What Enables a Chinese Firm to Create New-To-The-World Innovations?

An Historical Case Study of Intra-firm Coopetition in the Instant Messaging Service Sector

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ABSTRACT

Chinese firms have been widely seen as imitative. This historical case study explores what organizational mechanisms allowed Tencent, a Chinese firm in the fast-changing instant messaging (IM) service sector, to achieve a new-to-the-world innovation with its WeChat smartphone app. Tracing the competitive dynamics in the Chinese IM sector from its inception, we found that Tencent was able to create the innovative WeChat product through a crisis-induced intra-firm coopetition dynamic that was embedded in variation-selection-retention evolutionary processes spanning the market, the firm and the business unit levels. Building on the intra-firm coopetition and evolutionary literatures, the paper shows that three business units simultaneously competed and cooperated in developing alternative IM products while allowing the market to select the winner. The coopetition dynamic took place in three key areas — technology, product promotion, and complementary assets of suppliers. The relative balance between competition and cooperation changed over time, and top management guidance and firm-level routines were essential in managing the challenges of coopetition within the firm.

Keywords: innovation, coopetition, evolutionary theory, organizational capabilities, China

INTRODUCTION

Chinese firms have been widely seen as imitative (Redding and Witt 2007, Lewin, Kenney and Murmann 2016, Zhang and Zhong 2016). But in recent years a few of them such as Alibaba, Tencent, Huawei, and ByteDance (the developer of TikTok) have endeavored to become more innovative (Fast Company 2008-2014, McKinsey Global Institute 2015, The

Economist 2015a). Nevertheless, there has been little research investigating the detailed processes that would allow a Chinese firm to step out of the shadow of Western firms and create a product or service with at least some featured first conceived in China and then imitated by Western firms (Greeven and Yip 2019). Tencent's WeChat IM product is such a new-to-the-world innovation with innovative features that have been imitated by Facebook and other firms in the most advanced countries in the world (Livingston 2014, The Economist 2015b, 2016). This paper investigates the process by which Tencent was able to create the innovative WeChat product, achieving as of January 2019 1.08 billion monthly active users around the world, with 23% being outside China (GlobalWebIndex 2018). The only two other messaging apps that had similar success are WhatsApp, with 1.5 billion, and Facebook Messenger, with 1.3 billion monthly active users (Hootsuite and We Are Social 2019). Our research uncovered that the simultaneous competition and cooperation between Tencent's multiple business units developing rival products in the same space played a key role and that this process was embedded in a previously highlighted nested hierarchy of variation-selection-retention (VSR) processes (Baum 1999, Van de Ven and Grazman 1999, Murmann 2003).

The phenomenon of coopetition — generally referring to the simultaneous competition and cooperation between two or more actors — has drawn increasing attention from scholars since the 1990s. Most of the scholarly attention has been focused on coopetition between rival firms (Hoffmann, Lavie, Reuer and Shipilov 2018). A few scholars have investigated coopetition dynamics within individual corporations. Birkinshaw (2001) highlighted that coopetition dynamics were also extensive within individual corporations. In a second contribution, Birkinshaw and Lingblad (2005) connected coopetition dynamics within firms to the management of organizational charters for subunits. More recently, Song, Lee and

Khanna (2016) documented in detail how Samsung competitive success rested on extensive competition among various business units in developing new technologies.

Our study builds on these contributions to further investigate how and why intra-organizational coopetition emerges and evolves to help explain the creation of new-to-the-world innovations. Given limited theoretical insights into this complex and dynamic process, we drew on a case study of how in the fast-changing Chinese instant messaging (IM) service sector, Tencent was able to create the innovative WeChat product. Given the availability of smartphone use data, we were able to collect historical data across countries to analyze how WeChat was developed into a globally influential Chinese new-to-the-world IM product innovation. Comparing all players that have competed in the sector from 1997 to 2017 (e.g., Yahoo Messenger, MSN Messenger, Skype, QQ, etc.) and probing intra-firm events and practices from 1998 to 2019 (focusing on 2010-2015), we found that WeChat emerged through two interrelated mechanisms.

First, Tencent's time-varying intra-firm coopetition dynamic facilitates a micro-foundation for WeChat to emerge and become increasingly novel. In response to a change in the technological environment and a perceived market share crisis, Tencent spurred three business units to simultaneously compete and cooperate for developing rival products in the IM category and allowed the market to single out the winner. This coopetition dynamic changed over time from "strongly competition-dominant coopetition" to "balanced-strong coopetition" and became again "competition-dominant coopetition (Park, Srivastava and Gnyawali 2014, p. 213)." The first two forms allowed WeChat to emerge and gradually develop into a role model for innovation IM sector worldwide. Innovation and market share gains of WeChat reinforced each other and also propelled the core internal incumbent — Mobile QQ — to become increasingly innovative after initially falling behind for several years.

Second, Tencent's intra-firm coopetition dynamic interwove VSR processes at three levels (sector, firm, business unit) with organizational capabilities and other organizational features playing a role at two levels (firm, business unit). Together, these processes drove WeChat to become a new-to-the-world innovation. On the one hand, the intra-firm coopetition made three business units to compete for Tencent's internal resources (firm-level VSR) and survive or die from external hyper-market competition with domestic and foreign rivals in the IM sector (sector-level VSR). On the other hand, the coopetition pressed and stimulated business units to develop innovative products through repetitious fast trials and failures (business unit-level VSR). The WeChat team won out firm-level and market selection mainly because its routines, structures, and strategies encouraged employees to create products that were both novel and popular with users (business unit-level organizational capabilities and features). Tencent prevailed in the market selection mainly because it has established routines that were product-based, user experience-centric, and compatible with internal coopetition (firm-level organizational capabilities and features).

Our study adds to the innovation literature by revealing that an intra-firm coopetition dynamic, if integrated with market competition and compatible organizational features, can facilitate the micro-foundation for creating new-to-the-world innovations. Showing how intra-firm coopetition evolves and contributes to new-to-the-world innovations, our study also contributes to the intra-firm coopetition literature by unearthing an extreme case of institutionalized coopetition of units within the same firm that offer functionally equivalent products in the marketplace. Previous empirical research by Song et al. (2016) on coopetition has documented parallel technology development at Samsung but then the firm resolved the competition internally and introduced only one product or technology. We document and analyze a more extreme form of coopetition where a firm (Tencent) went further and

introduced parallel competing products into the market and institutionalized this intra-firm competition.

Analyzing the organizational drivers of Chinese new-to-world innovations as a nested multilevel evolutionary framework, this study also empirically corroborates the usefulness of evolutionary theory as a meta-approach to addressing organizational change not only in advanced economies already been shown be a powerful explanatory theory (Burgelman 1991, Mowery and Nelson 1999, Murmann 2003, Malerba, Orsenigo and Winter 2016) but also in transitional emerging economies such as China.

THEORETICAL BACKGROUND

In research on the innovative capacity of China and Chinese firms, authors typically do not use a conceptual distinction that has been used extensively by the OECD and Eurostat to capture to what extent a country or firm is a pioneer of new product or services and to what extent the country or firm imitates innovations pioneered elsewhere. In this section, we provide a background on three theoretical ideas that proved most useful to explain what allows a Chinese firm to become an innovative leader in a product class, namely the idea of a new-to-the-world innovation, a hierarchical evolutionary theory of industrial and organizational change, and coopetition within an individual corporation, which to our knowledge has not been previously connected to evolutionary theory.

Schumpeter (1934) differentiated an innovation from an invention by insisting that only when an invention is introduced into the economy does it became an innovation because the inventions makes an economic difference. Following Schumpeter and the OECD and Eurostat (1997, 2005), we define a new-to-the-world innovation as a new combination of existing resources that is new to the world rather than being merely new to a country or new to a firm, be it a product (a good or service), a process, a raw material of supply, a marketing method, or an organizational arrangement. The first iPhone is an example of such an

innovation. While it was not the world's first smartphone, it combined a widescreen iPod with touch controls, a revolutionary mobile phone, and a breakthrough internet communication device into a smartphone for the first time in the world. The first smartphone copying iPhone in China was not a new-to-the-world innovation but merely a new-to-China and new-to-the-Chinese firm innovation. While a new-to-the-world innovation can be radical and disruptive, as in the case of the iPhone, it can also be incremental. The central idea is that a new-to-the world innovation must combine existing resources in a way that was never before available in the same industry around the world. We use this term to separate truly innovative Chinese firms from the majority of Chinese firms that copy existing innovations (existing combinations of resources) from other firms.

Even though the literature on Chinese innovation has been growing substantially (Fu 2015, Lewin et al. 2016), a precise mechanism for how Chinese firms can move from imitation to creating new-to-the-world innovations has not been identified. This has three main reasons. First, mainstream innovation theories grounded in developed capitalist economies cannot fully address transitional emerging economies, which present sufficiently different contexts (Govindarajan and Ramamurti 2011, Howell 2015, Chatterjee and Sahasranamam 2018), e.g., relatively stable and homogeneous pro-innovation institutions within one country. Second, with the notable exception such as Breznitz and Murphree (2011) and Redding and Witt (2007), the growing literature on Chinese innovations has barely built new theoretical accounts or empirically investigated when and how China can spawn new-to-the-world innovations. The works mostly applied extant theories to China but reported inconclusive empirical findings on the outcomes and antecedents of new-to-China or new-to-a-focal-Chinese-firm but not new-to-the-world innovations (e.g., Hu and Mathews 2005, 2008, Sun and Du 2010, Li 2011, Kafouros, Wang, Piperopoulos and Zhang 2015). Existing case studies

predict little Chinese new-to-the-world innovations until the medium term (e.g., Breznitz and Murphree 2011, Yip and McKern 2016, Zhang and Zhong 2016).

Third, there have been few documented cases of Chinese new-to-the-world innovations. One reason for this is that it is empirically time-consuming to establish that an innovation was new to China. Many firms that were suggested to us as new-to-the-world innovators (HEC pharmaceuticals, Hikvision, Gree, etc.) proved to have western antecedents when we investigated the suspects in detail. Furthermore, most authors are interested in finding high-impact innovations as opposed to new-to-the world innovations that can be incremental in nature and do not have to be high-impact. There have been few high-impact product and service innovation in China that were also new-to-the-world, and hence scholarly attention has been drawn away from new-to-the-world innovations.

Some scholars see the nature of China's authoritarian capitalism (Redding and Witt 2007, Redding 2016) as the root cause of few high-impact new-to-world innovations. Chinese authoritarian capitalism is marked by low institutionalized trust — i.e. trust in the overarching formal and informal institutions, which according to (Redding 2016) makes it very difficult for Chinese firms to coordinate employees and third parties to handle the complexity involved in new-to-the-world innovation (Apple needed to orchestrate a large number of employees and suppliers to be able to bring out the iPhone). Chinese firms are predisposed to eschew complexity by opportunistic copying, which required less coordination. If undertaking R&D, they are prone to confine it to incremental improvement of production processes and a few cadres whom the top management have interpersonal trust in.

Evolutionary theory holds that innovations emerge in an industry as a result of large number of trials and failures within a firm and the industry, as well as a virtuous coevolution between the industry and institutions (Campbell 1960, Nelson and Winter 1982, Nelson 1994,

Malerba and Orsenigo 1996, Mowery and Nelson 1999, Murmann 2003, Lewin and Massini 2004). A firm adapts its capabilities to environmental changes (being market, technological or institutional) through routines that are formed and changed slowly by a path-dependent and locally bounded learning process based on trial-and-error and vicarious experience (Campbell 1960, Cyert and March 1963, Aldrich 1979, Nelson and Winter 1982, Gavetti and Levinthal 2000, Greve 2003, Murmann and Frenken 2006). In the face of environmental changes, different firms develop products through their firm-specific routines, while not knowing if their products will be popular with customers (the process of variation [V]). A few firms gain market shares at the expense of others, meanwhile new firms — either de novo or diversified from incumbents — are attracted to enter the market and gradually displace the uncompetitive incumbents (the process of market selection [S]). Routines of the firms with the best products become dominant in the industry and continue self-reproducing (the process of retention [R]) until environmental changes favor different firms with different routines. These three processes, collectively known as a market-based VSR process, drive the changes of market shares, entry-exit and innovations within the industry, and the emergence of new industries (Nelson and Winter 1982, Malerba and Orsenigo 1996, Murmann 2013). To create more innovations in an industry, government can facilitate the development of institutions that support market-based VSR process (Nelson 1993, 1994, Mowery and Nelson 1999, Murmann 2003). With these insights from the evolutionary theory, one can predict that new-to-the-world innovations should emerge from those industries in China's transitional economy that (1) emerge after China's opening and reform in 1978, (2) technological change is not strongly cumulative and new entrants can get to the frontier of knowledge relatively fast (Lee 2016a), (3) that have few entry barriers and hence a lot of rivalry that will incentivize firms' trial-and-error learning.

But what type of firms would bring about new-to-world innovations? Previous research has shown that innovative Western firms orchestrate massive trial-and error process in the form of R&D labs that create many product ideas, while only a few are selected to be introduced into the market. Murmann (2003) argued that the firm Bayer became a leader in the synthetic dye industry from 1880 to 1914 by synthesizing a large number of dyes every year, a much smaller number were tested extensively, and an even fewer number were introduced in the marketplace. For example, in 1906, Bayer synthesized 2656 distinct dyes, tested 60 on a large scale and introduced and marketed 36 new dyes (Murmann, 2003).

Early in our research into how Tencent was able to create a new-to-world innovation, it became clear that coopetition dynamics within the firm seemed to play an important role in why Tencent dominated the IM sector in China for a long time.

Reviewing the existing literature on intra-firm coopetition, it becomes clear that one of the key reasons cited for why economic transactions are organized within firms and not markets is that it is easier to create and maintain coopetition through hierarchical control (Williamson 1975). But scholars of large enterprises frequently observe that business units also compete with one another (Birkinshaw 2001). Inspired by the work on inter-organizational coopetition (Brandenburger and Nalebuff 1996, Hoffmann et al. 2018), scholars have begun to use the conceptual framework of coopetition to illuminate market-like dynamics within individual firms (Tsai 2002, Luo 2005).

This intra-firm coopetition literature has highlighted that introducing competition into the firm involves complex trade-offs, requiring managers to carefully weigh benefits against costs before deciding to encourage intra-firm competition. The managerial motivations of making units within firms compete one another can be (1) to challenge the status quo by allowing multiple units to tackle a problem, thereby (2) to increase the flexibility of the firm as a whole, and (3) to increase the motivation of both units that compete with one another

(Birkinshaw 2001). The positive benefits of intra-firm coopetition are theorized to be faster organizational learning through more experimentation, faster adaptation to changing environments and a higher motivation to better understand what another more successful unit is doing. On the cost side of allowing two units to compete with one another are (1) duplication of efforts, (2) the potential confusion of customers, and (3) internal conflict about many issues ranging from resource allocations and resource sharing to charter overlap (Birkinshaw 2001, Birkinshaw and Lingblad 2005).

To ensure that the benefits outweigh the costs of internal coopetition, scholars have highlighted that the firm's top leadership needs to carefully manage this relationship through formal and informal controls (Tsai 2002, Luo 2005). Song et al. (2016) argue that this can be achieved for example by transferring managerial personnel between headquarters and business units to develop a shared purpose even though headquarters emphasized performance-based rewards for business units focused on the profits of the individual unit and not the corporation as a whole. Theorists of intra-firm competition have also emphasized that intra-competition is most useful when market and technological uncertainty is high, which often occurs in the early stages of an industry or product class (Birkinshaw and Lingblad 2005). The most detailed empirical study of intra-firm coopetition to date has been of Samsung by Song and colleagues (Song and Lee 2014, Song et al. 2016). The study showed that Samsung increased its invention capability by letting different businesses compete with one another at the R&D stage.

There has been an increasing interest in the innovative capacity of Chinese firms (Lewin et al. 2016), but we know little about what processes may enable Chinese firms to create new-to-the-world innovations. While the intra-coopetition literature has already documented that coopetition at the level of R&D can increase a firm's inventiveness, we are not aware of any study that has analyzed intra-firm coopetition in product markets as a

mechanism to create new to-the-world innovations. Our study seeks to illuminate how this form of intra-firm coopetition emerges and can be successfully managed within a firm, given the inherent tensions of competing and cooperating at the same time.

SETTING, METHODS AND DATA

An inductive historical case study is appropriate to build theory about "how" and "why" emerging complex phenomena occur and evolve (Eisenhardt 1989, Langley 1999, Yin 2003). We carried out the study in two stages. In stage one, we searched extensively in the Chinese economy for a clear case of new-to-the world innovations. As mentioned earlier, we found that the existing literature innovative Chinese products presented very little comparative data ensuring that non-Chinese companies had not already introduced products and hence made Chinese companies merely imitative. For this reason, we took great pains to ensure that WeChat is a clear example of Chinese new-to-the-world innovations by comparing its timeline of innovations with those of its worldwide rival products. In stage two, we analyzed the process of WeChat growth to theorize what micro-organizational mechanisms drive its innovativeness and may drive Chinese new-to-the-world innovations in other sectors. We do not claim one and the same mechanism will underlie all Chinese new-to-the-world innovations. Our detailed case study has uncovered one interesting theoretical mechanism in principle can be used by other firms.

Research Setting

We grounded our research in the IM sector for two reasons. Second, WeChat became a rare Chinese new-to-the-world technological product innovation with global impact. Many IM products around the world have been imitating the innovations "to become the WeChat of the west" (Livingston 2014). It is easier to detect causal mechanism with extreme cases. Second, this sector is new and subject to fewer national or regional institutions than older sectors (Jiang and Murmann 2012), thus allowing us to extract micro-organizational factors

while ruling out higher-level confounders to explain the association between the intra-firm coopetition process and WeChat's increasing novelty. For instance, foreign IM products have been competing in this sector on an equal footing since day one, rather than being blocked off by the Chinese government's censorship as with search engine and news website sectors.[1]

To provide context to our research setting, we briefly sketch the history of how WeChat emerged as a new-to-the-world innovation from the Chinese IM sector across four periods that witnessed different enabling technologies. WeChat was not the first IM product in the sector nor the only IM product of Tencent. It was developed as one of the two internal competitors of Tencent's core incumbent IM product (Mobile QQ) in the most competitive period of the Chinese IM sector. It became increasingly novel under the pressure of sector-level competitive dynamics and intra-firm coopetition dynamic.

Founded as an IM service provider in 1998, Tencent developed four generations of IM products along with the four distinct waves of entry in the Chinese IM sector (see Table 1). When the first wave began with the entry of an Israeli computer-based IM app named ICQ in 1997, due to the diffusion of computer-based internet technologies from western countries to China, Tencent emulated ICQ with its first and the sector's fifth entrant, computer-based QQ. QQ became the market leader within nine months due to its user friendliness built by fast incremental innovations (Wu 2016).

INSERT TABLE 1 ABOUT HERE

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[1] WhatsApp, Line, Google's different generations of IM apps (i.e. Google Talk, Google Voice, Google Hangouts), and other major players in the world or in Asia Pacific — except for Facebook Messenger — have been accessible by Chinese users without using a VPN until 2015, and many of them were born years earlier than WeChat. Only Facebook Messenger was a victim of the Chinese government's censorship of social networking products (e.g., Facebook and Twitter). It has been unavailable in China since its birth in Aug 2011, when WeChat's user base increased to about 50 million.

In the second wave driven by China's development of 2G mobile internet (2000–2008), a new type of IM app, capable of running on functional mobile phones through the wireless application protocol (WAP), emerged and coexisted with computer-based apps. Tencent's Mobile QQ launched in April 2000 was the first comer, followed by over 30 foreign and domestic entrants, including one sibling (named TM [probably standing for "Tencent Manager" like MSN standing for "MicroSoft Manager") geared toward workplace communication in the manner of Microsoft's MSN Messenger. Mobile QQ became the market leader and Tencent's core product over time, outcompeting MSN Messenger and Skype that had significant market share in China in the early period (see Table 2).

INSERT TABLE 2 ABOUT HERE

When 3G mobile internet began to operate in China in 2009, smartphones became increasingly popular and induced third-generation IM apps born purely for the over-the-top (OTT) services for smartphones. Besides launching WeChat as China's third smartphone-based OTT player and a direct rival of Mobile QQ in 2011, Tencent strengthened the compatibility of Mobile QQ to smartphones[2] and complemented Mobile QQ with three new smartphone-based apps targeted at specific user segments (namely QQ International, QQ Talk and QQ Lite). Another new rival of Mobile QQ, namely QQ Address Book, was aborted relatively quickly because it lagged behind WeChat.

Since the birth of 4G mobile internet in China in 2014, smartphone-based OTT apps have substituted for functional phone-based WAP apps and coexisted with major computer-based apps to serve users anywhere, anytime. Tencent's WeChat has gained market leadership from

[2] Mobile QQ, like most functional mobile phone-based WAP apps, replicated its computer-based sibling QQ to a large extent. It was thus not as user-friendly as smartphone-only OTT apps.

Mobile QQ and stabilized as the role model of all OTT apps around the world. Mobile QQ has matured as a pure OTT app after a four-year struggle and maintained the second-largest market share behind WeChat, while three apps (namely TM, QQ Talk and computer-based QQ Lite) were displaced by two new entrants (namely computer-based and smartphone-based TIM) (see Table 1 and 2).

Data Collection

We carried out two major rounds of data collection from October 2014 to January 2017. The first round (October 2014-April 2015) was an open-ended search to first validate that WeChat qualifies as a new-to-the-world product innovation and then to obtain retrospective and real-time accounts of why this new-to-the-world innovation emerged from within Tencent and not in other firms. As innovation is driven by factors inside and outside a firm, we collected data on the macro-environment influencing the Chinese IM sector (e.g. government regulations, infrastructure development), market competition within the sector (e.g. user growth), firm-level and business unit-level resources, processes and events (e.g. R&D team sizes, business strategies, organizational structure, product development practices). The critical data to qualify WeChat as having new-to-the-world features come from the release notes of different version of the software in Apple Store iPhone store and Android store and Wechat official product website for later version[3] and 50 others sources for confirmation. Because each release note in the app stores has a date, we could reconstruct when WeChat and its competitors first introduced new features. This showed that many features were first introduced in WeChat and not by rival products within Tencent and other global competitors (see Table 4 and Appendix Table A1).

[3] Wechat website with version info: https://weixin.qq.com/cgi-bin/readtemplate?lang=zh_CN&t=weixin_faq_list
QQ website with version info: https://im.qq.com/mobileqq/feature/

To explain how Tencent created new-to-the-world innovations, we used extensive data from public sources. Because WeChat became so famous in China, managers of WeChat gave many public speeches on the history of the product and books and articles have been written about Tencent and WeChat. We complemented and triangulated this public data with four semi-structured interviews on four department managers of Tencent in January 2015 (see Table 3 listing all our data sources). We mitigated biases related to interviewees' "impression management and retrospective sense-making" (Eisenhardt and Graebner 2007, p. 28) in multiple ways. We chose one manager from Tencent's headquarters, two from the WeChat team, and one from another division who worked on a daily basis with both the WeChat team and the Mobile QQ team. The two managers outside the WeChat team witnessed WeChat's first four years and one published a case study on WeChat's innovation process (Luo, Ren, Jiao, Cai and Xu 2014). We also did interviews in three cities. Moreover, we asked interviewees the same set of key questions (see our main questions to Interviewee 1 in Appendix Part I), requested them to describe factual evidence, and cross-validated their answers with one another and archival data. To examine what drives WeChat's innovativeness rather than its market growth, we focused interviews on the first two years from WeChat's birth, when WeChat had not gained supremacy in the market yet. We had permission to audio-record four interviews and took notes of one interview. We transcribed the interviews and de-identified the interviewees as requested. We also wrote memos right after interviews.

INSERT TABLE 3 ABOUT HERE

The second-round data collection (June 2015-Feburary 2017) tried to gain more details on Tencent's intra-firm coopetition dynamic and organizational practices of the WeChat team

and the Mobile QQ team, given that our first-round data analysis (October 2014-May 2015) suggested that the competition (and cooperation, though less evident) between the WeChat team and the Mobile QQ team and the organizational practices of the WeChat team were important to WeChat's innovativeness. The competition between the two teams was so intense and uncertain that Tencent avoided disclosing information to outsiders to prevent stock price plummet (I1, I2, I3, I4, I5). It was not until May 2015 that Tencent executives began to recall the competition history in small-scaled events and not until October 2015 that the Mobile QQ team's core members recalled their five-year struggle along with WeChat's growth in an in-depth report. We thus collected data from public resources and triangulated it with two interviews (I5, I6). We stopped data collection until we reached theoretical saturation in building the intra-firm coopetition account.

Data Analysis

We did data analysis simultaneously, with data collection taking two steps. First, we justified that WeChat qualifies as a new-to-the-world innovation, and second we used the "Gioia approach" (Gioia, Corley and Hamilton 2013) to inductively build theory about what organizational mechanisms drive WeChat's innovativeness.[4] The second step involved recursive cycling among data, coding, related theories and emerging theoretical framework. In the first-order analysis, we manually extracted all plausible causal factors of WeChat's innovativeness from raw data and then cross-validated them, abandoning those inconsistent across data sources and those accounting for WeChat's market growth but not its innovativeness. In the second-order analysis, we categorized the retained factors into second-order theoretical themes and ranked the themes in line with their importance to answering why WeChat rather than others has become the innovation leader and why WeChat has

[4] Given that the first author has worked extensively with evolutionary theory, in our data collection process we looked for data that could support and disconfirm evolutionary theory. We use the label inductive here to signify that we were open to discovering new constructs as opposed to simply testing existing constructs.

emerged within Tencent but not from other firms. Next, we distilled the themes into second-order aggregated dimensions, iterated between the dimensions and cornerstones of main organization theories to build an integrative framework.

We ensured internal and external validity of data analysis by multiple measures. The two authors independently worked out one version of first-order analysis and second-order theoretical themes, then discussed together to resolve discrepancies. For raw data in Chinese language, the bilingual author translated it to English and then discussed with the other author about theoretical interpretation. We also checked key theoretical themes with Interviewee 4. To integrate aggregated dimensions in one framework, we tried different ideas and finally figured out a three-level evolutionary framework underpinned by intra-firm coopetition and organizational features. We repeatedly refined the parsimony and rigor of our framework according to scholarly feedback, emerging nuanced data, and development in the coopetition research. Our current data structure is shown in Figure 1.

INSERT FIGURE 1 ABOUT HERE

EMPIRICAL FINDINGS

WeChat: A Chinese New-to-the-World Innovation

Our comparison across products popular in China and/or the world shows that WeChat qualifies as a new-to-the-world combination of existing resources. Albeit a latecomer, within four years WeChat created a number of functions never before available in IM products by integrating various functions that previously existed only in other contexts into IM products (as detailed in Table 4). By doing so, within four years it moved beyond an IM app and to an open-ended ecosystem, accommodating diverse individual and organizational users through

its inclusive IM-based functions categorized into communication, social networking, media, entertainment, smart life, and online-to-offline commerce[5] (illustrated in Appendix Fig. A1).

INSERT TABLE 4 ABOUT HERE

WeChat has become a role model for IM products around the world since 2013. The international players — e.g. Kik Messenger, Facebook Messenger, Snapchat, among others — have scrambled to emulate WeChat's innovative transformation from a simple IM app to an open ecosystem (Livingston 2014, Fong 2015, Griffith 2015, Olanoff 2015, The Economist 2015b, 2016).[6] A recent case by Birkinshaw, Ke and De Diego (2019) has come to similar conclusions.

Nested Organizational Mechanisms Shaping WeChat to a New-to-the-World Innovation

We built a nested coopetition-based evolutionary framework to explain what organizational mechanisms drove WeChat to be a new-to-the-world IM product innovation (see Figure 2). In the framework, a hierarchy of VSR processes spanning sector, firm and business-unit levels jointly laid foundations for, and organizational capabilities and features supporting intra-firm coopetition ultimately shaped WeChat into a new-to-the-world innovation. What is new compared to earlier research (e.g. Murmann, 2003) is at the level of the firm where distinct business units are standing in a coopetitive relation. We also found two factors related yet not as important as those in the framework, namely the network effect

[5] Online-to-offline (commonly abbreviated as O2O) commerce draws potential customers from online channels to brick-and-mortar stores in the real world. Famous O2O startups in the West include Groupon, for example.

[6] As an example, consider the case of Facebook Messenger. Since 2015, it has added the following features that were mature in WeChat as early as 2013: friend-to-friend payment (March 2015), commerce and customer services (March 2015), an opening platform to developers of content and apps (March 2015), video calling (April 2015), location specifications via chat (June 2015), taxi-hailing (via Uber, December 2015), music-sharing (March 2016), group-calling (May 2016), group video chatting (Dec 2016), and in-app purchase (Oct 2017).

of the user bases of WeChat and Tencent's other products, and leadership of the WeChat team and Tencent (See Figure 3). We explain this more later.

INSERT FIGURE 2 ABOUT HERE

The three-level VSR processes result from China's technological environment and a relatively unregulated institutional environment surrounding the IM sector that allowed massive entry into on a scale not documented in the literature (see Table 1). The rapid development of China's mobile internet infrastructure and technologies led to exponential growth of smartphone users since 2009 (China Internet Network Information Center 2006, 2009), which foreshadowed a large emerging market for smartphone-based mobile internet products. Few institutions in China constrained the IM sector growth or market competition (e.g., government-erected entry barriers), enabling a large number of Chinese and foreign firms to develop quickly smartphone-based IM products, including Tencent offering multiple products developed by different teams. It is important to stress that other sectors in China were strongly protected and prevented free entry such as in the neighboring telecom carrier sector, which is dominated by three state-owned enterprises, China Mobile, China Unicom and China Telecom.

We will next flesh the framework out by articulating the VSR processes at sector, firm, and business-unit levels in turn because they set the backdrop for one another. Within firm-level VSR, we highlight how intra-firm coopetition dynamic underpinned and interwove it with the sector- and business unit-level VSR to collectively impact WeChat's innovativeness (see Figure 3).

INSERT FIGURE 3 ABOUT HERE

Sector-level Market-driven VSR Process

WeChat's innovativeness is partly shaped by the VSR process running on the Chinese IM sector. The VSR process is manifested in the massive and fast market entries and exits of products from diverse countries, as can be seen from the appearance and disappearance of products in Table 1 and 2). Beginning with five entrants in the first two years (1997-1999), the sector then attracted over 30 new apps between 2000 and 2005, such as Microsoft's MSN Messenger, Yahoo! Messenger, and computer-based Skype. Entries flourished with the start of 3G mobile internet operation. From early 2009 to August 2012, smartphone-based apps alone increased from about 50 (iResearch Inc. 2006-2014) to 91. As of August 2013, 79 out of the 91 incumbents remained, meanwhile 60 new players emerged. One year later, 25 of the 79 incumbents and 35 of the 60 new entries exited the market, including Samsung ChatON, Google Voice, Google Hangouts, Tango, and AOL AIM. Meanwhile, 45 new entrants emerged (see Appendix Figure A2).

The intensity of entries and exits in the IM sector is unusually high, compared with those of similar internet-related sectors in China. For instance, the social networking services (like Facebook) sector saw five exits out of 18 incumbents and 11 new entries in August 2013, then 15 exits and 21 new entries in August 2014 (see Appendix Table A2). Likewise, the micro-blogging (like Twitter) sector saw one exit out of 13 incumbents and six new entries in August 2013, then seven exits and two new entries in August 2014 (see Appendix Table A3).

WeChat competed in the intense sector-level VSR process by rapidly and constantly enhancing its features with novelties. Within five months from its birth (January-June 2011), WeChat underwent seven major updates that focused on IM function but offered multiple features never before available in IM products (see Appendix Figure A1), such as using its proprietary voice recognition technology (WeChat Group 2011-2017, Achan 2013, Sun, Yang and Xu 2014) to allow users to input text messages via speaking or to convert voice

messages into texts when it was inconvenient to play voice messages. Still in 2011, WeChat expanded functions to social networking, smart life, and entertainment (see Table 2), many of which were unavailable in rival products from all over the world. By doing so, WeChat outperformed the largest smartphone-based incumbent (i.e. MiTalk by the smartphone manufacturer Xiaomi) (I3, Luo et al. 2014, Yang, Sun and Lee 2016) and gained market share from functional phone-based incumbents, including its older sibling Mobile QQ and the external rival Fetion owned by the giant telecom carrier China Mobile Group (see Table 2 and Table A2).

Flourishing in the sector-level VSR process gave WeChat the resources and credibility to survive Tencent's internal firm-level VSR process. To survive the competitive industry, WeChat instituted a within-team VSR process that allowed it to absorb external knowledge (from sector and Tencent's other divisions) and recombine them to create WeChat's new-to-the-world innovation. We will next cover the firm-level VSR processes and then move to WeChat business unit ones.

Firm-level Coopetition-based VSR Process and Organizational Capabilities

Tencent top management initiated the coopetition-based firm-level VSR process because it perceived a crisis that its Mobile QQ seemed unable to address. Fast smartphone user growth from 2009 on intensified competition among smartphone-based mobile Internet products. For example, China's first Twitter-like product — Sina Weibo — appeared in 2009 and rapidly grabbed a few million users from Tencent's largest functional mobile phone-based apps — Mobile QQ and two others. Tencent's leadership was deeply concerned that the firm would lose attention (minutes per day spent) of IM users to Sina Weibo.[7] Believing, "*It was a life-or-death moment,*" Tencent executives "*disregarded duplication concerns*"

[7] Tencent's own Twitter (Tencent Microblog) was not able to win users back and hence top management counted on improvement of the IM products to prevent attention share loss among Chinese users.

(HKU DreamCatchers 2015, pp. 24'36"-26'10") and encouraged the formation of rival product development teams to create more appealing IM products (I2). Thus, in 2010 "*Three teams in our firm were developing the WeChat-alike [IM] products simultaneously*" (I1, HKU DreamCatchers 2015, pp. 24'36"-26'10"), namely the Mobile QQ team optimizing the incumbent Mobile QQ for smartphone use (exploitation), a team developing QQ Address Book that combines phonebook management functions and IM features (exploration), and the WeChat team developing WeChat as a purely smartphone-based IM app (exploration). The three teams belonged to two divisions located in three cities: The Mobile QQ team in Shenzhen and the QQ Address Book team in Chengdu were under Wireless Internet Business (WIB) division in charge of all IM products but computer-based QQ, and the WeChat team in Guangzhou was under the firm-level R&D division and responsible for email rather than IM products. Given that it was flush with resources, the WIB division is said to have had "unlimited" budget for the two QQ Mobile and QQ Address Book, whereas the WeChat team got ¥100 million for WeChat (Huang 2012, Yang, Wang, Su and Gan 2013, Luo et al. 2014, Li 2016b, Yang et al. 2016). The three teams were expected to simultaneously compete and cooperate with one another to make their apps competitive enough to win back user attention from rival firms (I3).

This cross-unit coopetition persisted from then to now with changing intensity and balance, helping the WeChat team to increase WeChat's new-to-the-world innovations over time.

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WeChat infancy: Strongly competition-dominant coopetition

The coopetition began October 2010 as competition-dominant, meaning that the teams competed intensively but hardly cooperated with one another. This form occurred because the three apps were targeted at the same market and Tencent adopted the market selection rule that "*Who outperformed others [in the market], would win [firm resources]* (HKU DreamCatchers 2015, pp. 24'36"-26'10")." The three teams independently developed the apps, promoted them to users, and secured telecom carriers' mobile internet resources. "*The tension between them was as intense as that with external enemies* (Wu 2015)." Cooperation was minimal, but they could gain basic technologies and infrastructures from the firm-level R&D division and shared knowledge from a firm-wide knowledge-sharing platform (I1, I2).

WeChat was officially launched four months later on 21 January 2011 and accumulated users fast without leveraging the user base of Tencent's incumbent products. QQ Address Book did not get traction with early users and top management decided to abort the rollout of QQ Address Book on a large scale, while allowing WeChat to coexist in the marketplace with Mobile QQ (I6, Tencent Science and Technology 2013, HKU DreamCatchers 2015, pp. 25'16"-27'20").

WeChat childhood: Balanced coopetition

Since the release of the third version of WeChat two months later in March 2011, Tencent top management pushed the WeChat team and the Mobile QQ team to increase cooperation such that it was roughly as intense as competition between them. Tencent expected this balanced-strong coopetition to speed up WeChat's growth and curtail the growth of Sina Weibo. The WeChat team leveraged both the competition and cooperation to strengthen WeChat's innovativeness.

Technological competition centered on the two apps' features and version update strategies. The WeChat team constantly developed novel features to distinguish WeChat from

all internal and external rivals. They transformed WeChat into an ecosystem offering inclusive functions in this period (see Table 4 and Appendix Figure A 1). Meanwhile, Mobile QQ imitated WeChat and launched some features earlier that were never available in WeChat (see Appendix Table 1A for a detailed comparison between the two apps over six years). The WeChat team was always first to launch new versions for Apple's iOS system, whereas the Mobile QQ team always prioritized Google's Android system. Tencent top executives also put extra competition pressure on the teams, e.g., ordering both to launch the same embedded game on the same day and WeChat to launch the feature of making payment by bank cards earlier than Mobile QQ (Zhai 2015).

The two teams also cooperated in technologies while competing with each other. The Mobile QQ team allowed WeChat to imitate the most popular features of Mobile QQ and to use its location-based-services (LBS) backstage to develop new features (e.g., WeChat Group 2011-2017, Hexun.com 2013, Sun 2013, The Informant 2013, Jaxon 2014, Zhai 2015). In turn, the Mobile QQ team could use technologies developed by the WeChat team (I1, Jaxon 2014, Qin 2014), discuss "*user experience and user demands*" with it (Jingyu cupl 2013, Chen 2014, Ye 2014), and copy WeChat's features (e.g., Mobile QQ Team 1998-2017, Jingyu cupl 2013, He and Song 2014, Luo et al. 2014, Wang 2014, Zhai 2015).

Coopetition in product promotion means that the two teams not only competed for but also facilitated market growth of the two apps. As users of the two apps largely overlap, the teams competed with different strategies to enlarge user bases. The WeChat team highlighted WeChat's novelty and user-friendliness to businesspeople, whereas the Mobile QQ team leveraged the large existing user base of Mobile QQ to gain network effect. After WeChat experienced the first user explosion in May 2011, in June 2011 the Mobile QQ team began to popularize WeChat through its own user base (e.g., Huang 2012, Sun 2013, The Economic Observer 2013, The Informant 2013, Li 2016a, Wu 2016), which "*brought a large number of*

users to WeChat (Wu 2016, p. 741)." This was partly ordered by Tencent top management, but at this moment the leader of WIB group also personally wanted to support WeChat. In turn, WeChat enabled a Mobile QQ user to add a WeChat user as her Mobile QQ friend and allowed a WeChat user to forward her WeChat posts directly to Mobile QQ friends.

The two teams both relied on the telecom carriers' mobile internet networks, and the WIB division in charge of Mobile QQ aided WeChat in this period against competitive attacks from the telecom carriers who tried to defend their telephony, messaging business and own IM apps (Hexun.com 2013, The Economic Observer 2013). At this point, WeChat users could call and message friends using free Wi-Fi, thus reducing the usage of telecom carriers' paid telephony and messaging businesses as well as IM apps that were not as user-friendly as WeChat (e.g., Fetion launched by China Mobile in 2007). To protect their business, carriers cut off the networks that WeChat used and asked the government (which owns the firms) to support the move. When the government investigated WeChat appeals against this move, the WIB division helped the WeChat team meet with important government officials to keep it from being banned by the government (Yang et al. 2013). The leader of the WIB division also personally trained government officials on how to use WeChat (Hexun.com 2013). This move came as surprise because the WIB division always avoided adapting Mobile QQ too much to smartphones so as to maintain its decade-long profitable business with carriers built on Mobile QQ and other functional mobile phone-based apps such as Mobile QQ, which relied on membership fees. It even held back the development of QQ Address Book before the top management allowed WeChat to be developed. The reasons why the division protected WeChat from carriers' attacks included Tencent top management's mandate, the division's intention to sustain the firm growth, and the division leader's personal acceptance of WeChat as a very good product.

As the coopetition proceeded, WeChat became increasingly innovative and the market selection caused its user base to grow dramatically at the expense of internal and external rivals. For instance, many users of Mobile QQ and Sina Weibo spent more time on or completely switched to WeChat. Managers at Tencent used the signals of the market and selected internal winners and losers and modified the internal hierarchy: in January 2013, the Mobile QQ team was merged to the division Social Network Group responsible for computer-based QQ; the development team that two years earlier had developed the QQ Address Book was merged into the WeChat team in March 2013 and its aborted QQ Address Book app was resurrected and repositioned as a telephony app in February 2014; in May 2014, the WeChat team was upgraded from a sub-department of the firm-level R&D division to a large new division named WeChat Group.

WeChat adolescence: Competition-dominant coopetition

Since the establishment of the WeChat Group, WeChat and Mobile QQ have coexisted as the twin nuclei of Tencent's mobile internet business and the coopetition between the two teams has switched once again to being more competition-dominant although not as strongly as in the first period. Unlike in previous examples of intrafirm competition documented in the literature where competition stopped at the R&D stage and one product was selected for commercialization (Song et al. 2016), Tencent institutionalized coopetition in the marketplace. This stimulated WeChat to develop and helped to revive Mobile QQ because it now had an innovative internal rival that it could emulate.

The two teams stopped cooperation in product promotion and competed intensively to counter the slowing user growth and gain more resources from users (e.g., attention and the connected advertising revenues). During every Chinese New Year holiday, for example, the teams independently launched promotion campaigns to boost user growth. Likewise, the teams no longer cooperated to secure complementary assets of key suppliers (telecom

resources), but instead competed for the finite bandwidth of telecom networks by improving the two apps' data transmission independently.

Technologically, they competed but also cooperated more. They continued to exchange ideas and share infrastructure for developing new features of the two apps. Meanwhile, they deepened the differentiation between the two apps through "*respective foci and positioning* (I3)," by "*creating many innovations* (I2)" and developing common features via "*different paths independently* (Chen 2014)." While WeChat launched more new-to-the-world features to expand its internationalized ecosystem so that "*everybody is able to use [WeChat]* (Achan 2013, Penguin's Ecosystem 2017)" to meet their daily needs, Mobile QQ tried hard to regain momentum with emergent strategies such as "*focusing on youngsters, personalization, and diverse social networking* (Tencent Science and Technology 2014, Wang 2014)" in 2014, and "*making social networking fun and [optimizing user experience of] communication in specific scenarios* (Wu 2016, pp. 769-788, Penguin's Ecosystem 2017)" as of 2016. What we see here is that coopetition is managed for the benefit of the firm. While the two apps compete for some users, by increasing the differentiation of the two apps to appeal, Tencent won more users for both apps. This allowed them to outcompete other firms, including Chinese telecoms, which tried to lure back customers with their own smartphone-dedicated messaging apps such as Feiliao (see Table 2 and 4).

To summarize, the cross-unit coopetition process changed in terms of the relative balance of competition and cooperation. Tencent institutionalized this coopetition by turning WeChat into a separate business unit whose resources would no longer depend on the central R&D budget. Both apps of Tencent became more innovative through the coopetition.

Firm-level organizational capabilities underpinning the coopetition-based VSR process

Tencent could leverage the firm-level coopetition-based VSR process to shape WeChat's innovativeness mainly because its product-based and user-experience-centric routines laid the

cornerstone. By contrast, one of Tencent' largest competitors — the big telecom carrier China Mobile Group — failed to create IM product innovations by intra-firm coopetition, because it appears not to have managed as well the inherent tension of coopetition.[8] Other strong competitors such as Microsoft opted to avoid the coopetition mechanism.[9] So what are the reasons why Tencent was able the harness this coopetition when other firms seem to struggle with it? Four key organizational routines were already laid before WeChat ever emerged.

First, the routine of exploitation and exploration in product development already started in 2002. Besides appropriating the value of existing products, Tencent has always granted business units significant autonomy and resources to develop new products, even if the new products were beyond their duties. This is one main reason why the WeChat team, though responsible for email products rather than IM apps, was allowed to develop WeChat. This also explains why Tencent executives have not intervened in WeChat's disruption of Mobile QQ's performance, but instead "*let the two products explore their own roadmaps on the premise of satisfying user demands* (Wang 2014)."

Second, a routine of product lifecycle management — called "*Product Manager System*" by our interviewees and confirmed in Khanna, Dai and Lin (2018) — was established in 2003 to facilitate new product exploration. Since then Tencent permits employees to set up small teams for new product development. Once the product gains popularity in the market, Tencent promotes its team to a higher-level unit and authorizes it to take full charge of the

[8] Like Tencent, China Mobile Group allowed multiple subsidiaries, local branches and departments to jointly or independently develop substitutable apps and vie with one another. But chaos often occurred and terminated product development (Huxiu 2013). For instance, an IM app named Jego was launched by the Marketing Dept. of Beijing branch to serve the Olympic Games in 2008 but was handed over to the Research Institute for pure research after the Games because it threatened the Group's core business — mobile phones' messaging and calling. However, the subsidiary China Mobile International Limited revised and launched it in June 2013 without gaining permission ex ante. The Research Institute fought back by appealing to the Group, causing the Group to discontinue Jego in July 2013 (Su 2013).

[9] For instance, Microsoft gave up its own MSN Messenger after acquiring Skype. Google's Messenger, Hangouts, Allo and Duo were developed and maintained by the same team (Bohn 2016, Dolcourt 2016); so were Alibaba's Wangxin, Laiwang and Dingding (Ebrun 2013, Sanjinjinjin 2015).

product until its demise. Prominent examples of failed teams are Tencent's Weibo team (a version of Twitter) and the team that had developed the QQ Address Book. In this way, WeChat team has grown from fewer than 10 people to a large business unit with over 2,000 people.

Third, Tencent created a myriad of routines enabling resource sharing across competing and non-competing business units, such as: a. continually funding firm-level R&D division regardless of organizational changes,[10] to ensure basic technologies and infrastructures are available to all business units; b. a regulation requiring all business units to share basic technological modules with others, irrespective of business competition, if any (I1); c. an internal mobility mechanism (called "*Running Water Plan*" by our interviewees) allowing teams to recruit members throughout the firm with no barriers. Due to these routines, "*They [WeChat team] also used technologies and modules of other business units* (I1);" when WeChat grew at full speed from 2012 to 2013, a good number of Mobile QQ team members joined the WeChat team (Qin 2014); as of 2015, "*approximately 60% of WeChat Group's employees were recruited from the internal talent market* (Li 2015)."

Fourth, since the founding of Tencent, a positive user experience was elevated to a central selection rule for intra-firm VSR process (I1-5, Wu 2016, Birkinshaw, De Diego and Lianghong Ke 2018) . Because of this, Tencent top management encouraged other teams to create a smartphone messaging service when the user experience of Mobile QQ in 2010 was judged as not good enough on smartphones. When the coopetition dynamics created conflicts, the WeChat team was allowed by top management to follow its strategy for as long

[10] Tencent has made major changes to its organizational structure four times since 2002, but the firm-level R&D division has persisted and taken charge of the firm's basic research, fundamental platforms, technological and engineering support to all business units. In parallel, R&D departments also exist in respective business units and possess significant autonomy to develop new products and technologies in line with their respective business growth. Moreover, large business units' R&D departments are also divided into two levels: the business unit's fundamental research is in charge at the Unit level, whereas the development of specific products are fully responsible by respective product teams. See the major changes to Tencent's organizational structure in Appendix Figures A3 and A4.

as long they could argue their moves created a more positive user experience (e.g., Song 2014b, Wu 2016). The WeChat team to prioritized user experience over everything else and in the process generated many new-to-the-world innovations, as we will show in more detail now.

Business Unit-level VSR Process and Organizational Features

In the context of the sector- and firm-level VSR processes detailed above, the WeChat team built fast and iterative VSR processes for product development to continually create novel and user-appealing features of WeChat. The selection mechanism at this business unit level are a combination of market selection and the team leader's decisions responding to user demands. The WeChat team's origin was in developing email products for Tencent both for PC and mobile phones. Team leader Allen Zhang foresaw that smartphone use would take off dramatically and started to develop two mobile mail clients, Wapmail (for the Symbian OS) and Mobile Notebook for (iOS). When Zhang got the green light from the Tencent CEO to develop a competitor product to QQ Messenger, the WeChat team had only 10 members and aborted its efforts with the two email apps to throw its limited resources behind creating a world-leading smartphone messaging app (Anonymous WeChat team member 2015, Li 2016a).

The WeChat developers have used extensive VSR processes during all R&D stages. The more innovative a feature would be, the more rounds of selection it had to live through before launch. For example, the "Moments" feature, similar to social networking apps' homepages, was finalized after over 30 trial versions in four months (Xiang 2013, Anonymous WeChat team member 2015). To choose the best available online-to-offline commerce apps to run on WeChat, the team tested more than 120 candidates for 1.5 months and abandoned the majority because they could not gain momentum in the market (Song 2014a). While some of the apps were developed by other Tencent business units, they *"could not get any privilege"*

from the WeChat team and had to compete fairly with all the third-party apps (He and Song 2014). As team members summarized, "*We allow product revision even just 10 minutes ahead of the scheduled launch* (Xiang 2013)."

The VSR processes drove WeChat's high frequency of innovations in the first two years and team members acknowledged that they could not predict how WeChat would look in the next two months[11] (Xiang 2013, Luo et al. 2014, Anonymous WeChat team member 2015, Yang et al. 2016). 44 versions of WeChat were released to the market in the first year alone (WeChat Group 2011-2017), which was far more than those of strong incumbents and latecomers, e.g. six versions of Viber, seven of Facebook Messenger and SnapChat (App Annie 2016). Within 30 months, WeChat transformed from an IM app to an all-in-one open-ended ecosystem (see Table 2). The WeChat business today uses repeated VSR processes to expand the WeChat product.

Organizational capabilities and features supporting business-unit VSR process

For the business-unit VSR processes to create new-to-the-world innovations, they also seem to require three pro-innovation organizational capabilities and features. First, routinized extreme emphasis on a positive user experience that was even stronger than at other business units of Tencent. It entails multiple rules that collectively work as the selection mechanism in the WeChat team. First, product design must be as natural, simple, and humanized as possible; thus all the details of WeChat were polished iteratively to perfection. For instance, how many menus and how they should be displayed on WeChat's main user interface were reassessed repeatedly along with the increase of WeChat's features (e.g., Interviewee 1, 2015; Yang et al. 2013, Sun et al. 2014). The Mobile QQ team, by comparison, at times did not

[11] We notice that the WeChat team leader, Allen Zhang, has played a role as "concept champion" (as called by Clark, Chew, Fujimoto, Meyer and Scherer 1987, Kuwashima 2013) and strategy formulator. But we do not highlight his role in this paper because organizational routines and processes are necessary to ensure his concepts and strategies were well implemented and more generalizable to other firms.

understand user demands as precisely as the WeChat team, causing notable failures in some of Mobile QQ's new versions. For example, Mobile QQ V4.0 received 50,000 bad reviews from users on the day of its launch (e.g., Chen 2014, He and Song 2014, Zhou 2014). Second and more important, a positive user experience always holds the highest priority whenever conflicts arise. For instance, the WeChat team has persistently refused to add features or third-party apps that would hurt user experience, despite internal and external pressures to monetize WeChat (e.g., I3; Global Entrepreneurs 2012, Achan 2013, Wu 2016). "*At last an oral agreement arose, stipulating that Pony [Tencent's CEO] would not request Allen [the WeChat team leader] to add any single feature to WeChat within two years and nobody else would make the same request* (I2)."

Second, a set of routines unleashing employees' creativity means that the WeChat team stimulates members' initiative and responsiveness by building high-level trust, interactions and efficiency. Members were exempt from performance evaluation in the first three years; a flexible working-hour mechanism rather than 9 a.m.-5 p.m. for all people has been established since August 2011 (I2) (Anonymous WeChat team member 2015); the hierarchy between bottom employees and the top leader has remained no more than three levels (I2, I3); the team has been organized as multiple small sub-groups, with group members swapped frequently to facilitate cross-group interaction and extend members' skillsets (Global Entrepreneurs 2012, Wu 2016). Meanwhile, two product-development cycles have persisted since early on, playing a significant role in shaping WeChat's novelty. The first one is what the team calls an "*around-the-clock terminal development*" mechanism, which means that the team developed WeChat versions for smartphones based on Apple's iOS, Google's Android, and Nokia's Symbian operating systems concurrently (Hecaitou 2011, Wang 2015). The second one is what they call "*revolving development flow*" that created a new version of WeChat every 24 hours:

> *"Every morning the development group received the product manager's email outlining specific functional requirements and then began development. At sunset the group finished the new version, delivering it to Allen and the product manager for evaluation. At midnight Allen and the product manager finalized new ideas, which sometimes changed to completely new directions. Then the product manager broke the ideas into specific functional requirements overnight and emailed them to the development group at dawn. A new flow begins* (Anonymous WeChat team member 2015)*."*

Third, a platform innovation strategy[12] has been implemented to develop and monetize WeChat, enabling it to transform from an IM app to an open-ended ecosystem. An illustration of this strategy is WeChat's online-to-offline commerce feature, for which the WeChat team has designed a sophisticated yet user-friendly architecture allowing any organization to develop its own hardware and software to run on WeChat (Anonymous WeChat team member 2015). Hence, a virtuous self-reinforcing business ecosystem centered on WeChat has been built, with diverse parties "innovating independently while competing collectively against other firms and/or ecosystems in the relevant market (Teece 2015, p. 1)." By October 2015, 10 million official accounts have run on WeChat, offering diverse business or daily-life services (e.g., food delivery, traffic infringement disposal), competing and complementing traditional offline ecosystems (e.g., restaurants, government offices). WeChat's success in this platform strategy has triggered emulation from its rivals. Mobile QQ allowed various third parties to build on it and collectively create "*a 24-hour life circle that enables users to solve all types of daily life problems in Mobile QQ anywhere, anytime* (Zhou 2014)." Foreign rivals such as Facebook Messenger have also begun to implement the strategy.

DISCUSSION

To identify organizational processes that enable Chinese firms to create new-to-the-world innovations, we carried out an historical case study of development of WeChat in the context of its corporate parent, Tencent, and the Chinese IM sector from its inception in 1997. We

[12] "In a business context, the term platform innovation refers to changes in the mechanisms or support structures that affect how a group or system of activities may be performed (Leiblein 2015, p. 1)."

identified two linked sets of mechanisms that allowed WeChat to succeed as an innovative IM product with new-to-the-world product features. First, a nested, three-level hierarchy of VSR processes (Figure 2) that were embedded in organizational capabilities and other organizational features at the Tencent firm and the WeChat business unit level. Second, a coopetition dynamic between rival business units that was interlinked with the VSR processes at the firm level.

Earlier empirical research has documented coopetition among units in a diversified firm for the purpose of developing alternative technologies at the pre-commercial stage (Song et al. 2016). This literature echoes the earlier work that advocated parallel R&D on alternative solutions until uncertainty was resolved and it was clear which technology was superior (Nelson 1961).

Our chief contribution in this paper is to document and analyze coopetition at the firm level that institutionalized both competition and cooperation processes between two business units which created very similar products. We showed that initially three business units simultaneously competed and cooperated in developing alternative IM products while allowing the market to select the winner. One of the IM products (QQ Address Book) was selected out, but Tencent then institutionalized the coopetition between two business units (Mobile QQ and WeChat). We bring more nuance to the literature by detailing that the coopetition dynamic took place in three key areas — technology, product promotion, and complementary assets of suppliers. Furthermore, we show that the relative balance between competition and cooperation and their intensity changed over time (Figure 3). We also find additional evidence that top management guidance and firm-level routines are essential in managing the challenges of coopetition within the firm

Since the pioneering studies of Intel by Burgelman (Burgelman 1991, 1994), there has been a growing awareness that firms can be conceptualized as populations that themselves

change through VSR processes (Murmann 2003, Ocasio and Joseph 2008, Wu, Murmann, Huang and Guo 2020). On this view, managers are not viewed as designing a particular solution to organizational problems but as designers of an evolutionary system that is able to create solutions that none of the managers know in detail in advance (Levinthal 2017).

Tencent top management gradually learned to harness the coopetition dynamic as part of its evolutionary system for transforming Tencent. There is no evidence that Tencent learned about coopetition from another firm or through consultants. Top management sought to respond to a crisis when it encouraged a different team than the one that traditionally was tasked with designing IM products to develop alternative products for smartphones. It opted for coopetition when in 2009-10 it feared that Tencent would experience massive user defection to rival firms because its Mobile QQ team was unable to upgrade its product to take full advantage of smartphones.

Tencent top executives did not know ex ante how the coopetition process would function in detail, how they should manage it or how positive the outcomes would be. While the WeChat team realized that smartphones were a technological game changer to bring the internet to mobile phones, the team itself was not too optimistic in the first few months about the prospect of its product given Mobile QQ's market dominance for over a decade, the first-mover advantages of Xiaomi's MiTalk, and given that it had no experience in IM product development (e.g. Huang 2012, Xiang 2013, Song 2014a, Anonymous WeChat team member 2015, Wu 2016). But the WeChat team built up its capabilities by a large number of product feature trials that made it a big success with Chinese users who were adopting smartphones in expoential numbers. Even though it had much more resources than the WeChat team, the Mobile QQ team was almost overwhelmed by WeChat between 2010 and 2013. What helped Mobile QQ is that Tencent top management required that business also to cooperate and share basic technologies and infrastructures with all business units. Even though Tencent

institutionalized coopetition by elevating WeChat to a separate independent business unit, Tencent management over time changed the relative mix of competition and coopetition depending on what it perceived to be beneficial for the firm as a whole.

It seems to us that Tencent was in part successful with its attempt to harness coopetition because it already possessed a number of organizational routines and practices (e.g. allowing teams to go develop product beyond their charter in 2002 and letting people set up teams with new product ideas who would own the product if they became successful in 2003) that made it easier to overcome resistance to instituting fierce competition among business units in the same product space. In that sense, Tencent was already to some extend pre-adapted for coopetition (Cattani 2006). Other firms might find it more difficult to implement coopetition. The existing literature on coopetition has suggested that coopetition needs to be managed by top management. Our Tencent case study goes further by highlighting that managers need to learn how to balance competition with cooperation over time. What the optimal balance is cannot be decided theoretically for all cases, but needs to be ascertained by managers who can assess whether the balance is not struck appropriately in a particular situation, as March (2005) remarked for striking the balance between exploration and exploitation.

We would like to stress that we did not cover in this paper all the reasons why WeChat became successful. The network effect and individuals (e.g, the leader of Tencent and of the WeChat team) also played a role, as we acknowledge in Figure 3. We also like to need to stress that we do not claim that we have identified the one and only mechanism by which Chinese firms can create new-to-the-world innovations. We have found one set of mechanisms, but there are likely to be others that need to be identified in future research.

We have studied a sector that is compatible with Lee's theory that China is more likely to be able to reach the technological frontier in short cycle technologies where the

knowledge of incumbent firm becomes more readily obsolete (Lee 2016b). It is also important to note that it is a sector of the Chinese economy that is similar to western economies in that the sector allowed free entry of large numbers of firms, a precondition for creativity through industry-level VSR processes.

This means that the mechanisms that would create new-to-the world innovations in a sector dominated by a few state-owned enterprises might be different. Nonetheless, evolutionary theory would predict that if sectors dominated by SOEs create new-to-the-world innovations, SOEs are likely to have carried out large numbers of trials. Another area where China might be able to create new-to-the-world innovations is in those areas where China experiences problems that are not faced in other parts of the world and where the state allocates large resources to tackle a problem. There are many fascinating avenues for additional research on new-to-the-world innovations in China. China has experienced spectacular economic growth and the recent success of TikTok suggests that WeChat is not an abnormality. Other Chinese firms are bound to move from imitation to new-to-the-world innovations.

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TABLES AND FIGURES

Table 1 Evolution of Tencent's IM products in their technological context in China

	1990-1999	2000-2008	2009-2013	2014-present
Enabling Technology	Computer-based internet	Computer-based internet; 2G mobile internet	Computer-based internet; 2G & 3G mobile internet	Computer-based internet; 2G, 3G, & 4G mobile internet
IM product evolution	Computer-based apps (emerging in 1997)	Computer-based apps; Functional mobile phone-based WAP apps (emerging in 2000)	Computer-based apps; Functional mobile phone-based WAP apps; Smartphone-based OTT apps (emerging in 2010)	Computer-based apps; Smartphone-based OTT apps
Tencent's IM products	Computer-based QQ (1999─)	Computer-based QQ; Functional phone-based Mobile QQ (2000─); Computer-based & Functional phone-based TM (2004─)	Computer-based QQ; Smartphone-based Mobile QQ (April 2011─); Computer-based & Functional phone-based TM; Computer-based & Functional phone-based QQ International (Dec 2010─); Smartphone-based QQ Addressbook (2010-Feb 2011); Smartphone-based WeChat (Jan 2011─); Smartphone-based QQ Talk (Aug 2011─); Smartphone-based QQ Lite (Nov 2013─)	Computer-based QQ; Smarphone-based Mobile QQ; Computer-based & Functional phone-based TM (2004-Sep 2017); Computer-based & Functional phone-based QQ International; Smartphone-based WeChat; Computer-based & Smartphone-based QQ Talk (Aug 2011─Aug 2016); Smartphone-based QQ Lite; Computer-based QQ Lite (Jan 2015-Apr 2017); Computer-based and Smartphone-based TIM (Mar 2017─)

Note: (1) The table is built on the authors' summary of various public data (e.g., Lu 2017). (2) Mobile QQ was initially developed for functional mobile phones and then switched to smartphones due to the popularization of smartphones in China. The first version of smartphone-based Mobile QQ was launched for Android phones in April 2011, three months after WeChat. (3) TM, QQ International, QQ Talk, QQ Lite, and TIM were developed for specific user groups to complement Mobile QQ. TM, computer-based QQ Lite and TIM were for workplace communication, QQ International for foreign users, QQ Talk for Tencent's game players, and smartphone-based QQ Lite for Android phones with smaller RAMs. The teams responsible for them belong to the same business unit that managed Mobile QQ. (4) TM and computer-based QQ Lite were displaced by TIM in 2017. QQ Talk was displaced by a new game streaming app You Xi Shi Ke.

Table 2 Top IM players in the Chinese market by reach (Unit: Percentage)

Firm	IM App	Nov 2006	Dec 2009	Dec 2011	Dec 2013	Apr-May 2014	Oct-Nov 2015	Dec 2016
Tencent	Mobile QQ	93.6	97.4	99.5	85.0	77.8	90.3	87.0
Microsoft	Mobile MSN Messenger	38.4	15.3	8.5				
Sina	UC	2.6	10.6					
Skype	Mobile Skype	2.5	2.2		2.0	1.8	1.4	
NetEase	PoPo	2.2	3.8					
Alibaba	Mobile Aliwangwang	1.8	17.4	9.4				
Yahoo	Yahoo! Messenger	1.0	4.6					
Mirabilis	ICQ/ICQ Lite	1.0						
Google	Google Talk	0.6						
Alibaba	Maoyitong	0.4						
China Mobile	Mobile Fetion	0.1	20.5	23.8	15.0			
Baidu	Hi		19.8				6.9	
Tencent	WeChat				63.0	65	81.6	95.6
Alibaba	Wangxin				26.0	20.7	20	26.6
Alibaba	Laiwang				1.0	2.7	2.7	
China Telecom	Yixin				3.0	2.7	4.5	
Momo	Momo				8.0	10.2	18.9	17
Xiaomi	Mi Talk					2.9	3.3	
China Mobile	Feiliao					9.8	8.6	
Line	Line					1.8	2.2	
YY	YY/YY Voice				17.0	14.8	21.4	21.2
Tencent	QQ Talk					5.6	9.3	10.6
Renren	Renren Desktop				5.0	4.2	3.3	
Sina	Wemeet					1.5	1.7	
WhatsApp	WhatsApp					0.6	1.6	
	Others	1.1		2.5				

Note: (1) Data source: China Internet Network Information Center (2006, 2009, 2012, 2013-2017). The center collected data by randomly making phone calls to mobile phone users in mainland China and asking them questions. All data in the table is drawn from the reports, except that data in 2013 is estimated by the authors based on a graph in the report. Data in 2006 shows what percentages of respondents used the app in the past one month, and data in other years shows how many percentages of the survey respondents used the app in the past six months. But data in 2013 is the authors' rough estimation based on the graph in the report. (2) The data in 2006 and 2009 includes both computer-based and functional mobile phone-based versions of the apps, whereas data afterward includes only functional mobile phone-based or smartphone-based versions of the apps. The data of Mobile QQ in 2009, 2015, and 2016 also includes users of TM that Tencent launched in 2004. (3) A blank cell means that the apps were either not launched by then or had a negligible number of users at that point. (4) The apps highlighted in grey are the leading apps developed by foreign firms. (4) TIM is not listed here because it was only launched in 2017.

Table 3. Main Archival Data and Interviews in Three Rounds of Data Collection

	Data type	Quantity	Data type	Quantity
Archival data	Main products' timelines	54	Main products' market growth statistics	28
	IM sector analysis reports	113	Independent databases of IM sector dynamic	2
	Industry experts' observations	111	Journalist reports	142
	Documentaries	1	Company quarterly and annual reports	16
	Tencent top- and mid-level managers' speeches and interviews in the media	45	Tencent employees' blogs	18
	Official firm history of Tencent	1	Published books on Tecent and its products	8
	Peer-reviewed journal articles	19	Teaching cases	11

	No	Venue and date	Length (minutes)	Interviewee	Business unit	Office location	Employers before joining Tencent
Interviews	I1	Beijing, Jan. 11, 2015	85	Interviewee 1	Online Media Group	Shenzhen	Baidu
	I2	Guangzhou, Jan. 20, 2015	95	Interviewee 2	WeChat Group	Guangzhou	Huawei
	I3	Guangzhou, Jan. 20, 2015	30	Interviewee 3	WeChat Group	Guangzhou	Emerson
	I4	Guangzhou (by phone call), Jan. 21, 2015	40	Interviewee 4	Financial Dept. of headquarters	Shenzhen	Huawei
	I5	Shenzhen, Dec. 7, 2015	30				
	I6	WeChat, May 31, 2016	29				

Note: Interviewee 1 quit Tencent to start his business in 2014. He published a case study on WeChat innovation in a top Chinese journal in 2014 (Luo et al. 2014), for which he interviewed WeChat Group and Tencent mid- and high-level managers from July 2012 to Oct. 2013 and analyzed a large amount of Tencent's archival data. We triangulated his data with our interviews and archival data.

Table 4. Comparison on functions of Tencent WeChat and other main IM apps in the Chinese market (as of March 2015)

Application name	Date of launch	Firm	Place of origin	IM	Social networking	Entertainment	Media	Smart life	Online-to-offline commerce
Smartphone-based WeChat	21/01/2011	Tencent	China	21/01/2011	10/05/2011	14/12/2011	20/07/2012	10/05/2011	5/08/2013
Computer-based ICQ	June 1996	Mirabilis	Israel	Y	Y	Y	/	/	/
Computer-based Yahoo! Messenger	09/03/1998	Yahoo	US	Y	Y	Y	/	/	/
Computer-based QQ	10/02/1999	Tencent	China	Y	Y	Y	Later and fewer	Fewer	Fewer
Computer-based MSN Messenger	22/07/1999	Microsoft	US	Y	Y	/	Y	/	/
Mobile QQ	April 2000	Tencent	China	Y	Y	Y	Later and fewer	Later and fewer	Later and fewer
Computer-based Aliwangwang	2003	Alibaba	China	Y	/	/	/	/	Y
Computer-based Fetion	9/09/2006	China Mobile	China	Y	/	/	/	/	/
Computer-based Chaoxin	28/12/2006	China Unicom	China	Y	/	/	/	/	/
Smartphone-based Skype	March 2009	TOM	US	Y	/	/	/	/	/

Smartphone-based WhatsApp	May 2009	WhatsApp	US	Y	/	/	/	/	/
Computer-based Tianyi Live	26/05/2009	China Telecom	China	Y	/	Y	Y	/	/
Smartphone-based Blackberry Messenger 5.0	Dec. 2009	Blackberry	Canada	Y	/	/	/	/	/
Smartphone-based KakaoTalk	18/03/2010	Kakao	Korea	Y	Y	Fewer	Later and fewer	Later and fewer	Later and fewer
Smartphone-based Tango	30/09/2010	Tango	US	Y	Y	Y	Y	/	/
Smartphone-based Kik Messenger	19/10/2010	Kik	Canada	Y	/	/	/	/	/
Smartphone-based GeXin	07/11/2010	iGexin	China	Y	/	/	/	/	/
Smartphone-based Viber	2/12/2010	Viber	Cyprus	Y	Y	Y	Y	/	/
Smartphone-based Mi Talk	10/12/2010	Xiaomi	China	Y	Y	Y	/	/	/
Smartphone-based TalkBox Voice Messenger	18/01/2011	Talkbox	Hong Kong, China	Y	/	/	/	/	/
Smartphone-based Wangxin	24/01/2011	Alibaba	China	Y	Later and fewer	/	Later and fewer	Later and fewer	Later and fewer
Smartphone-based Woyou	April 2011	China Unicom	China	Y	/	/	/	/	/
Smartphone-based iMessage	6/06/2011	Apple	US	Y	/	/	/	/	/
Smartphone-based Line	23/06/2011	Line	Japan	Y	Y	Later and fewer	Later	Later and fewer	Later and fewer
Smartphone-based Momo	4/08/2011	Momo	China	Y	Y	/	/	/	/
Smartphone-based Facebook Messenger	9/08/2011	Facebook	US	Y	Y	/	/	/	/
Smartphone-based Snapchat	Sept. 2011	Snapchat	US	Y	Y	Y	/	/	/
Smartphone-based Feiliao	28/09/2011	China Mobile	China	Y	Y	/	/	/	/
Smartphone-based Yiliao	18/10/2011	China Telecom	China	Y	/	/	/	/	/
Smartphone-based Laiwang	30/11/2011	Alibaba	China	Y	Y	Later and fewer	Later and fewer	Later and fewer	Later and fewer
Smartphone-based Yixin	19/08/2013	China Telecom	China	Y	Later and fewer	/	Later and fewer	Later and fewer	Later and fewer

Note: 1. “Y” means the function is available in that IM app and “/” means it is unavailable. “Later and fewer” are relative to WeChat. 2. Apps highlighted in grey are major foreign apps. 3. For a finer-grained comparison between the three largest Asia-based apps — WeChat, Kakao Talk and Line — as well as the commerce functions of WeChat, Line, and Facebook Messenger, one can refer to the most influential annual report on internet trends (Meeker 2016, pp. 103, 105). 4. Data source: The authors’ summary of various public data on Chinese and foreign websites.

Table 5. Coopetition between WeChat Team and Mobile QQ Team (Nov 2010-present)

Time span	WeChat's life stage (& milestones)	Coopetition form	Business units in coopetition	Coopeittion details		
				Area	Competition	Cooperation
19/11/10~21/3/11	R&D start~V1.2 launch (2 million monthly active users)	Strongly competition-dominant	The WeChat team, the Mobile QQ team, the QQ Address book team	Technology	Yes	Very little
				Product promotion	Yes	
				Complementary assets of suppliers	Yes	
22/3/11~7/5/2014	V1.2 to V5.2.1 (Establishment of WeChat Group)	Balanced	The WeChat team, the Mobile QQ team	Technology	Yes	Yes
				Product promotion	Yes	Yes
				Complementary assets of suppliers		Yes
8/5/2014~now	V5.3 launch~now (WeChat and Mobile QQ as twin nuclei)	Competition-dominant	The WeChat team, the Mobile QQ team	Technology	Yes	Yes
				Product promotion	Yes	
				Complementary assets of suppliers	Yes	

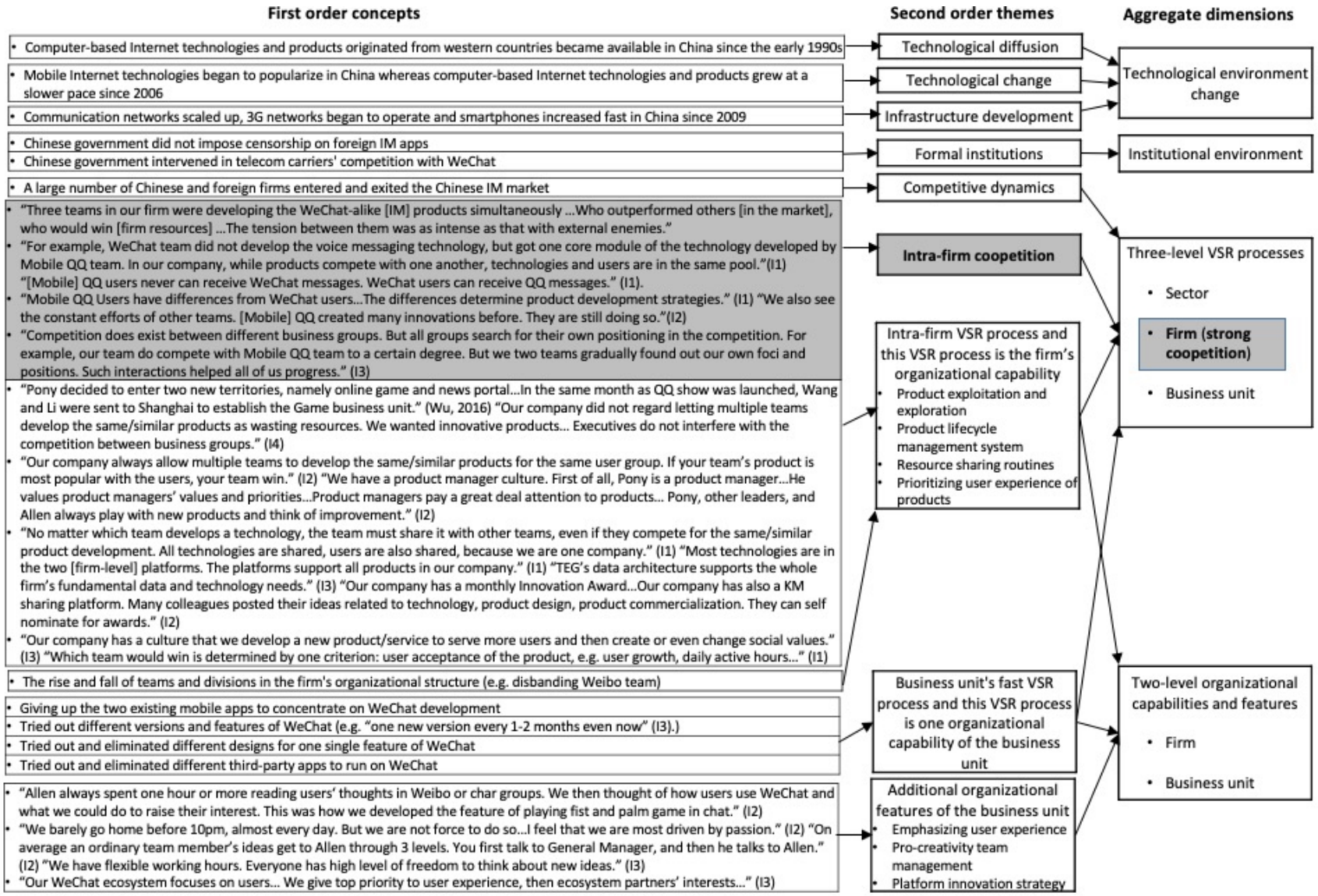

Figure 1. Data structure

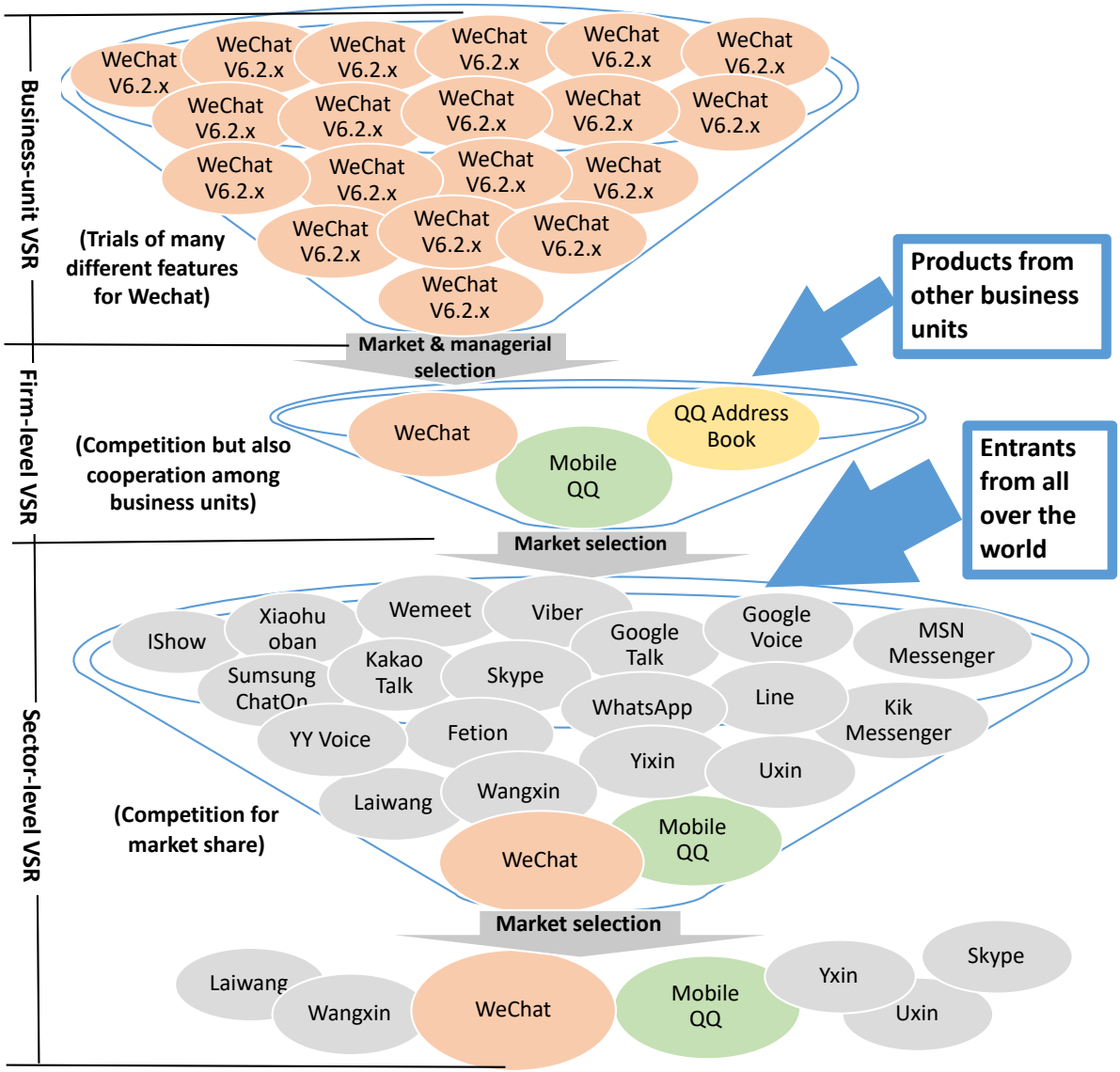

Figure 2. Three-level VSR processes driving WeChat's innovativeness

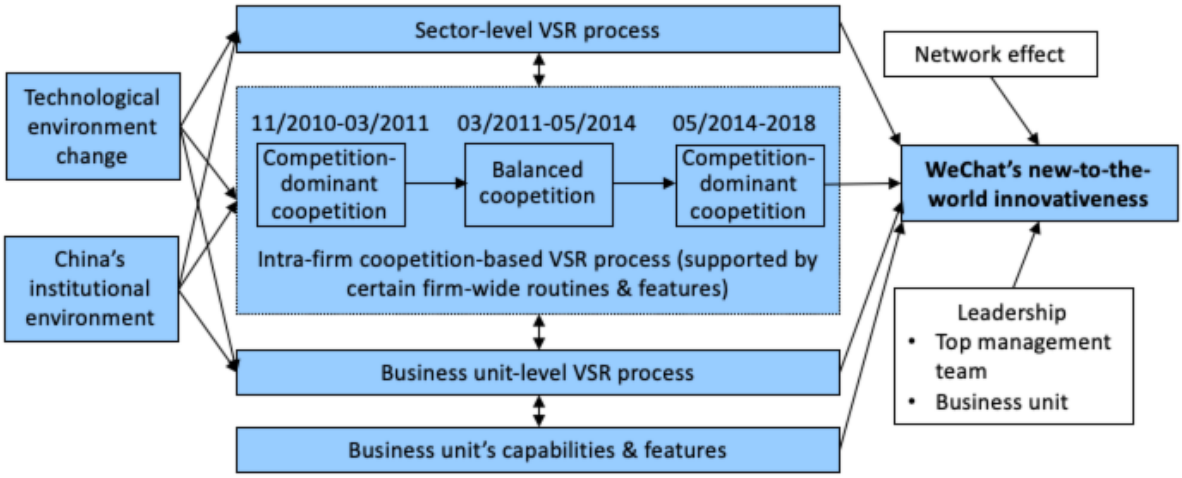

Figure 3. Our theoretical framework of what drives WeChat's new-to-the-world innovativeness

Note: The foci of this study are highlighted in blue.

Online Appendix available here: Wechat Paper Appendix

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