F. *et al.* (2017) *Ant Financial (A)*. Available at: https://www.hbs.edu/faculty/Pages/item.aspx?num=52493 (Accessed: 26 August 2018).

Zott, C. and Amit, R. (2008) 'The fit between product market strategy and business model: implications for firm performance', *Strategic management journal*. Wiley Online Library, 29(1), pp. 1–26.

Zott, C. and Amit, R. (2010) 'Business model design: an activity system perspective', *Long range planning*. Elsevier, 43(2–3), pp. 216–226.

Zott, C., Amit, R. and Massa, L. (2011) 'The business model: recent developments and future research', *Journal of management*. Sage Publications Sage CA: Los Angeles, CA, 37(4), pp. 1019–1042.

APPENDIX

1. CO-OCCURRENCE ANALYSIS

1.1 PROCEDURES OF CO-OCCURRENCE ANALYSIS

Co-occurrence in this dissertation is to map out keywords who hold strong relations with our topic keyword FinTech. The primary task of this analysis is to identify how well-coupled the keywords as FinTech and Big data are within both business and technological domains. Secondary task of this analysis is to screen FinTech companies in China with higher exposure in the context chosen. The companies filtered out in co-occurrence will be candidates for the case study in this dissertation.

The co-occurrence analysis was conducted with Python and Gephi. Raw data were collected from two type of index databases. Raw data from science and technology domains was retrieved by acquiring all academic articles from SCI,EI and IEEE with keyword "FinTech" from 2000-2018. Raw data from the business domain was retrieved through downloading all news, academic articles and trade magazine articles in EBSCO from 2000-2018. The collection of data was limited by the fact that FinTech, as an emerging domain, is rarely covered in academic contexts. Total entry number of the data collected only reached 3000 with less than 500 from SCI/EI/IEEE. All the material was acquired with CBS-full text permission. TF-IDF processing was applied after transforming PDF files into readable text files. In each file, 10 keywords were extracted based on the score of TF-IDF. Selected 10 keywords were then permutated and combined to form keyword relationship network. All 10 keywords in each file were then combined into a source and target CSV file that can be imported into Gephi. N-gram was used to filter most of the stop-words and illegal characters. Two other datasets were generated by extracting the top 20 and 50 frequent keywords.

Since datasets containing 20 and 50 keywords were redundant with meaningless characters such as "world: and "journal volumes", final graph plotting was beyond the computational power of accessible devices, the author chose to focus on datasets with 10 keywords extracted from each article and commences data cleaning. The data cleaning was applied by creating an illegal word dictionary using already widely used NLPK package. Due to the author's limited coding skills, words with same roots such as forecasting, forecasts and forecast had to be manually edited in certain entries in the

CSV file. Cleaned data was then imported into Gephi. Fore key parameters were calculated using Gephi for final graph output: Modularity class, PageRank, Average node weigh degree and Average edge weight. Modularity calculation was to identify every sub-network center in the whole network and to apply more weight to those who serve as centers of multiple sub-networks. The author used this parameter to attribute different colours to those with higher Modularity class values. PageRank is a parameter to determine how important one certain node is by assuming that more important nodes would naturally receive more links from other nodes. The author used this parameter to filter out nodes with less significance, i.e. it will not alter the graph topology drastically even being removed. Average edge weight is plain and simple; it was used to identify the strength of one edge. It is shown on graph primarily by the thickness and distance of edges. The thicker edges refer to a stronger relationship. The shorter distance of edge is not necessarily equivalent to the stronger relationship between two nodes since the distance has more inherent parameters when the graph is laid out via different algorithms. The average node degree is determined by the number of relations, i.e. edges one node has. The average node weight degree is the number of the average degree ponderated by weight of edges connecting to this node. This was used to filter the important nodes with more "quality" connections. The color of different nodes and edges in the graph was determined by a module class calculation done by Gephi. The thickness of edges is, as above mentioned, determined by the importance and quality of relations between two nodes. The author manually edited colors of certain keywords to highlight their relative relationship in the whole graph. All three graphs are generated with Hu Yifan Proportional layout algorithm and adjusted for final output. The relationship strength of FinTech and other keywords was plotted from data extracted from the co-occurrence whole graph with edge weight. The code of TF-IDF is displayed as below. Original file is in .Py.

```
1.  #! /usr/bin/env python
2.  # coding: utf-8
3.  # author: Shanshan Wei
4.
5.
6.  import sys
7.
8.  reload(sys)
9.  sys.setdefaultencoding("utf-8")
10.
11. from collections import defaultdict
12.
13. import jieba.analyse
14.
15.
16. def get_file_content(infile):
17.     content = list()
18.
19.     with open(infile, 'r') as fd:
20.         for line in fd:
21.             content.append(line.strip())
22.
23.     return "\n".join(content)
24.
25.
26. def extract_tags(infile):
27.     content = get_file_content(infile)
28.
29.     result = defaultdict(lambda: defaultdict(float))
30.
31.     allow_pos = ('n', 'nt', 'nz', 'ni', 'vd', 'vn', 'v')
32.
33.     for word, weight in jieba.analyse.extract_tags(content, topK=5000,
34.                                                    allowPOS=allow_pos, withWeight=True, wi
    thFlag=True):
35.         result[word.word + "|" + word.flag]['TF-IDF'] = weight
36.
37.     for word, weight in jieba.analyse.textrank(content, topK=5000,
38.                                                allowPOS=allow_pos, withWeight=True, withFl
    ag=True):
39.         result[word.word + "|" + word.flag]['TextRank'] = weight
40.
```

```
41.     sorted_result = dict()
42.     for word in result:
43.         tf_idf = result[word]['TF-IDF']
44.         text_rank = result[word]['TextRank']
45.
46.         sorted_result[word] = tf_idf * text_rank
47.
48.     for t in sorted(sorted_result.items(), key=lambda t: t[1], reverse=True):
49.         word, value = t
50.
51.         tf_idf = result[word]['TF-IDF']
52.         text_rank = result[word]['TextRank']
53.
54.         print("\t".join([word, str(tf_idf), str(text_rank), str(value)]))
55.
56.
57. if __name__ == '__main__':
58.     if len(sys.argv) != 2:
59.         print("usage: %s <positive.txt>" % (sys.argv[0],))
60.         sys.exit(-1)
61.
62.     extract_tags(sys.argv[1])
```

1.2 FIGURE NOTATION

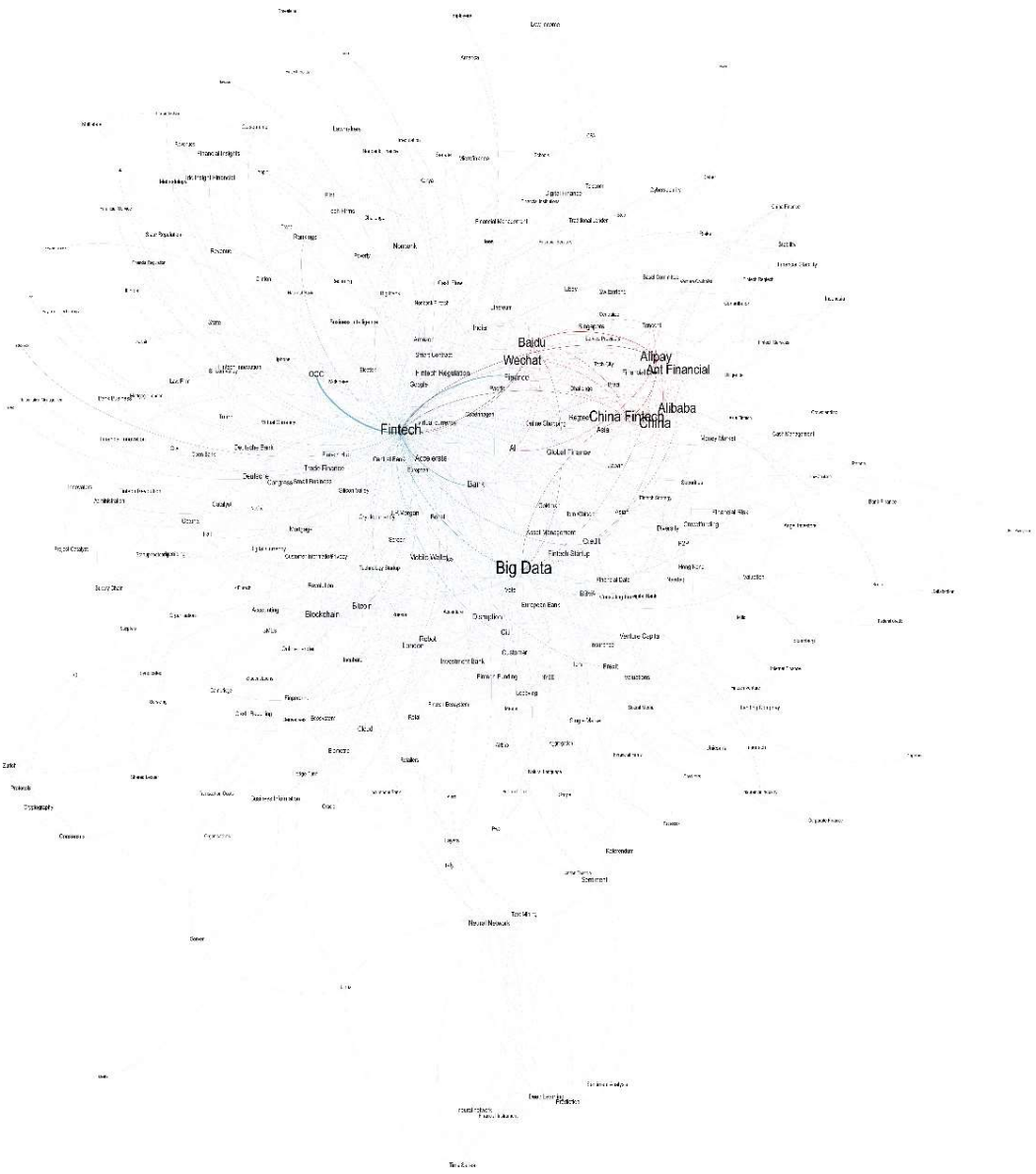

Figure 5. Full Graph of Co-occurrence Results
(Source: based on own analysis)

From Figure 5 China FinTech and its surrounding nodes as Alipay and Baidu have a strong relationship with primary keyword FinTech. Big data was serving as a key node to connect business notions as banks and insurance firms and technological terms as AI and robots. By zooming in on the center of the graph, a triangle was obviously composed by China FinTech, Big data and FinTech. This

is a clear indication that each time when China FinTech was mentioned in either mass media or academic articles, Big data related technologies were rather likely to be mentioned in the same text. It is also clear that stronger relationship occurs between FinTech and traditional financial terms as banks, insurance firms etc. This implies that FinTech is still balanced on the financial part. Around central keyword FinTech, there are multiple keywords relating to regulation, e.g. OCC (Office of the Comptroller of the Currency), Regtech and FinTech Regulation. A very strong relationship between OCC and FinTech indicates that although FinTech is surrounded by multiple terms relating to blockchain and cryptocurrency, the primary concern for the topic is still regulation and fear for future unsustainable development. FinTech is often described as a challenger to traditional financial organizations; this could explain why the one holds a second strongest relationship with FinTech is keyword Bank. In the China FinTech Cluster, the interrelationship between each keyword is much less strong than their relationship with Big data and AI. This indicates that Chinese FinTech giants from BAT (Baidu, Alibaba, Tencent) are focusing on AI and robotics at the moment and competing with each other more than cooperating with each other.

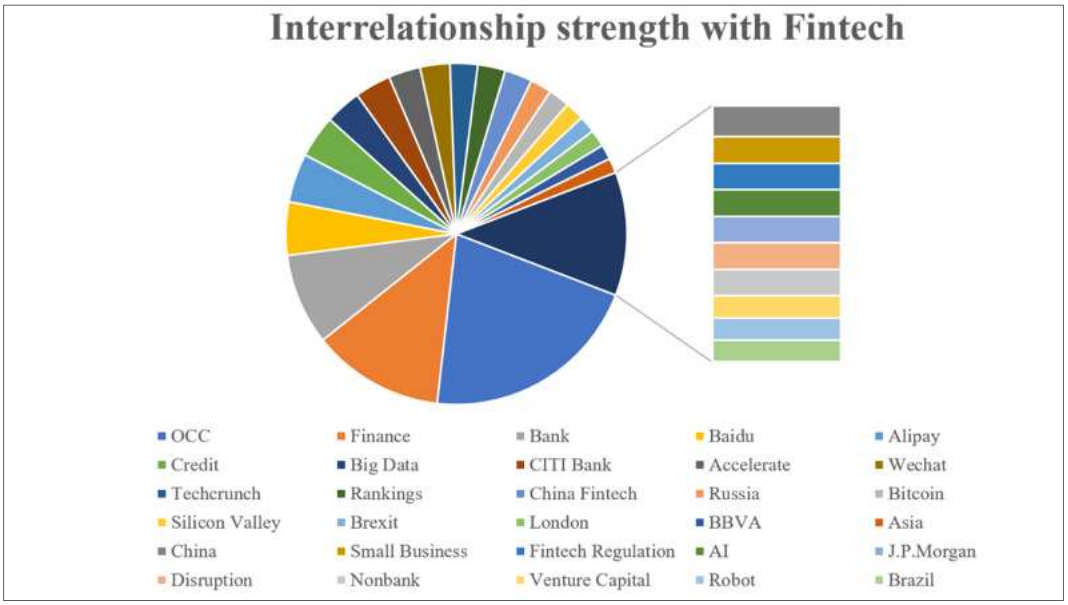

Figure 6. Interrelationship Strength with FinTech
(Source: based on own analysis)

Figure 6 is plotted using edge weight from co-occurrence whole graph. The author picked 30 edges connecting FinTech with high weight. From the pie graph although Big data does not hold the strongest relationship with FinTech, which is obvious from the whole graph, keywords above Big

data are primarily terms relating to finance. This is clear evidence that from the beginning of the birth of FinTech, Big data has been serving as the core technological elements of this new cross-disciplinary field. It is interesting that Brexit has a high weight in this pie plot which was not expected. From the whole graph, it was also interesting that both developed markets as the US and developing markets as Brazil, India, China are frequently occurred on the graph, not many Europe related keywords except for Deutsche Bank. The author views that this is due to that many FinTech firms operating a business in EU are based in the UK. The Brexit's impact on these firms is not yet fully released. Majority sentiment in the market is a concern for future situation development.

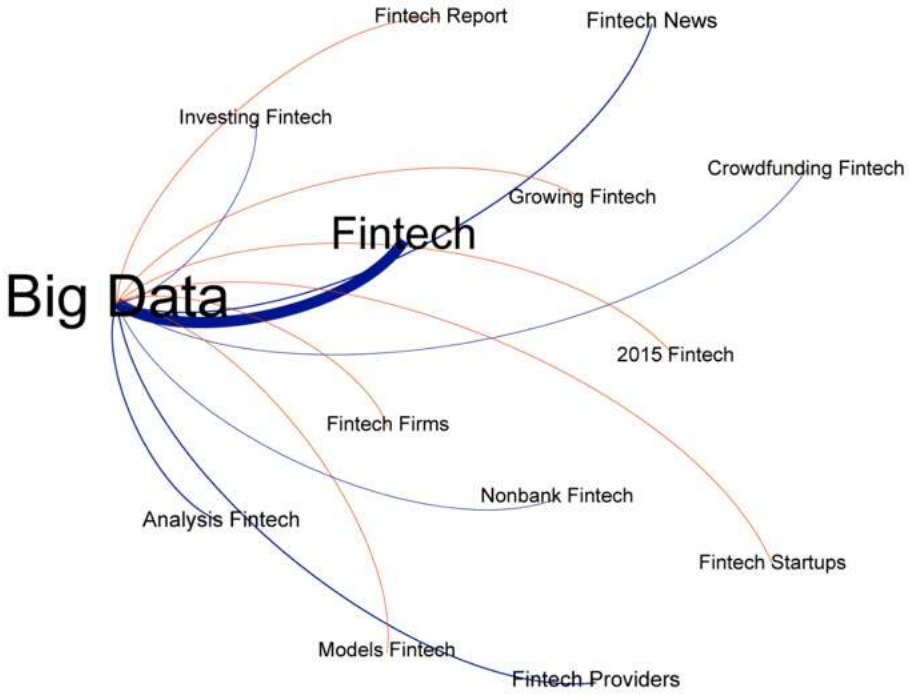

Figure 7. Partial Graph of the Co-occurrence Results with Focus on Big data
(Source: based on own analysis)

Figure 7 is plotted using Gephi by filter entries from TF-IDF results with both "*FinTech*" AND "Big data". This is to identify which areas of FinTech holds stronger relationship with Big data. In the co-occurrence whole graph, FinTech has a strong relationship with the bank, however, in this graph, only term involving bank is nonbank FinTech. This indicates that although FinTech has both positive and negative relationship with already existing big bank businesses, those who embrace new technology as Big data the most are nonbank businesses. Multiple keywords including words as

investing, growing and startups indicate that moving into FinTech business is still the mainstream by now. No dominating FinTech giants have grown yet even with numerous IT giants as Google and Facebook, financial giants as CITI and Deutsche Bank are investing to move into FinTech, the whole business is still a red ocean.

Figure 3 is plotted based on Figure 5, i.e. the whole graph of the co-occurrence network. By filtering in Gephi with PageRank and average node weigh degree, the author removes nodes with weak relations with FinTech and nodes with no strong community center feature. Figure 3 is mainly used to provide a clearer demonstration of the relations between FinTech, Big data and China FinTech related terms. Topology principle and calculation of the graph is the same as Figure 5.

2. Tables and Graphs in Introduction

- ### Internet Penetration Rate in China

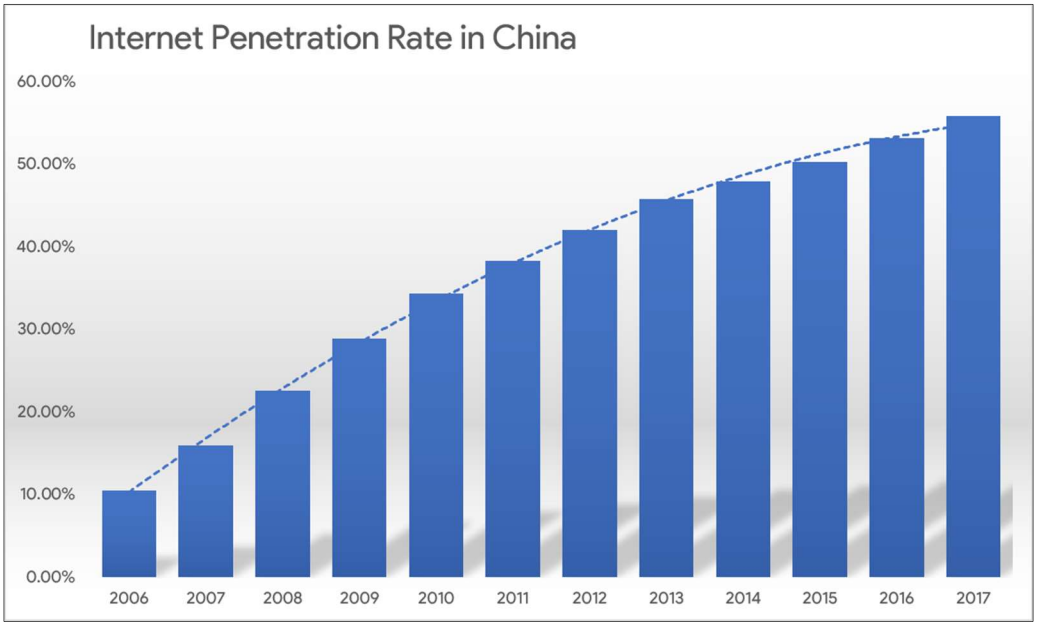

Figure 8. Internet Penetration Rate in China (Source: Statista)

The number in Figure 8 is obtained with CBS license from Statista (CNNIC.n.d., 2017). The Internet penetration rate is calculated as the percentage of the total amount of mobile Internet users (via cellphone) in China, with the total population of China as 1 and not adjusted by number of infants or

illiteracies. The Internet penetration rate of China in 2017 reached 55.8%, formulating 786.5 million Internet users in total. The fitted trend line (the blue dotted line) is calculated in Excel with second-order polynomial fitting. The fitted equation is not given as it's beyond scope of this dissertation. The trendline is plotted to imply the growth rate of Chinese Internet users.

- MOBILE INTERNET PENETRATION RATE

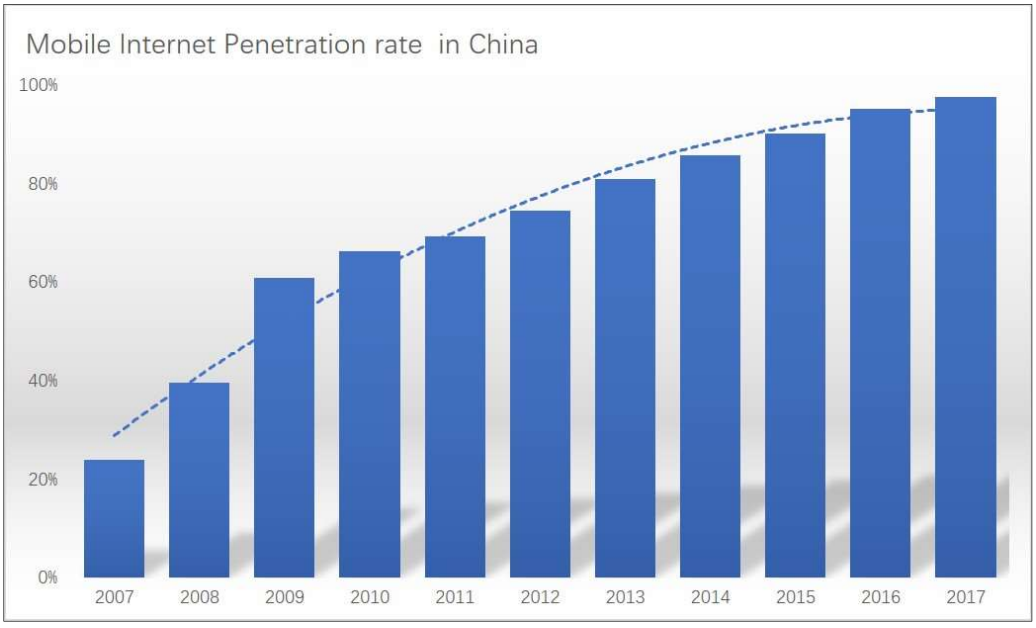

Figure 9. Mobile Internet Penetration Rate in China (Source: Statista)

The number in Figure 9 is obtained with CBS license from Statista (CNNIC.n.d., 2017). The mobile Internet penetration rate is calculated as the percentage of the total amount of mobile Internet users (via cellphone) in China, with the total population of China as 1 and not adjusted by number of infants or illiteracies. The number is significantly higher than that of Internet penetration, rationality of which could be justified as the fact that smartphones in China are easily and readily available (Liu and Li, 2010). The mobile Internet penetration rate of China in 2018 reached 97.5%, formulating 1380 million mobile Internet users in total. The fitted trend line (the blue dotted line) is calculated in Excel with second-order polynomial fitting. The fitted equation is not given as it's beyond the scope of this dissertation. The trendline is plotted to imply the growth rate of Chinese mobile Internet users.

NUMBER OF SMES IN CHINA

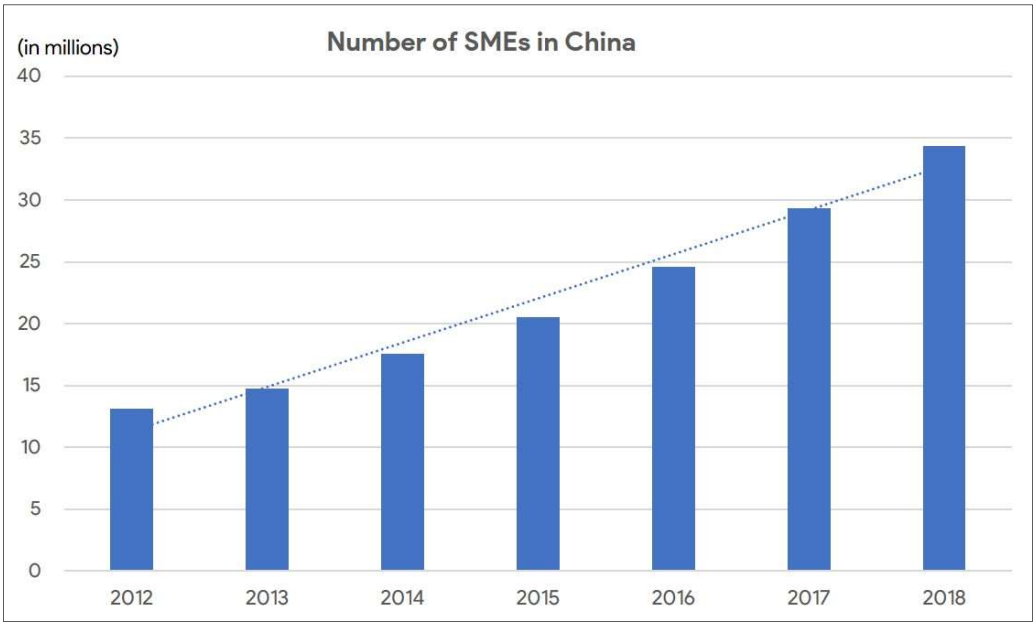

Figure 10. Number of SMEs in China (Source: iResearch)

Figure10 shows the number of SMEs in China from 2012 to 2018. The numbers are calculated from source data from iResearch (iResearch, 2018). Number of SMEs has reached 34.37 million as according to the statistic. The trendline (blue dotted line) is plotted using second-order polynomial fitting with Excel. The trendline is given to show roughly the growth rate of number of SMEs in China.

3. TABLES AND GRAPHS IN CASE STUDY

3.1 ANT FINANCIAL

◆ DEVELOPMENT TIMELINE

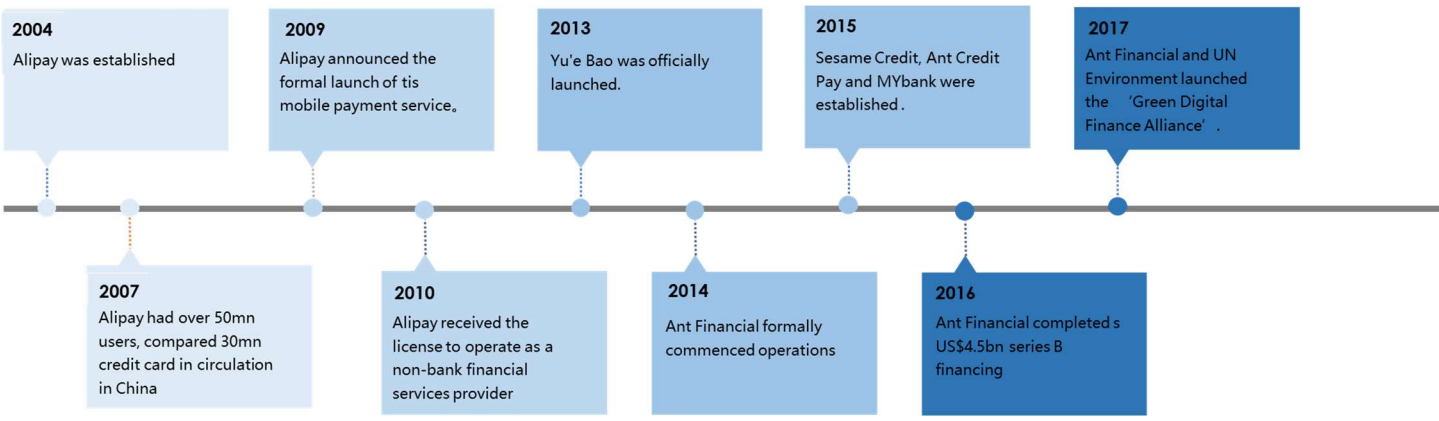

Figure 11. Ant Financial's Development Timeline (Source: Ant Financial)

Figure 11 depicts the development timeline of Ant Financial. Started with online payments, Ant Financial has developed into an empire that running a wide scope of business including credit scoring, wealth management and lending within only a decade. Noteworthy, the information is collected on Ant Finanical's official website, only remarkable events are chosen to be displayed in its timeline.

China Banking System

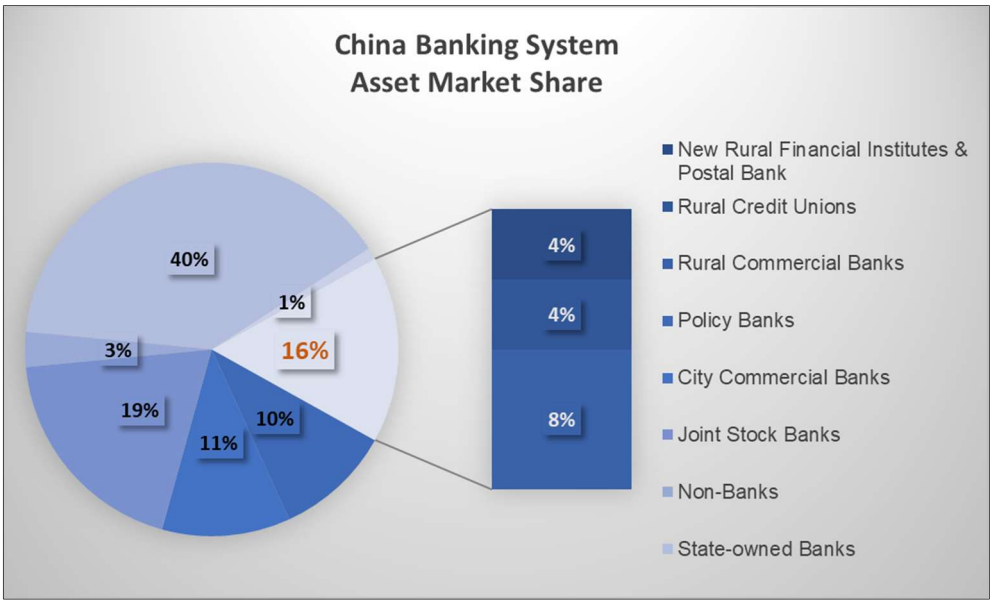

Figure 12. China Banking System with Market Share (Source: PBOC)

Figure 12 shows the China banking system market share (by AUM). The graph is produced from data with sources from PBOC (People's Bank of China-Central Bank of China) and CBRC (China Banking Regulatory Commission). Data is acquired from CBRC 2016 annual report (CBRC, 2016). As depicted in the pie graph, rural financial institutions (including new rural financial institutes, rural credit unions and rural commercial banks) manage only 16% of AUM in Chinese banking system.

◆ INTERNET USER DISTRIBUTION IN CHINA

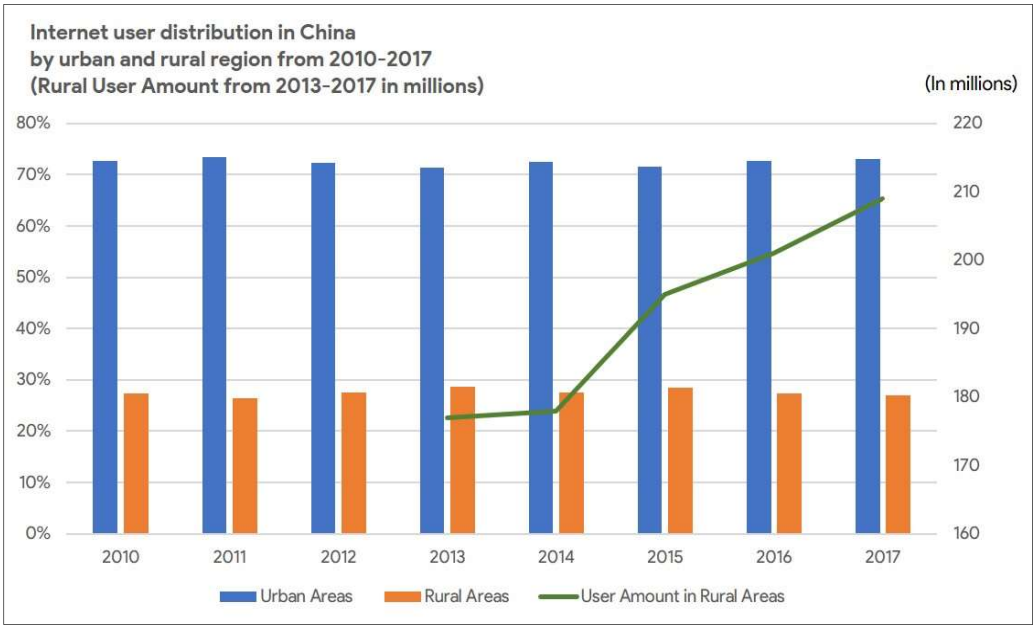

Figure 13. Internet User Distribution in China (Source: Statista)

Figure 13 shows the Internet user distribution according to users in urban areas and in rural areas. The graph is reproduced from Statista. Data source is from CNNIC (China Internet Network Information Center) and AskCI Consulting (AskCI Consulting, 2018; CNNIC.n.d., 2018). The ratio of urban and rural users are roughly the same (at around 7:3) considering most of the telecom infrastructure construction in China has finished before 2010 (Fan, Zhang and Zhang, 2004). Taking the total population of China in account, the green line shows the number of Internet users in rural areas, displaying a drastic growth.

◆ CUSTOMER ATTITUDES TOWARDS NON-BANKING PROVIDER

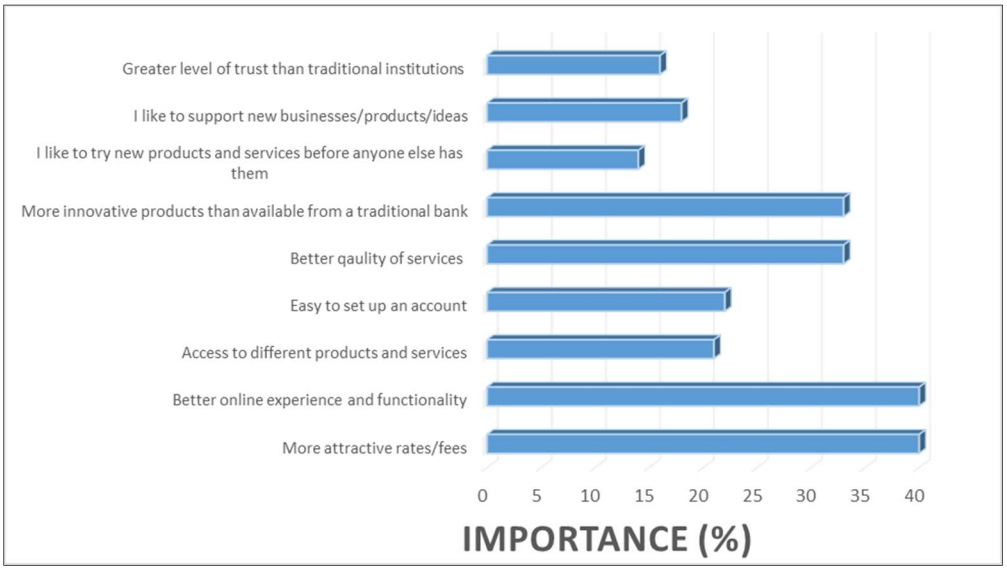

Figure 14. Elements for Customers Considering a Digital Nonbank Provider Rather Than Traditional Bank (source: https://www.ey.com/Publication/vwLUAssets/ey-the-rise-of-FinTech-in-china/$FILE/ey-the-rise-of-FinTech-in-china.pdf)

Figure 14 is a survey conducted by EY in 2016. More than 2000 Chinese participated to give their attitudes on the comparison between banks and non-banks. As the figure illustrates, non-bank service providers have an absolute competitiveness when it comes to the service offering, customer trust, customer experience and service innovation. All of these have originated in increasing customers seeking non-banking providers for better services.

◆ KEY SERVICES AND PRODUCTS OF ANT FINANCIAL

Table 8. Ant Financial Services and Products (Source: Ant Financial)

Product	Functionalities
Alipay	Mobile and online payment platform
Yu'e Bao	Money market fund
Zhima Credit	Social credit scoring system
MYbank	Internet banking service provider
Ant Fortune	One-stop personal investment and wealth management platform
Ant Credit Pay	Online consumer credit portal for short-term credit services
Insurance	Insurance service platform
Ant Financial Cloud	Cloud technology platform for financial institutions
Ants Daq	Crowdfunding platform

Figure 15. Ant Financial Products and Services (Source: Ant Financial)

Figure 15 shows the product/service provided by Ant Financial. The graph is produced with information from Ant Financial official website (Anf Financial, 2018). Inner semicircle is Ant Financial with middle semicircle containing core products/services of Ant Financial, business lines of which can be found in the introduction of case company in Ant Financial section. The outer circle

is the service line built based on core services/products, containing products from online banking (MYbank) to charity service (Ant Love and Ant Forest).

- ANT FINANCIAL'S SCENARIOS

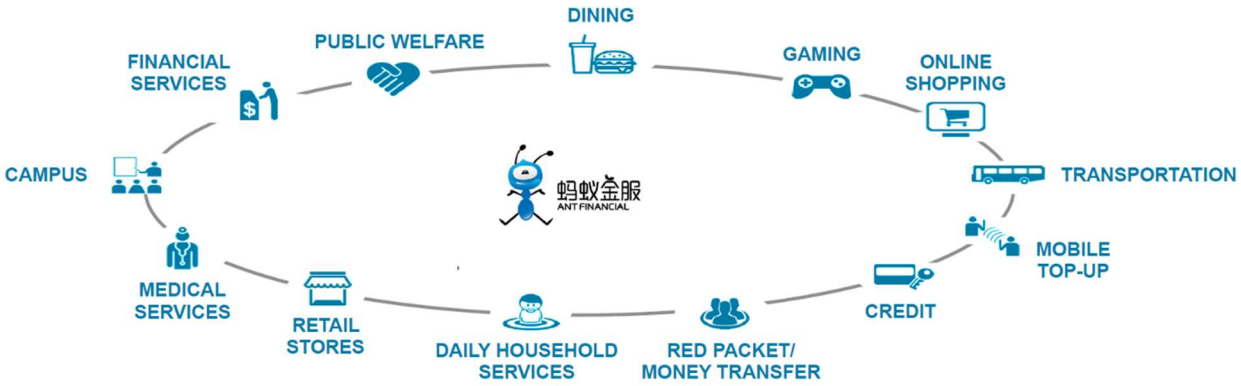

Figure 16. Scenarios Involved in Ant Financial Ecosystem (Source: Alibaba Investor Day Report)

The ecosystem of Ant Financial is depicted in Figure 16. The figure is reproduced from Alibaba's investor day report in 2016 (Alibaba Group, 2016). According to this investor day report, 40% of users of Ant Financial services are involved in four or more active scenarios. By 2016, number of TPV (Third Party Veirication) of Ant Financial has become less and less from Alibaba China retail marketplaces.

3.2 QUDIAN

- CREDIT APPLICATION PROCESS

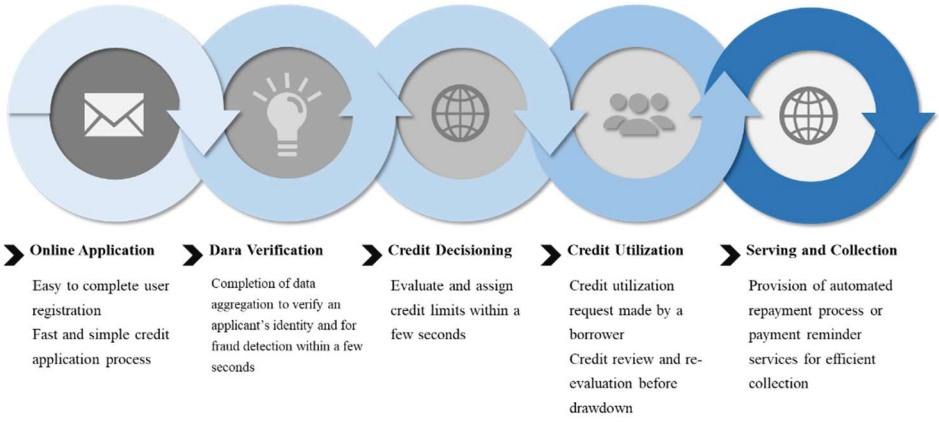

Figure 17. QuDian's Credit Application Process (Source:

https://www.sec.gov/Archives/edgar/data/1692705/000119312517287443/d282719df1.html)

The Online business model of QuDian is illustrated through Figure 17 by following steps: online application, data verification, credit decisioning, credit utilization, serving and collection.