Telecommunications Policy 42 (2018) 566–574

Contents lists available at ScienceDirect

Telecommunications Policy

journal homepage: www.elsevier.com/locate/telpol

From aperture satellite to "Internet finance": Institutionalization of ICTs in China's financial sector since 1991

Jing Wang

School of Communication and Information, Rutgers University, U.S., 4 Huntington Street, New Brunswick, NJ 08901, United States

ARTICLE INFO

Keywords:
Institutionalization
ICT diffusion
Fin-tech
Internet finance
China

ABSTRACT

China's financial industries started the process of marketization only two decades ago, but by 2017 its financial technology or fin-tech sector had taken half of the global market. The exponential diffusion of information and communication technologies (ICTs) in Chinese financial contexts have generated new organizational structures and socio-political relations that have the capacity to change China's position in the world economy. Drawing upon the sociological concept of institutionalization, this paper examines how the Chinese state has integrated ICT diffusion in its formal policies and its informal rules in China's financial development since 1991. Further, it addresses the political and socio-economic consequences of these developments. Based on the analyses of government documents and sources, trade journals, and statistic data from business databases, this paper divides the Chinese institutionalization of financial technologies into three stages and identifies the primary actors and paradigms for ICT diffusions in each stage. ICT diffusion has been constitutive but also disruptive to the existing financial policies, instrumental to the commercialization of state-owned banks, and has gradually transformed into a set of formal and informal rules accepted by a network of professionals, corporations, and government agencies. The institutionalization of ICT diffusion has engendered the continuous adjustment of financial policies and propelled innovations in China's financial economy.

1. Introduction

The financial industries in China embarked on informatization[1] and networking strategies in the early 1990s (Zhang, 2004). In April 1991, the debut of the Satellite Communication System (SCS) by the People's Bank of China (the central bank) significantly accelerated inter-bank transactions. Cash transaction would formerly take seven to ten days through a telegraph system, but now it only takes two days through the SCS. To meet the efficiency standards set up by the central bank, regional and local banks started to adopt the informatizing strategies promoted by the state, and information and communication technologies (ICTs) became a vital element to rebuild the financial infrastructure nationwide. In less than a decade, most Chinese banks had established a national network based on computerization and the Internet-mediated exchanges of financial information. The Internet and the related digital technologies became the cornerstone of the Chinese financial regime.

In July 2015a, The *People's Daily* officially recognized the new business category “Internet finance.” Aside from the mainstream

E-mail address: jw751@rutgers.edu.

[1] Informatization here has two-fold meanings. It is a set of particular policies called *xinxihua* (信息化) which has been promoted by the Chinese government in the financial sector since the early 1990s. The informatization strategies aim at higher efficiency and networked financial works computerization and the Internet technologies (Wen, 2009). In the meantime, informatization is also emblematic of the increasing scholarly attention in the 1990s to the role of information and communication technologies in transforming the techniques and styles of public administration (e.g., Bellamy & Taylor, 1998; Hudson, 1999) and forming the new socio-economic relations in the post-industrialization age (Castells, 2010).

https://doi.org/10.1016/j.telpol.2018.04.004
Received 7 October 2017; Received in revised form 6 April 2018; Accepted 6 April 2018
Available online 04 May 2018
0308-5961/

financial industries (e.g., banks, insurance companies), licensed Internet companies are eligible to provide financial products or services, including investment brokerage, online payment, person-to-person online loans, crowd-funding, and insurance to the market ("Guanyuhulianwang," 2015), which formerly were solely controlled by state-owned financial corporations. Extensive media reports on " Internet finance" soon brought this emerging business category into popular discourse and triggered an investing trend followed by more than 300 million lay investors (Wang, 2017). A 2017 article in *The Economist* flagged China as the world's fin-tech leader which has taken more than half of the global market ("The age of the appacus …," February). The largest Chinese fin-tech company, Ant Financial, a subsidiary of Alibaba, has been valued at about $75 billion in year 2016 (Bajipai, 2017) and identified as the world's most valuable fin-tech firm ("China's digital payment giant ...," August 2016).

In the last two decades, Chinese financial industries including the mainstream financial companies, Internet firms, and the private companies providing financial products and services have adopted ICTs through increasingly diversified forms. Yet, the ICT adoptions by these actors have always been intertwined with the institutional reforms initiated and lead by the Chinese government. This paper asks, how have the shifting modes of ICT diffusions related to the state's policymaking and regulative adjustment in the financial sector? Specifically, who are the actors involved in and contributing to the formation of policy discourses? How have policy changes influenced the diffusion of financial technologies, and what are the technological implications that, in turn, disrupt the existing social-political orderings in the development of fin-techs? The theoretical starting point of this paper is that ICT does not only refer to a general term for electronic or digital communication technologies. Rather, it is a network of industries, professions, and widely cultivated assumptions about the value of information, computers, and telecommunications in modern society (Avgerou, 2002).

Based on the examination of ICT-related policies in China's financial industries since 1991, this paper first analyzes the proliferation of "electronic finance" in the 1990s and identifies how the central bank has used communication technologies, particularly communication satellite and IC cards to promote the protocols and technical standards among regional banks. This section is followed by a review of "financial informatization" in the early 2000s. The expansion of financial networks from regional to national, from within banking industries to across the national treasury system has fully utilized ICTs–a form of widely recognized must-haves for high productivity. ICTs in this stage have been constitutive to management rules implemented by individual banks as well as the entire financial industries. In the past five years, when the integration of ICTs emerged as a dynamic engine to enlarge the financial market, the state legitimized it as a way to jump-start the alternative financial sector, referred to as "Internet finance." Ultimately, ICTs became normalized and catalyzed policy adjustments and structural reform in the Chinese financial industry.

This paper contributes to telecoms policy studies by providing new perspectives on the institutional approach. Institutional analyses of ICT development have mostly focused on the political, social, and organizational surroundings of technologies (e.g., Dholakia & Kshetri, 2004), thus only taking formal policies and informal rules as "institutions." This paper identifies such institutional factors external to ICT diffusion, but also considers ICT diffusion itself as an institution which has been administrative, constitutive, and also disruptive to policymaking. Finally, the historical review provided here helps to clarify the policy legacies in the development of the fin-tech sector in China that has drawn increasing attention from practitioners and scholars in ICT studies and finance studies.

1.1. An institutional approach to ICT policies in China's financial sector

The institutional approach is useful to define the conceptual boundaries of the two interacting variables in this project: ICT diffusion and fin-tech policy-making. The outset of institutional theory is very broad, and the definition of institutions varies across and within disciplines including political science, economics, and sociology (see detailed reviews in Djelic, 2010). Taking "institutions" as organizations embedded in a larger socio-economic structure, Avgerou (2002) considers ICTs as a network of actors at multiple levels (government agencies, industries, and individual users) and their value systems. The early adoptions of ICTs were mostly based on their technical merits (Zuker, 1983) and were under the influence of powerful individuals, such as business executives or political leaders (Granovetter & McGuire, 1998), which then led to the standardization and stabilization of ICT uses within or among organizations. Further, ICT diffusion is a non-stationary process driven by multiple types of organizational forces, including company culture, management orders, and super-organizational interventions (Avgerou, 2002).

For neo-institutionalists, policies, laws, and regulative rules only represent institutions in a narrow sense—that is, by the ways they influence the society; institutional rules can be broken down into three categories: the regulative, cultural-cognitive, and normative institutions (Scott, 2008). Regulative institutions are formally established in the forms of regulations and laws made by powerful actors such as the state, to constrain and regularize behaviors. The cultural-cognitive elements identify the shared conceptions and meanings through which social reality is conceiv. Lastly, the normative rules refer to the value systems and norms which can be used to assess or valorize behaviors or existing structures.

From the institutional perspective, the relations between formal policies and ICT diffusion essentially include the interactions between a network of actors (both organizational and individual) adopting and disseminating emerging technologies, and the authoritative actors dominating the overall network. In the financial context in China, the "dominating actor" refers to the Chinese state and its policy-making agencies (e.g., the central bank), whereas the remaining actors include banks, securities, insurance companies, and, more recently, IT companies that have been licensed to develop fin-tech businesses (Xie, Zou, & Liu, 2016). International IT corporations and consulting firms have also been part of the network since the early 1990s when they were assigned as vendors to build up the IT infrastructure (Zhang, 2004). Furthermore, this network includes the individual investors and borrowers participating in a wide variety of finance practices (Wang, 2017).

Thus, a complex of networked actors drives the processes of policy-making and its influence on political and socio-economic relations. Institutionalization of ICTs in China's financial sector is a process in which the state, corporative, and individual actors

collectively define the implications and diffusions of new ICTs in financial industries based on their regulative, normative, and cultural-cognitive considerations.

Many scholars have studied the policy trajectory of ICTs in China over the past two decades, particularly the Chinese government's motivation and the tendency of using ICTs to adjust the gap between the developed and underdeveloped regions, and between fast-growing and latent economic sectors (e.g., Harwit, 2008; Hong, 2017; Xia, 2017; Zhao, 2010). In these studies, the "state" has been taken as a monopolizing force determining the directions of ICT policies through bureaucratic administration and continuous operation. This paper complicates the role of the state by taking it as a political administrator, but also as the largest shareholder of the modern financial companies. Unlike in many other countries, the majority of the mainstream financial companies, including banks, security companies, and insurance companies in China are state-owned and subordinate to the state's control but also have undertaken reform as modern enterprises compelled to follow the rules set by domestic and global market forces (Fu & Heffernan, 2009). The dual attributes of the Chinese financial companies have been vital in influencing the government's attitude and actions towards ICTs. In this context, the discourse of telecommunications policies is not only constructed by the Chinese government. The ownership structure, management rules, and profit mechanisms of the Chinese financial companies also co-constitute the foundations of ICT-related policymaking in China's financial economy. Highlighting the organizational essence of the state-owned banks adds further dimension to the government's considerations upon ICT-related policy changes, which include political values, economic interests, as well as normative cognition.

Second, by analyzing the policy changes over the recent development of fin-techs, this paper aims to show the moments and conditions in which the seemingly stabilized politico-economic relations have been disrupted. A business category legitimized by the Chinese state, fin-tech has transformed the industrial structures and reconfigured the relations between the state, financial corporations, and the more than three million individual investors in China (Kshetri, 2016a,b; Xie et al., 2016). On Chinese financial media, fin-tech is also a vision advocated by financial professionals and individual investors, a symbol of innovation extremely popular among the Chinese public (Wang, 2017). The adoption and diffusion of digital technologies by a wide variety of actors in the financial context has exerted pressure on existing institutional structures thus encompassed substantive reform of formal policies.

Finally, this paper emphasizes that the institutionalization of digital finance is not only to delineate the policy trajectories and actors in the past two decades but ultimately to be treated as a process of "socio-technical formations" (Sassen, 2012)–how new technologies facilitate the formation of new power relations between the state and fin-tech corporations in China. This paper demonstrates four key elements embedded in the Chinese financial economy: existing politico-economic structures, the rise of corporative forces, aggregation of organizational actions, and process of rationalization. None of the four elements could be ignored in understanding the dynamics and consequence of the socialization of digital finance in China, and perhaps in many other developing countries.

2. Method

This paper took a grounded theory approach (Glaser & Strauss, 1967; Martin & Turner, 1986) to identify the general features of the ICT-related policies in Chinese financial industries while simultaneously grounding the account in empirical data or case studies. Given the very limited amount of existing work on this topic, I collected qualitative data and information from a variety of recognized data sources. First, this research used the archive of *China Finance*, the fortnightly magazine established in 1950 and managed by the People's Bank of China (the central bank). This national magazine reports financial policies and industry updates and has been the most often used source of policy studies for Chinese financial officials and business executives. The archive has an online version for all the issues since year 2000 and supports keyword search (the magazine is in the Chinese language and the search word has to be in Chinese). This study used keywords including "Internet (hulianwang)," "Internet finance (hulianwang jinrong)," "information technologies (xinxi jishu)," and "fin-tech (jinrong keji)" to search articles which titles contain any of these keywords. Then, the articles that report or reprint original ICT-related policies, reports major ICTs-related events were manually selected from the search results (opinions, commentaries surrounding policies are not selected). For policies between 1990 and 2000, this study triangulated between three sources: the *China Finance* articles that mention or address early policies, the official website of the People's Bank of China, and the sources from college textbooks used by national universities, particularly business schools. The manual selection and triangulation were based on the criteria developed by Gottschalk's (1986) criteria which includes time elapsed between events and reporting, openness to corrections, range of knowledge and expertise of the person reporting the events, and corroboration from multiple sources. In addition, this study also collected statistical data from the recognized business database, such as China Internet Network Information Center (CNNIC), and Yearbook of World Electronics Data.

The archival research combined with studies of formal policies and case studies renders a repertoire of articles on the major policies or events reflecting the institutionalization of ICTs in China's financial industries since 1990. (See Table 1 for the events and policies list). Based on the characteristics of leading actors and their cognitive conceptions and normative understandings of information technologies, this study divides the institutionalization of ICTs into three stages which are listed as below. The subsequent session elaborates the features and significance of ICT diffusion in each stage.

2.1. The three-phase institutionalization of ICTs in China's financial industry

The diffusion of ICTs in the financial sector has primarily been promoted by the government, but it has also involved multiple levels of actors, including financial corporations, industry associations (Kshetri, 2007), IT corporations (e.g., Shim & Shin, 2016), as well as individual investors (Wang, 2017). These actors comprehended the functions of ICTs in different ways and utilized specific

Table 1
Major events or policies related to the institutionalization of ICTs in China's financial industries (1991-present).

Year	Events or Policies
First stage: ICT diffusion as political orderings by the state	
1990	The central bank establishes the Shanghai Stock Exchange. The central bank decided to skip the dealers-mediated trading and jump-started with the computerized system to serve nation-wide investors.
1991	The central bank founds the Department of Financial Science and Technology (DFST, now the Department of Science and Technology).
1991	DFST starts to build the Electronic Inter-bank System supported by VSAT (Very-Small-Aperture Terminal) technologies to enable the electronic transactions among Chinese banks.
July 1991	The central bank establishes the China Financial Standardization Technical Committee (CFSTC) which was in charge of the unified coding systems that had been used to encrypt or decrypt data in financial transactions among all the banks.
1994	The central bank holds its first meeting on technological works and announced the State Council's orderings which urged to network the regional banks at the city and county levels.
1996	Most Chinese banks in urban areas join the national network constructed according to the central-bank-configured protocols
1996	The central bank signs the agreement with the Society for Worldwide Interbank Financial Telecommunication (SWIFT) and connects the SWIFT codes with the domestic coding system developed by CFSTC.
Second stage: ICTs integration as management rules by the corporations	
Sept. 1999	The Industry and Commercial Bank of China starts the "9991 project" taking three years to construct a centralized database storing all the information of customers and transactions.
2000	Chinese banks start to connect their ICT networks serving the construction of the Treasury Information Processing System (TIPS).
October 2005	In the 11th Five-Year Plan, the Party announces the permission of private capital in the banking and finance sectors.
2006	Chinese banks collectively build the National Credit Reference System (NCRS) and merge their customers' databases.
Third stage: ICT utilization as the leverage for financial reform	
2010	The central bank grants TPP licenses to 27 IT companies including Alibaba and Tencent.
2013	The State Council announces that it would allow private companies to establish banks on a trial basis, and designates 10 companies, including Alibaba and Tencent with banking licenses.
June 2013	Alibaba launches Yu'ebao, an online investment app allowing individual investors to invest as little as one Chinese Yuan. Yu'ebao partners with the largest money market fund, Tianhong Asset Management.
2014	Ezubao, a dynamo of online peer-to-peer lending service collects more than 7.6 billion dollars from almost one million Chinese investors with a Ponzi scheme.
January 2015	Upon the inauguration of China's first online-only bank, WeBank, Chinese Premier Li Keqiang comments that Internet finance would lead to a deeper reform in the traditional financial sector.
July 2015	The central bank announces the *Guidance on Promoting the Healthy Development of Internet Finance* On July 30 the central bank announces further guidelines on online payments, which limited shoppers' spending through third-party online payments at between CNY 1000 ($160) to CNY 5000.

information technologies for various purposes. The diversified means and outcomes of ICT integration leads to shifting social understandings of the institutional nature of ICTs in a given time and place. Moreover, the execution of government policies has not only been through formal political orderings, but has taken various institutional forms such as engendering new technological divisions, unifying informational standards, management rules, guidelines to industries, licensing systems, and regulative interventions.

2.2. ICT diffusion as a political ordering for centralized control in the 1990s

Since the establishment of the People's Bank of China in 1948, the state-controlled financial system has been part of the planned economy and served the highly centralized financial and economic work by the Administration Council. Deng Xiaoping's “reform and opening-up” policies in the 1980s provided a backdrop for financial reform, but the substantive transformation only started in the early 1990s (Zhou, 2015). In this context, the state took a “top-down" strategy to promote the ICTs-mediated network aiming to connect the central bank and the regional commercial banks, to improve the transactional efficiency between and within bank branches, and ultimately to prepare for the connection with the global financial market. During this time, the major actor, the People's Bank of China had emphasized setting up technical standards for the networked information and capital flow as well as for the construction of financial infrastructure. Such a strategy was fulfilled through the collaborations with international IT corporations and consulting firms since the development of general ICTs in China lagged far behind that of other countries in the early 1990s, not to mention the ICTs specialized for financial operations.

In 1991, the People's Bank of China founded the Department of Financial Science and Technology (now the Department of Science and Technology at the central bank) which was in charge of the informatization work for the entire finance sector. Using the financial satellite communication network, the department started to build the Electronic Inter-bank System (Li, 2009) to enable electronic transactions among banks. This communication network supported by VSAT (Very-Small-Aperture Terminal) technologies had been designed for and exclusively used by the central bank (Zhang, 2004). The terminal functioned as a central hub exchanging transactional information between the central bank and its branches at the provincial level through their individual dish antennas.

At the same time, the China Financial Standardization Technical Committee (CFSTC) designed extensive technical standards for all the banks. Established in July 1991, CFSTC has been responsible for the State Council and managed by the central bank (Zhang, 2004). It is in charge of the centralized management ensuring the regional banks conform with the unified coding systems that have been used to encrypt or decrypt data in financial transactions. In 1996, the central bank signed the agreement with the Society for Worldwide Interbank Financial Telecommunication (SWIFT) (Li, 2009) and connected the SWIFT codes with the domestic coding

system developed by CFSTC. Through this connection, Chinese banks officially joined the global electronic transaction system and extensively enlarged the electronic financial network in China.

The construction of the national information network paralleled the wave of computerization sweeping the regional banks. Prior to the introduction of the computerized system in the early 1990s, business operations in Chinese banks mostly relied on human labor. Transaction records were kept by individual banks, and the inter-bank transactions usually took more than a week. Pioneered by the Industrial and Commercial Bank of China (ICBC), the major banks in China started to computerize their infrastructure from their branches in first-tier cities such as Beijing and Shanghai. These branches gradually replaced the manual records by bank tellers with digital input and intra-net communication of transactions (Wang & Sinnreich, 2017). Compared to the labor-driven mechanism, the computerized system was much more efficient in storing and communicating transaction information, and more importantly, to dock with the national satellite network designed and managed by the central bank.

Satellite communication, informational standardization, and computerization collectively constitute the cornerstones for the central bank in expanding the electronic network nationwide. In 1994, the People's Bank of China had its very first meeting on technological works and announced the State Council's orderings which urged to network the regional banks at the city and county levels. In two years, most Chinese banks in urban areas had joined the national network constructed according to the central-bank-configured protocols (Cheng, 2015).

The state's informatization strategy was also fundamentally embedded in the Chinese securities and insurance sectors since their infant stage in the early 1990s. The Shanghai Stock Exchange (SSE), the first stock exchange founded in the year 1990, was directly supervised by the central bank for its establishment and early run until 1992 when the central bank established the Chinese Securities Regulatory Commission (CSRC) and passed the administrative role to CSRC. Despite the technological constraints during the late 1980s, the central bank decided that China's first stock exchange in Shanghai would use a computer-aided automated bidding and transaction system. This ambitious decision had made SSE the first stock exchange in the world that skipped the dealers-mediated trading stage and jump-started with the computerized system to serve nation-wide investors (Yang & Yu, 2001). By the same token, the insurance companies started to use electronic insurance policies in the late 1980s (Li, 2009). Most insurance policies were available on intra-net for the customer to claim at different local branches.

It is noteworthy that during the 1990s, China's overall development with regard to information technologies was very low compared to the world average (Yearbook of World Electronics Data, 1987–1996). In addition, the strength on “hardware” and weakness on “software” had been embodied in the informatization of the finance sector. Although computerization and networked infrastructure grew rapidly in the 1990s, the key software used in major banking systems and e-commerce applications came mostly from foreign companies (Yu, Han, & Liu, 2003). Equally important is that the local experts had played a significant role domesticating the imported technologies.

2.3. ICTs integration as management rules for higher efficiency in the 2000s

In 1992 state-owned enterprises in China embarked on commercialization after the 14th National Congress. A year later, the State Council announced *Decisions on Reform of the Financial System* which set the directions for Chinese financial companies (“Decisions of the State Council …," 1993). While the three policy banks (such as Agricultural Development Bank of China) ran as non-profits to support national industrial development, all the other banks, security agencies, and insurance companies needed to pursue profit and professional efficiency for the competency of individual companies in the increasingly marketized financial sector (Hu, 2012). In 2005, the Party, in its 11th Five-Year Plan, started committing private capital in the banking and finance sectors. Aiming at deepening financial marketization, the government started promoting shareholding reforms of state-owned financial corporations and developing small and medium financial enterprises of multiple ownerships (Liu, 2011). The ownership reform in Chinese financial systems has been fundamental to shift the integration of ICTs from a top-down political ordering to a company-driven business imperative.

To most financial companies, the state's commercializing strategies had identified the immense consumers and investors market which undoubtedly required digital technologies to handle the high volume of information and transactions. If integrating ICTs was a political order exerted by the central bank in the 1990s, the entire financial industries soon recognized that ICTs are indispensable productivities helping them to survive financial reform and market competition. Chinese financial corporations, as the leading actors of ICTs diffusion, had taken digitalization and networking as part of their management rules in the first ten years of the new millennium; the growing recognition and adoption of ICTs at the corporate level, in turn, reinforced the state's informatization strategies promulgated in the 1990s.

The banking sector had taken a top-down approach to network and digitize business operations. For instance, beginning in 1999, the ICBC took three years on the “9991 project” to construct a centralized database. The business information collected from any local branch would be accessible to regional or headquarter offices. By 2014, the ICBC's Data Center in Shanghai had collected more than 430 million individual customers' profiles and more than 600,000 commercial business records. These data have been used for digital marketing and customer management (Wang & Sinnreich, 2017). During this time, digital network and the information collected through this network were perceived as powerful and useful in helping the commercialized banks to improve their client services and increase their market share. As a strategic choice, the centralized networking had stabilized ICT diffusion within and among financial corporations.

Moreover, the banking industries integrated ICTs not only for business development but also for their supportive role assigned by the central bank—to facilitate the informatization of the capital system in China. Since 2000, ICTs development work by Chinese commercial banks has also served the construction of the Treasury Information Processing System (TIPS) (Li, 2009). TIPS has allowed the digital exchange of information and capital between the finance, tax, custom, treasury, and banking sectors, the five pillars of

Chinese capital system, thus substantively speeding up the circulation of money-capital and made them efficiently used for overall economic development.

Furthermore, the information system connecting the major commercial banks has been pivotal for the construction of National Credit Reference System (NCRS). In 1995, the central bank and the former Ministry of Electronics Industry (now part of Ministry of Industry and Information technology) launched the "Golden Card Project" to promote the use of credit and debit cards for the development of e-commerce in China (Shim & Shin, 2016). It was not until 2006 that credit cards had been popularized, when the commercial banks built up the central NCRS providing credit references of individual cardholders and for business loans to businesses (Li, 2009). Under the overall management by the central bank, local bank branches sought to develop their networks of financial technologies, and their investment of economic and human resources on ICTs have been an unequivocal tactic for business development.

2.4. ICTs utilization as the leverage for financial reform

If in the preceding two stages, ICTs related policies and corporative strategies have been instrumental or constitutive to the institutional actors such as the state and major financial companies, ICT diffusion in the third stage has created a new business category, "Internet finance" which has brought structural changes to the financial regime in China (Xie et al., 2016). As defined by the central bank, Internet finance refers to the new business model of utilizing the Internet and information communication technologies to accomplish a wide range of financial activities, such as third-party payment (TPP), peer-to-peer lending, direct sales of funds, crowd-funding, online insurance, and banking ("Guanyu hulianwang," 2015). Traditional financial corporations are no longer the exclusive intermediaries for the flow of financial capital. IT companies participate in the finance sector not only as technology vendors, but also as financial companies running cash transactions, loans, and funds. These structural shifts enabled by the growing financial technologies have pushed the government to keep adjusting existing financial policies and regulations, aiming at controlling systematic financial risk and securing the state's dominance in the scaling financial economy. Moreover, the technical and politico-economic changes collectively lead to profound changes in Chinese people's everyday life.

In 2010, the central bank granted TPP licenses to 27 IT companies including Alibaba and Tencent. These IT companies started to provide payment services through online or mobile technologies, such as Alipay and WeChat Wallet. Since then, the annual growth of online payment through these TPP companies and their mobile apps has been more than 30 percent. Until January 2017, among the 731 million Internet users in China, 67.5 percent have used TPP to pay online and 50.3 percent of them have paid through TPP when they shopped in brick-and-mortar stores (CNNIC, 2017, January). The more than 490 million Chinese e-shoppers have created an increasing flow of financial capital beyond the traditional banking system. The formal policy changes thus - expand opportunities for IT corporations to identify new markets and prospects for financial businesses. At the same time, the regulations on TPP licenses have also brought the non-bank payment services officially under the government's regulatory regime (Shim & Shin, 2016).

In addition, big data has been an enabler lowering informational opacity (Stiglitz & Weiss, 1981) between borrowers and banks, thus allowing small and medium businesses to access financial loans. Digital technologies have helped to bring in new actors and establish new operational rules, therefore facilitate the structural changes in Chinese financial industries (Kshetri, 2016a,b). Meanwhile, Internet finance development alters the sensitivity of deposit growth ratios to some banks' risk measures (Hou, Gao, & Wang, 2016). In 2013, the State Council announced that it would allow private companies to establish banks on a trial basis, and designated 10 companies, including Alibaba and Tencent (Techcrunch, 2015) with banking licenses. In June 2013, Alibaba launched an online app, Yu'ebao which allows people to transfer their PayPal balance or bank savings to an investment account and start investing from as little as one yuan (about 15 cents). Alibaba doesn't charge any transaction fees and the investment app is very user-friendly. In less than a year, Yu'ebao has attracted more than 65 billion dollars from Chinese people who enjoyed being lay investors without technical or financial constraints. While more than 300 million online investors are playing around Yu'ebao as of 2016, Internet finance has become a buzz word on the media. Pro-innovation became central to the social understandings of ICTs and finance (Wang, 2017).

During this time, the financial policy changes on payment and money market businesses have all centred on utilizing ICTs to further marketize China's financial sector. As the Chinese Premier Li Keqiang commented upon the inauguration of the first Internet Bank in China on January 4, 2015, Internet finance would lead to a deeper reform in the traditional financial sector despite the fact that it would only account for a minor share of the overall market (People's Daily, 2015b, January 4). The proliferation of ICT-mediated TPP and money market business has allowed IT corporations to create a fin-tech market co-existing with the mainstream financial market. Although the latter remains the primary sector, the former seems increasingly threatening due to its technological advantages and the huge market base. For example, Ant Financial, the subsidy of Alibaba and provider of Alipay services has developed its own digital financial technologies for fraud risk control. The big-data-based CTU (counter-terrorists-unit) takes the level of fraud loss down to less than 0.0001% and allows Alipay to serve millions of users and their transactions at one time (Chen, Tao, Wang, & Chen, 2015). The technological strength of fin-tech companies underscores their market competencies and potentials. Very quickly, the rapid growth of fin-tech companies has triggered another round of ICT diffusion among traditional financial industries. Further, to their electronic networks in the 1990s and digitization in early 2000s, Chinese major banks have sought the construction of big data after the fin-tech companies have taken more than 60 percent of their credit card or debit card users (Wildau, 2016).

However, since 2015 the central bank has held back the liberalizing tendencies and started to control the rampant growth of the fin-tech sector. After the Ezubao, a dynamo of online peer-to-peer lending service devoured more than 7.6 billion dollars from almost one million Chinese investors in a Ponzi scheme in 2014, Internet finance suddenly became an alerting business containing potential risks and urging the state's extra control (Gough, 2016). On July 18, 2015, the central bank announced the *Guidance on Promoting the*

Healthy Development of Internet Finance which signifies the government's formal intervention in the development of ICT-mediated financial businesses. China Banking Regulatory Commission (CBRC) started to issue multiple regulations towards P2P lending after several financial frauds schemes were unveiled being offered by online lending platforms (Wang, Shen, & Huang, 2016; Yang, 2014).

3. Discussions and conclusion

Despite its long-standing position in sociology, the term of "institutional theory" perhaps is ambiguous in regards to what this "theory" addresses. Such an ambiguity is mainly in debt to the varying definition of "institutions" across as well as within disciplines (see detailed review in Djelic, 2010, p. 25). In the institutional approach to ICTs (Avgerou, 2002, 2003), "institution" mostly means organizations. This approach draws more attention to the new organizing logic in which organizational actors (as opposed to the state or the powerful individuals) have normalized ICT diffusion in business development. Following the standardization of ICTs at the organizational level, the growing network of business industries, political agencies, professionals, and socio-cultural value systems embedded in this organizational network collectively propelled the socialization of ICTs. To this approach, the networked organizations are dynamic actors for social change.

At the same time, "institutions" have also been taken as formal rules interacting with the processes of ICT diffusions. Political economic projects have a long tradition of using "institutions" to refer to formal rules and political economic structures (Elliott, 1978). Much research on ICTs in China follows this tradition to study the interactions between the political transformation and the development of communication technologies (e.g., Harwit, 2008; Hong, 2017). To this research, the state is the leading actor determining the trajectory of ICT development, as well as its social consequences.

Still other studies take "institutions" as cultural-cognitive and normative rules (Scott, 2008) to study the adoption of ICTs in Chinese economic reform. The adoption of ICTs by various levels of actors are influenced by strong nationalism, the state's entrenchment in the economy, political cognitive, and political normative factors, regulative uncertainty, the role of professional associations, and the importance of business and social network (Kshetri, 2007). This strand of research highlights the ideologies that have been contributing to the adoption of ICTs and also been agreed and shared by networked actors at the state, organizational, and individual levels.

This paper takes "institutions" both as formal and informal rules. Institutionalization of ICTs in Chinese financial industries reflects the process in which the new technologies have been subordinate to and also compete with existing politico-economic orderings. Further, the capacity of ICTs in reforming political or economic orders is not immediately realized. Instead, it is the gradual normalization of ICT diffusions over the course of decades that has transformed formal institutions, thus leading to the shift of power relations. Specifically, the three-stage interactions between ICT diffusion and the formal policy-making reflect the process in which ICTs have been institutionalized in Chinese financial contexts. Since the early 1990s, the state, through its controlling power, adopted and promoted ICTs as part of political orderings. In the developing stage, ICTs have been widely normalized among corporative actors and integral to their management rules. More importantly, at the transforming stage, ICT diffusions have created the growing market, emerging social groups, and potential issues which collectively undermine the equilibrium between the state-owned and the private financial sector, and ultimately arouse the reform of existing politico-economic policies.

With the intensive marketization and rapid technological progress in the 2000s, Chinese financial corporations have taken ICT diffusions into a set of internal logics underpinning their daily operation and business development. Efficiency-driven computerization was promoted within the financial industries from the national to the regional, then the local level. Collection and accumulation of information capital became a normative vision for the entire industry. In this stage, the state-owned financial companies played the leading role in the institutionalization of ICTs. If in the 1990s, the government promoted financial ICTs through specific policies with very detailed technical references; its policy intervention in the early 2000s was primarily through indirect supervision with an emphasis on further marketizing the financial industries. The central bank urged the financial industries to increase their competence in the market, whereas these companies realized ICTs could be an effective approach. This type of ICT policy discourse fully embodied the Party's guidelines announced at the Third Plenary Session of the 18th Central Committee: to deepen the all-round economic reform and let the market play the decisive role in resource allocation ("The Decision on Major Issues …," China Daily, November 2013).

The Chinese government has emphasized the efficiency of financial transactions, but the efficiency enhancement had to be based on a centralized technological system that the government had full control over. Such a paradox between efficiency and control has been well reflected in many of today's fin-tech regulations. In the past five years, the rise of IT corporations in the financial domain and the enthusiastic participation of online lay investors have created the new fin-tech market which led to double-sided policy changes. The government chose de-regulation to legitimize the fin-tech sector and allows its co-existence with the mainstream financial industry. At the same time, the central bank has been helicoptering around the emerging fin-tech companies with an increasingly stricter regulatory control.

The government's wait-and-see attitude reflects the shifting state-corporation relations in China's financial sector. In the first stage, state-owned banks, security, and insurance companies constituted the corporate sector which entirely subordinated to the central bank. ICT diffusion had been promoted as part of the national financial infrastructure, and more importantly as a political dynamic to reinforce the central government's controlling position. In the second stage, ICT diffusion increased the corporative power, which is however still within the state-defined institutional frame. In the third stage, the rise of digital financial technologies and new financial policies has complicated the corporate sector. In addition to the state-owned financial companies, private fin-tech companies have also been included in financial businesses. The market dynamic as well as the development of digital financial technologies collectively gave more weight to the corporate sector. Yet, a very large part of the corporate sector is still state-

controlled. In this context, ICTs could assign a larger space to corporations but also could propel innovations among the state-owned enterprises. The changing relations between the state and the corporative determines the government's two-pronged responses to ICT diffusions: supporting the corporative actors and their ICT usages that will be subordinate to the state's overall economic plan but repulse those threatening the stabilization of state-dominated structures.

The three-stage institutionalization of ICTs in China has never been isolated from the international ICT standards implemented in the global financial market. Constrained by technological underdevelopment during the 1990s and early 2000s, the central bank had assigned international IT consulting firms to help build the informational infrastructure from scratch. China then has increasingly integrated its financial sector into the global market since it participated in WTO in 2001. The informational standards shared between the domestic and international financial corporations have been constitutive of the latest financial institutions in China. The international consulting firms and the local experts collectively translate the set of standards and build them into the growing financial information and communication system.

The financial industry in China is one of the most rapid-growing economic sectors in which the accelerating informatization and digitization have entailed fundamental social and political transformation (Kshetri, 2016a,b). In recent years, the ties between ICT development and the state's political directions in the financial sector has been reinforced and complicated. In March 2015, the State Council of China announced the “Internet Plus” action plan meant to utilize the Internet and many other forms of ICTs including big data and cloud computing to develop traditional industries, such as manufacturing, finance, transportation, healthcare, and education (People' Daily, 2015c, March 6). On January 22, 2017, the Chinese cabinet announced its $14.5 billion investment plan in the development of the industrial Internet consortium. On the same day, more than $4.3 billion of this giant bill is given to three financial corporations, Industrial and Commercial Bank of China, CITIC Guoan, and China Post Insurance (Xinhua News, January 22). While ICTs have been assigned a powerful instrument for financial development, financial companies have also been built into the bedrock of the ICT development in China. The political, as well as the market dynamics, have knitted the two sectors tightly for the overall economic restructuration. Institutional research on this intersection is critical to understand the policy dimension of ICTs and digitalization in China.

Acknowledgements

The author wishes to acknowledge Professor Philip Napoli and the two anonymous reviewers for their careful reading and constructive comments on the manuscript.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.telpol.2018.04.004.

References

Avgerou, C. (2002). The institutional nature of ICT and organizational change. *Information systems and global diversity*Oxford, NY: Oxford University Press Chapter 1.
Bajipai, P. (2017). *Why Ant financial's IPO is hugely anticipated. Nasdaq.* May 15, 2017. Retrieved from https://www.nasdaq.com/article/why-ant-financials-ipo-is-hugely-anticipated-cm789161.
Bellamy, C., & Taylor, J. (1998). *Governing in the information age.* Buckingham: Open University Press.
Castells, M. (2010). *The information Age: Economy, society and culture, vol. 1, the rise of the network society* (2nd ed.). Oxford: Blackwell.
Cheng, Y. (2015). *Renmin yinhang xinxihua fazhan [The informatization at the People's Bank of China]. 21*China Financehttp://www.cnfinance.cn/magzi/2015-11/12-22763.html.
Chen, J., Tao, Y., Wang, H., & Chen, T. (2015, December). Big data based fraud risk management at Alibaba. *The Journal of Finance and Data Science, 1*(1), 1–10.
CNNIC, China Internet Network Information Center (2017). 39th Statistical report on Internet development in China. http://www.cnnic.net.cn/hlwfzyj/hlwxzbg/hlwtjbg/201701/t20170122_66437.htm.
Djelic, M. (2010). Institutional perspectives: Working towards coherence or irreconcilable diversity? In Morgan, (Ed.). *The oxford handbook of comparative institutional analysis* (pp. 13–40). Oxford University Press.
Dholakia, R., & Kshetri, N. (2004). Factors impacting the adoption of the Internet among SMEs. *Small Business Economics, 23*(4), 311–322.
Elliott, J. (1978). Institutionalism as an approach to political economy. *Journal of Economic Issues, 12*(1), 91–114.
Fu, M., & Heffernan, S. (2009). The effects of reform on China's bank structure and performance. *Journal of Banking & Finance, 33*(1), 39–52.
Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research.* NB & London: Aldine Transaction.
Gottschalk, L. A. (1986). Research using the Gottschalk-Gleser content analysis scales in English since 1969. In L. A. Gottschalk, F. Lolas, & L. L. Viney (Eds.). *Content analyses of verbal behavior* (pp. 29–46). .
Gough, N. (2016, February 1). *Online lender Ezubao took $7.6 billion in Ponzi scheme.* New York Timeshttps://www.nytimes.com/2016/02/02/business/dealbook/ezubao-china-fraud.html?_r=0.
Granovetter, M., & Patrick, M. (1998). The Making of an industry: Electricity in the United States. In Michel Callon (Ed.). *The Laws of the Markets, Blackwell* (pp. 147–173). .
Harwit, E. (2008). *China's telecommunications revolution.* NY: Oxford University Press.
Hong, Y. (2017). *Networking China: The digital transformation of the Chinese economy.* University of Illinois Press.
Hou, X., Gao, Z., & Wang, Q. (2016, February). Internet finance development and banking market discipline: Evidence from China. *Journal of Financial Stability, 22*, 88–110.
Hu, H. (2012). *Reform and innovation as the dynamics for the development of banking industries*, *18*China Financehttp://www.cnfinance.cn/magzi/2012-10/08-15750.html.
Hudson, J. (1999). Informatization and public administration: A political science perspective. *Information, Communication & Society, 2*(3), 318–339.
Kshetri, N. (2007). Organizations' e-business adoption in China: An institutional perspective. *Electronic Markets, 17*(2), 113–125.
Kshetri, N. (2016a). Big data's role in expanding access to financial services in China. *International Journal of Information Management, 36*, 297–308.
Kshetri, N. (2016b). The evolution of the internet of things industry and market in China: An interplay of institutions, demands, and supply. *Telecommunications Policy, 41*(1), 49–67. https://doi.org/10.1016/j.telpol.2016.11.002.

Li, D. (2009). *Woguo jinrong yexinxihua jianshe de chengjiu yu fazhansilu: The informatization of financial industries in China: A historical review. Vol. 18*China Financehttp://www.cnfinance.cn/magzi/2009-09/17-1951.html.
Liu, S. (2011, January 9). *Deepening financial reform and establishing modern financial enterprise system*People's Bank of China. Retrieved from http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/2849715/index.html.
Martin, P., & Turner, B. (1986). Grounded theory and organizational research. *The Journal of Applied Behavioral Science, 22*(2), 141–157.
Guanyu hulianwang jinrong jiankang fazhan de zhidao yijian [Guidelines regarding the healthy development of Internet finance by the Central Bank of China and nine relevant ministries] (2015a). *People's daily*. http://finance.people.com.cn/money/n/2015/0718/c42877-27324285.html.
People's Daily (2015b). *Chinese premier Li Keqiang visit the inauguration of webank*. http://politics.people.com.cn/n/2015/0104/c1001-26322036.html.
People's Daily (2015c). *"Internet +" announced in the government work report will have a profound influence on our nation*http://finance.people.com.cn/n/2015/0306/c394090-26651519.html.
Sassen, S. (2012). Interactions of the technical and the social: Digital formations of the powerful and the powerless. *Information, Communication & Society, 15*(4), 455–478. http://dx.doi.org/10.1080/1369118X.2012.667912.
Scott, W. R. (2008). *Institutions and Organizations: Ideas and interests* (3rd ed.). Los Angeles, CA: Sage.
Shim, Y., & Shin, D. (2016). Analyzing China's fin-tech industry from the perspective of actor–network theory. *Telecommunications Policy, 40*(2/3), 168–181.
Stiglitz, J., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review, 71*(3), 393–410.
The Decision on Major Issues Concerning Comprehensively Deepening Reforms (2013, November 13). *China daily*.
Wang, J. (2017). Stir-frying Internet finance: Business and financial news and financialization in China. *International Journal of Communication, 11*, 581–602.
Wang, J., Shen, Y., & Huang, Y. (2016). Evaluating the regulatory scheme for internet finance in China: The case of peer-to-peer lending. *China Economic Journal, 9*(3), 272–287.
Wang, J., & Sinnreich, A. (2017). In L. Shintler, & C. McNeely (Eds.). *Big data construction at the industrial and commercial bank of China. Encyclopedia of big data.* Springer.
Wen, S. (2009). *Informatization at People's Bank of China, 7*China Financehttp://www.cnfinance.cn/magzi/2009-04/01-457.html.
Wildau, G. (2016). *China banks starved of big data as mobile payments rise.* Financial Times August 28, 2016.
Xia, J. (2017). China's telecommunications evolution, institutions, and policy issues on the eve of 5G: A two-decade retrospect and prospect. *Telecommunications Policy, 41*(10), 931–947. http://dx.doi.org/10.1016/j.telpol.2016.11.003.
Xie, P., Zou, C., & Liu, H. (2016). *Internet finance in China: Introduction and practical approaches.* London, NY: Routledge.
Yang, X. (2014). *Inside China: Reining in P2P lending.* International Financial Law Review 224.
Yang, X., & Yu, J. (2001 September 20). *Zhongguo zhengquan qihuo jishu shinian xiliebaodao [Reports on the ten-year development of financial technologies in China's securities industries]*. CEOCIO Magazinehttp://www.ceocio.com.cn/e/action/ShowInfo.php?classid=89&id=120011.
Yu, J., Han, M., & Liu, Y. (2003). *Business for development: Implications for export strategy-makers.* file:///C:/Users/Doo-Hun%20Choi/Downloads/China%20_E-CommerceDevelopment_EF2003.pdf.
Zhang, F. (2004). *Electronic commerce conspectus.* Tsinghua University Press.
Zhao, Y. (2010). China's pursuits of indigenous innovations in information technology developments: Hopes, follies and uncertainties. *Chinese Journal of Communication, 3*(1), 266–289.
Zhou, X. (2015). *Jinronggaigefazhanjiqineizailuoji: Financial reform and development and its internal logics. Vol. 19*China Financehttp://www.cnfinance.cn/magzi/2015-10/08-22509_1.html.
Zuker, L. (1983). Organizations as institutions. *Research in the Sociology of Organizations, 2*(1), 1–47.