

Building and sustaining the emerging ecosystems by focal new ventures: evidence from the bike-sharing industry in China

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Abstract

Ecosystem co-evolution is important for companies' sustainable advantages. This increasingly holds true for new ventures in emerging ecosystems, where they often play the focal roles and co-evolve with a community of non-focal actors toward shared vision(s). However, we know little about the ecosystem co-evolution mechanisms that involve building and sustaining ecosystems by focal new ventures. Against this backdrop, we integrate ecosystem management literature and theory on industrial co-evolution within institutional environments to construct our analytic framework. Based on a case from the bike-sharing industry in China, we contribute to a better understanding of ecosystem co-evolution. First, a combined set of viable ecosystem strategies could help focal new venture overcome co-evolution challenges from different actors. The positive interactive effects between ecosystem strategies will further drive ecosystem co-evolution processes. Second, ecosystem co-evolution refers not only to individually achieving alignment between non-focal actors and focal new venture, but also to realizing positive spillovers between two ecosystem environments that resulted from combined ecosystem strategies. These findings suggest strategic officers of new ventures in emerging public-good related industries to systemically implement ecosystem strategies to improve their nascent ecosystem's development. We also inform a research agenda for future research on ecosystem co-evolution.

Keywords: ecosystem co-evolution; new venture; ecosystem strategy; bike-sharing industry

INTRODUCTION

Radical innovations are frequently developed and commercialized by new ventures, by taking the focal role (henceforth: focal new ventures) to build and manage a new ecosystem (Hannah & Eisenhardt, 2017). An ecosystem is regarded as a community of interdependent and co-specialized organizations, which combine their individual offerings into a coherent customer-facing solution (Moore, 1996; Adner, 2006). A viable ecosystem will bring focal new ventures sustainable advantages, such as accessible complementary resources (Williamson & De Meyer, 2012), more entrepreneurial opportunities (Overholm, 2015), and resilience to big technology transitions (Adner & Kapoor, 2016). However, such viability largely depends on the success of ecosystem co-evolution (Moore, 1996; Rong & Shi, 2014). Ecosystem co-evolution in this study refers to all ecosystem actors moving toward shared vision(s) through co-creating and co-capturing value (Adner, 2017).

Despite the potential benefits, achieving ecosystem co-evolution is problematic for many focal new ventures, especially during ecosystems' nascent developmental stages (Moore, 1996; Rong & Shi, 2014). Consider a recent case, Better Place, a focal venture launched in 2007 and devoted to promote revolutionary full electric vehicles (FEV). They took a lead to initiate a FEV ecosystem by successfully integrating various ecosystem actors. They also succeeded to test their innovative business models in two pilot markets: Denmark and Israel. Yet, Better Place finally declared bankruptcy in 2013, for multiple ecosystem-specific reasons. For instance, Better Place misinterpreted Danish's "green" attitude to FEV, which caused consumers' low buying intention. Also, they did not foresee a change from promoting to reducing electricity consumption in terms of Israel governments' energy policy focus, which led to inconsistent political supports, and they took an antagonistic approach towards cooperation with automobile incumbents and FEV competitors (cf. Noel & Sovacool, 2016; Sovacool et al., 2017). The exposure to so many co-evolution challenges raises the question how young ecosystem leaders, like Better Place, can promote economically justifiable, politically attainable, and socially acceptable innovations.

We find such topic relatively underexplored by current ecosystem literature. Studies either consider new ventures as non-focal roles constrained by focal incumbents (Ansari et al., 2015; Nambisan & Baron, 2013), or focus mainly on economic ecosystem obstacles that focal new ventures might suffer (e.g., Adner & Kapoor, 2010; Hedman & Henningsson, 2015; Joo & Shin, 2017; Kwak et al., 2017). Besides, little is known about how focal new ventures deal with political

and social pressures, as most research presumes social and political actors as enabling, and not as restricting, factors during ecosystems' early growth stages (e.g., Dedehayir & Seppänen, 2015; Overholm, 2015; Rong, Wu, et al., 2015). This is particularly relevant in public-good related, or emerging ICT industries, where young emerging ecosystems are inhibited by lagging or even changing industrial regulations (Nakamura & Kajikawa, 2017). Consequently, scholars intend to propose ecosystem strategies in response to economic or socio-political challenges in an isolated manner, instead of examining them simultaneously (Hedman & Henningsson, 2015; Rong et al., 2017; J. Zhang & Liang, 2011). Therefore, this study investigates the following research question: *how can focal new ventures address multiple co-evolution challenges to build and sustain their emerging ecosystems?*

To this end, we first draw on ecosystem management literature (e.g., Autio & Thomas, 2014) and theory on industries' co-evolution within institutional environments (e.g., Geels, 2014) to construct an analytic framework. Second, we empirically examine an emerging ecosystem from the Chinese bike-sharing industry. This emerging ecosystem experienced a rapid growth since its genesis three years ago, meanwhile facing multiple problems from various ecosystems actors. Relying on critical incident technique (CIT) (Flanagan, 1954), our in-depth qualitative analyses help to unfold ecosystem co-evolution processes by focal new ventures.

Based on the results, we subsequently derive three propositions: 1) ecosystem co-evolution is affected by the variety and magnitude of challenges from two distinctive ecosystem environments – economic and socio-political – which requires focal new ventures to apply different ecosystem strategies to address them; 2) the success of ecosystem co-evolution not only depends on addressing co-evolution challenges by sets of viable ecosystem strategies, but also on the positive effects between ecosystem strategies; 3) the success of ecosystem co-evolution further depends on focal new ventures dynamically aligning two ecosystem environments through viable ecosystem strategies producing intertemporal positive interactive effects. These insights suggest that different business ecosystems' environments, as classified by Moore (1996), are not homogeneous and static but should be considered as heterogeneous and dynamic resulting in interactive dynamisms during co-evolution processes, especially in the nascent stages of ecosystem development.

THEORETICAL BACKGROUND

Conceptualizing the emerging ecosystems

Defining the nature and its constituted elements is a necessity for researchers' conceptualization of ecosystems (Aarikka-Stenroos & Ritala, 2017; Jacobides et al., 2018).¹ According to Moore (1996) and Peltoniemi (2006), a defining feature of an ecosystem is co-evolution—that is, all ecosystem actors moving toward shared vision(s) by co-creating and co-capturing value. In this study, we argue that ecosystem co-evolution includes at least three aspects to understand how an *emerging* ecosystem works: co-evolution *processes*, co-evolution *roles*, and co-evolution *structures* (Han et al., 2017). Taking a co-evolution process perspective reflects an ecosystem's lifecycle stage and maturity. Taking co-evolution roles as a static snapshot view illustrates who the involved actors are. The co-evolution structures view depicts the 'fundamental skeleton' of an ecosystem, revealing how ecosystem actors are organized to co-create and co-capture value.

An *emerging* ecosystem is first experiencing its infancy from birth to the expansion stage (Moore, 1996) and shows immaturity (Rong, Hu, et al., 2015). The 'emerging' here is similar to what Hannah and Eisenhardt (2017) called "nascent": everything is new and needs to be governed. During this stage, ecosystems exist higher dynamisms than in other stages (Dedehayir et al., 2016). New entrants and participatory non-actor elements are not well synchronized due to heterogeneous capabilities, resources, and conflictive motives. Consequently, the performances of value co-creation and co-capture remain at the lowest level (Ketchen et al., 2014). The 'value' in ecosystems has sources such as use, efficiency, flexibility, and innovation, and therefore takes various forms, such as customer, social, or technological value (Adner & Kapoor, 2010; Thomas & Autio, 2012).

Second, an *emerging* ecosystem is populated with loosely coupled actors that play different roles. Dedehayir et al. (2016) identify four groups of actors seminal to ecosystem genesis. They

¹ There is an inconsistency in prior ecosystem definitions. In terms of conceptual relationships between the "business ecosystem" (Iansiti & Levien, 2004; Moore, 1996) and "innovation ecosystem" (Adner, 2006), some researchers argue such two constructs are clear to demarcate-business ecosystems more related to value co-capture while innovation ecosystems more to value co-creation (see recent reviews de Vasconcelos Gomes et al., 2016 and Aarikka-Stenroos & Ritala, 2017). But a portion of others apply both interchangeably without distinguishing (e.g., Bosch-Sijtsema & Bosch, 2015; Hellström et al., 2015). We argue two seminal concepts could be conceptually taken as the same if the attention is paid to value process. Thus, the innovation ecosystem might be a sub-set of business ecosystem in a lifecycle perspective, ranging from value proposition, value co-creation, value sharing, to final value co-capture (see Thomas & Autio, 2012). To avoid confusions, we observe very recent work only adopts the "ecosystem" without 'business' or 'innovation' prefix (e.g., Adner, 2017; Autio & Thomas, 2014), whose operation is followed by this study.

emerge and transform in different points of time but all roles keep relatively fixed functions to ecosystem development. Leader actors, known as focal actors and often taken by new ventures in emerging ecosystems (e.g., Hannah & Eisenhardt, 2017; Overholm, 2015), ensure governance, partnerships forging, platform management, and value distribution. Around them, direct value creation actors contribute their components, without which the whole ecosystem suffers low performance (Adner & Kapoor, 2010). These actors are aided by value support roles, adding their complements to final offerings. Finally, the entrepreneurial actors support ecosystems with indispensable talents, capitals, and favorable policies.

Third, an *emerging* ecosystem is structured by a fragmented ecosystem business model (Thomas & Autio, 2012; Hellström et al., 2015; Walrave et al., 2017). Extending the business model of individual firms (Amit & Zott, 2001), the ecosystem business model indicates in a holistic way how ecosystem actors are organized to co-create and deliver ecosystem value, and how this value is co-captured by various actors. During ecosystems' initial stages, the extent to which individual actors' business models get aligned with ecosystem business model “serves to explain why ecosystem members are motivated to join, stay, or leave the ecosystem” (Borgh et al., 2012: 165). As such, for a sustainable ecosystem, focal actors intend to manipulate the ecosystem business model, such as iterating technological standards (Rong & Shi, 2014), orchestrating innovations (Dhanaraj & Parkhe, 2006), encouraging relationship multiplicity (Williamson & De Meyer, 2012), redesigning the technological modularity (Jacobides et al., 2018), and even reconfiguring actors and their tasks (Adner, 2012).

Taken together, we define the emerging ecosystem as 1) an immature symbiotic entity that develops from birth to its earliest lifecycle stages, where 2) new ventures generally play the focal role around whom there is a community of diverse interdependent and co-specialized non-focal actors, and 3) where they intentionally are organized to co-evolve toward shared vision(s) by ways of materializing (co-creating and co-capturing) proposed value.

Ecosystem co-evolution challenges

Given the aforementioned “emerging” features, achieving ecosystem co-evolution appears challenging for focal new ventures (de Vasconcelos Gomes et al., 2017; Walrave et al., 2017). Based on previous ecosystem management and growth literature, we identify focal ventures' ecosystem challenges as practical frictions that affect the success of co-creating and co-capturing value.

The first challenge relates to finding and integrating ecosystem complementary sub-sectors (Adner, 2006, 2012; Heikkilä & Kuivaniemi, 2012). Especially under high market and technological risks, it is difficult for focal new ventures to find core partners with key resources, knowledge, or technologies (Adner & Kapoor, 2010; Rong & Shi, 2014). For example, focal start-ups in energy ecosystems are hindered by the unavailability of biogas technology and instability of raw materials supply to achieve an early advantage (Hellström et al., 2015). Also, 3D printing ventures face problems of connecting to crowdfunding networks to nurture a stable ecosystem growth (Kwak et al., 2017). Rong et al. (2017) explained that, in contrast with ecosystems led by incumbents, new ventures often fail to convince business partners of shared market or technology visions.

Second, ecosystem co-evolution challenges come from end customers/innovation adopters (Adner, 2006). During the early stages, the absence of lead innovation users and supportive customer communities restrict ecosystem value co-creation (Hienerth et al., 2014). For instance, Joo and Shin (2017) who examined B2C e-commerce ecosystems showed how value co-creation processes were hindered by several barriers in terms of customers' inactiveness and low participation.

Third, focal new ventures might suffer cooperative tensions from competitors (Ansari et al., 2015; Hannah & Eisenhardt, 2017). On the one hand, they face threats from established competitive ecosystems. For example, traditional banks defend their ecosystems against new mobile payment ecosystems through their oligopoly by safeguarding technology access, increasing investments in infrastructure, or lobbying governments (Hedman & Henningsson, 2015). Commercial success by pioneered ventures leaves opportunities for entrants, who replicate the ecosystem business model to increase competitiveness in the same market (Overholm, 2015). On the other hand, focal ventures in conjunction with their competitors need collaboration because of collective troubles they faced, such as strong regulations and changing markets (de Vasconcelos Gomes et al., 2017).

Fourth, new ecosystems might experience dominant influences from political agencies. We expect this to be more evident in public-good related industries, or emerging ICT industries. For instance, Peltola et al. (2016) found regulators might introduce disruptive restrictions on business opportunities in waste management ecosystems. In an EV case, the conflictive regulations between central and local governments were likely to decelerate ecosystems' expansion speed (Rong et al.,

2017). Moreover, for drone start-ups, they developed their ecosystems with lagging regulations and thus endured policy uncertainties (e.g., Nakamura & Kajikawa, 2017).

Last, beyond governmental objections, there are pressures from social agencies. Cultural expectations and social acceptance matter if focal new ventures provide innovations which are closely related to social benefits (Rong et al., 2017). Hara et al. (2015), drawing on institutional perspective, analyzed how newly introduced diesel cars into Japan around 2000 were delegitimated by social anti-diesel campaigns and a critical dissemination role by mass media.

Focal new ventures' strategic responses to ecosystem challenges

In order to obtain 'growth viability', focal new ventures have to respond strategically to multiple ecosystem co-evolution struggles with ecosystem-specific strategies (Walrave et al., 2017). Different from corporate strategy focusing on individual competitiveness (Dosi, 2000; Porter, 1980), the ecosystem strategy is regarded as "the way in which a focal firm approaches the alignment of partners and secures its role in a competitive ecosystem" (Adner, 2017: 47). In this definition, ecosystem strategy complements, rather than substitutes, corporate strategy, as it is made to put 'puzzle pieces'—even if some have indirect links to focal firms, into shared visions (Adner, 2017). Ecosystem strategies thereby pursue ecosystem-level competitiveness. In line with this feature, we propose that ecosystem strategies should be recognized as focal roles' deliberate or emergent actions to enable ecosystem's value co-creation and co-capture.

Although current ecosystem literature documented a set of ecosystem strategies available for focal new ventures (e.g., Adner & Kapoor, 2010; Autio & Thomas, 2014; Hedman & Henningson, 2015; Iansiti & Levien, 2004; Rong et al., 2017; J. Zhang & Liang, 2011), they do not fully explain how these are effectively used to address ecosystem challenges. First, extant ecosystem strategies mainly focus on solving *economic* ecosystem problems. Second, literature mainly pays attention to how focal new ventures deal with political or social agencies that *facilitate* ecosystem development, while there is little attention so far to strategies to address restraining political and social actions (e.g., Dedehayir & Seppänen, 2015; Overholm, 2015; Rong, Wu, et al., 2015). Third, there is not much research that examines interactive effects between economic and socio-political challenges and effective strategies. To fill in this gap, we consider both economic, societal and political strategies to address emergent ecosystem challenges.

The economic positioning strategies

The economic positioning strategies aim at actors who control economic factors that directly affect the materialization of value co-creation and co-capture, such as land, talents, labor, capital, and suppliers (Autio & Thomas, 2014; Oliver, 1997). Of the economic positioning strategies, the supply chain management strategy require scanning lower cost of material resources, easing manufacturing procedures, and stabilizing supply relations (Autio & Thomas, 2014). The platform organizing strategy entails to govern fragmented business partners and attract non-direct partners by building and sharing high-value common assets (J. Zhang & Liang, 2011). The vision diffusing strategy tells ‘good’ market stories to potential investors (Prince et al., 2014; Rong et al., 2017). The innovation strategy emphasizes increasing R&D inputs and managing patent activities. As a complement, the orchestration strategy enhances absorptive capacities and learning from others (Dhanaraj & Parkhe, 2006). The marketing strategy highlights promotions and branding activities, educating customers, and searching for more niche markets (Joo & Shin, 2017).

The cooperative strategies

The cooperative strategies target various competitors (Hannah & Eisenhardt, 2017; Hedman & Henningson, 2015). Specifically, the offensive strategy emphasize raising market entry barriers, providing incompatible innovation schemes, attacking new entrants with price wars, and establishing ties with big firms. While the defensive strategy entails collective negotiations with competitors, sharing information and intelligence, creating industrial associations, or even colluding (cheating policymakers, customers, and social publics).

The corporate political strategies

To avoid political agencies’ possible influence on realizing value co-creation and co-capture, the formulated corporate political strategies (CPS) aim to create a supportive political environment (Autio & Thomas, 2014; Hillman & Hitt, 1999; Oliver & Holzinger, 2008). Building on Oliver and Holzinger (2008), alternative CPSs are feasible for focal new ventures:

- a) Reactive political strategy. Focal new ventures have to quickly react to any political demands or sometimes comply with temporary regulations. For example, they are commanded to develop efficient pollution control processes to meet administrative expects. In other words, in the short-term, doing whenever political agencies have needs.
- b) Anticipatory political strategy. To influence political agencies to gain a first mover advantage, foal ventures have to prepare the impending policy changes (e.g., establishing

best practices that governments will adopt). They hire ex-government employees, make financial contributions to governments or political parties, and invite politicians to speak at company conferences, bribe, or give paid-travel. Put another way, in the medium-term, doing what policymakers will demand or encourage.

- c) Defensive political strategy. When confronted with particular problems, focal ventures should hire specialized lobbyist teams or mobilizing CEOs to lobbying, in order to thwart unwanted changes (e.g., maintain protective pricing structure) and protect the status quo (e.g., advocate entry restrictions). They also can activate their social networks to influence governments.
- d) Proactive political strategy. This is used to shape the way that regulations or political standards are defined to fit ecosystem's long-term interests. To do so, they participate in lawmaking and governmental decision processes, being experts or consultants before regulation release, share data and industrial information with governments. They also can build a massive grassroots constituency on behalf of their benefits.

The social strategies

The Social strategies are taken to shape the social actors (Geels, 2014; Mahon & Waddock, 1992; Rong et al., 2017; Snow & Benford, 1988):

- a) The diagnostic framing strategy. The '*framing*' denotes alignment actions to render social criticisms (doubts, or radical social movements) heading toward a beneficial direction. As such, first, focal new ventures need to identify and define the occurred salient social criticisms that plagued the whole ecosystem. After this, focal new ventures need denying criticisms through PR actions, attacking credibility and science base of criticism/doubts, advocacy advertising, and scientifically redefining certain issues.
- b) The prognostic framing strategy. If the diagnostic ways do not work, focal new ventures should take some concrete solutions: prove criticisms/doubts are wrong or technologically unfeasible with autoreactive reports/data, use official promises to acquire trust and reliability, develop metaphors (e.g., clean coal) to create positive meanings for their innovations.
- c) The issue management strategy. For some salient criticisms often emerging in civil society and then spreading to other actors, focal new ventures should solve these issues in lifecycle stages: reject or downplay critics' scattered demands in early age, engage in symbolic

actions to frame more organized criticisms latter, and take substantive actions (expenditure of money, equipment, or personnel resources) if necessary.

- d) The corporate social responsibility (CSR) strategy orients toward a wider civil society. Sometimes, focal new ventures can initiatives treat social issues as opportunities for social value co-creation, instead of troubles. They can subtly influence social publics (such as NGOs and consumer activists) through ‘doing the right thing’: provide help for local communities or nonprofit organizations, donate to education or hospital; signal commitment to social welfare, be a member of, or collaborate with, NGOs, behave sustainable or green (e.g., use green materials).

Analytical framework

We draw on Moore’s (1996: 27) conceptual ecosystem model to construct our analytical framework, which is complemented with theory on industrial co-evolution with external environments (e.g., Geels, 2014; Lewin & Volberda, 1999; Nelson, 1994; Scott, 2000).

First, the emerging ecosystem evolves in institutional settings and thus has distinct institutional environments. As argued by Thomas and Autio (2012), the introduction of institutional theory into ecosystem governance analysis provides a useful lens in understanding ecosystems’ organizing principles, rules, and norms. Aarikka-Stenroos and Ritala (2017) explicitly claimed that an ecosystem crossing industry boundaries is located in an institutional and socio-technical environment. Building on these insights, we also propose that the emergent ecosystem actors are embedded in two ecosystem environments—the economic environment and socio-political environment (see figure 1).

-----*Insert Figure 1 around here*-----

Accordingly, the core of the ecosystem includes focal new ventures and their competitors. On the one hand, these categorized actors compete in the same markets because of having shared product and services attributes, business processes, preliminary industrial identify and mindsets, and organizational arrangements (Geels, 2014; Moore, 1996). On the other, the ecosystem’s immaturity and fragility necessitate them staying close to collaborate and protect their business for a shared fate reason that they all suffer collective co-evolution challenges (de Vasconcelos Gomes et al., 2017; Overholm, 2015).

As depicted in Figure 1, the ecosystem's core is embedded in the economic and socio-political environment (Geels, 2014). The economic environment emphasizes technological reliance and economic efficiency that are essential to focal new ventures' core contributions (Moore, 1996; Oliver, 1997; Rong & Shi, 2014). It mainly comprises end consumers, direct value creation actors, value creation support actors, investors, and other industrial actors (Dedehayir et al., 2016). The socio-political environment emphasizes advisability of adhering to institutional expectations and social fitness (Geels, 2014; Rong et al., 2017; Scott, 2000). Political or related agencies, social media, relevant social movements, public discourses, and mass publics belong to this ecosystem environment.

Second, we propose that the success of ecosystem co-evolution largely depends on effective focal new ventures' ecosystem strategies to overcome multiple ecosystem challenges from these two ecosystem environments. Additionally, based on industrial co-evolution logics theory, we propose that ecosystem co-evolution depends on the effective strategies that enable positive *interactions* between the two ecosystem environments.

METHODOLOGY

To answer our research questions, we chose the Chinese bike-sharing industry as a proper research context for two reasons. First, the bike-sharing industry is typically regarded as an emerging (public transportation) industry that grows fast from birth to expansion stage over the last 3 years. After 18 months' rapid growth, the whole industry hits a plateau at the end of 2017. Second, the newly created bike-sharing companies as focal actors operate with some regulative influences from governmental agencies and threats from incumbents.

We chose the case study method, since it is well-suited for theory building to address "how" research questions in varied settings (Yin, 2013), in particular those containing high dynamics (e.g., Overholm, 2015). Moreover, the case study method allows the ecosystem co-evolution process analysis as "a discrete set of events occurred based on a story or historical narrative" (Van de Ven & Huber, 1990: 213).

Background: the bike-sharing industry

According to the European Cyclist Federation (ECF, 2012), bike-sharing refers to a self-service, short-term, one-way capable bike rental offer in public spaces, for several target groups, with

network characteristics. As an extension of public transport systems, public bike-sharing services are usually funded and managed by local governments for citizens' 1-5 km journey purposes.

Although such services have health, environmental, and social benefits, many government-initiated bike-sharing programs face similar operation and expansion problems during the past decades (L. Zhang et al., 2015; Ricci, 2015). For instance, they suffered serious thefts and vandalism as there was no efficient tracking system, they served only for a small amount of citizens because of limited available bikes/docks on the streets, and the complicated registration processes caused users' reluctant usage (L. Zhang et al., 2015).

During recent 3 years, we see many commercial bike-sharing ventures taking over governments' operations to provide bike-sharing services (for details see Table 1). They typically take an intermediary and focal role between bike manufactures, end customers, and relevant organizations. They run such operations with for-profit intention and generally receive none subsidies, while comparably governments offer it as a sort of 'public service' with social welfare objective (Ricci, 2015). Hence, in this study, the firms providing such services are called bike-sharing focal new ventures and as a whole it is called the bike-sharing industry, in order to differentiate from government-oriented bike-sharing programs (or their synonymies like Bike Sharing Schemes and Public Bike Sharing).

-----*Insert Table 1 around here*-----

The bike-sharing industry emerged in China around 2015. Then it has swiftly obtained a wide popularity not only in Chinese cities, but also in global markets. According to estimates from Roland Berger consultancy (Ram, 2017), over 1,000 bike-sharing ventures with more than 10 million bikes are already in operation worldwide and the market is expected to grow by 20% by 2020. Of global sharing bikes, about 70 percent (7 million) are in China.

The rapid rise in China has several reasons. First, China's penetration rates of smartphones and mobile payment are high, making it easy for financial-technology startups to reach a vast market cheaply. The volume of mobile payments reached almost fourfold in 2017 to \$8.6 trillion, compared with just \$112 billion in America (L'Huillier, 2017). As such, customers can unlock bikes with smartphones and pay fees in a quick way. Second, the relevant technologies become mature and widely applicable, such as tracking, solar energy, and narrow band Internet of Things (NB-IoT) (Monfardini et al., 2012). The tracking system and NB-IoT make the bikes free from

fixed stations or docks. Therefore, it reduces costs by thefts, and users can ride bikes to more under-desired destinations without fixed stations or docks. Third, with ongoing urbanization and motorization of many cities in China, the ‘first and last mile’ problem becomes severe for city dwellers. The dockless bike-sharing mode has a wider coverage and multiple application scenarios, which can better ease the week-day commuting, traffic congestion, and air pollution problems (L. Zhang et al., 2015).

Case selection

We chose a purposeful rather than random sampling approach whereby the selected case is deliberately chosen in order to support, refine, or extend emergent theory (Eisenhardt, 1989).

The first step is to identify potential cases. The case for this study was selected from a population consisting of 77 firms in China with a bike-sharing service business model. The database was created by the first author at the end of 2017 based on several techniques, such as direct online searching, independent press coverage, and interviews with experts and relevant analysts. The whole database was double-checked for errors by two industry experts at Beijing university institutes.

From these 77 firms, only new ventures were selected that 1) continued their business up to a period of 6 months (indicating their efforts to build and importantly sustain emerging ecosystems could be acquired), 2) were typically taken as analytic samples by industrial reports (indicating they showed complete performance indexes of ecosystem growth, such as ridership per-day-per-month, market share, and fundraise history), 3) were independently initiated by entrepreneurs, and 4) were not merely operated in single cities.

Finally, 7 of 77 cases fit the four inclusion criteria. Four ventures survived and three failed until the end of 2017. Further, we chose one successful case, which we will call *Redbike*, located in Beijing. We did try to get access to other firms but received explicit refuses or no replies. *Redbike* is considered an industry leader, who pioneered the novel bike-sharing mode and led the industry development, occupying over 40% of total market share since the beginning of industry.

Data collection

The case study requires multiple types of empirical evidence in order to converge towards emergent theory (Eisenhardt, 1989). Our data mainly drew from 15 semi-structured interviews and 4 online publicly available interviews by others, complemented with 6 types of secondary resources (see the Appendix). We stopped data gathering until a point of saturation was achieved

where additional data collection could not yield new knowledge to answer research questions (Eisenhardt, 1989; Yin, 2013).

First, all interviews were based on an interview protocol, containing questions derived from our theoretical framework. Two pilot interviews of *Redbike's* international business partners and one informal communication with a *Redbike's* insider were taken initially to test our interview protocol.

Second, as our research objective is to reveal ecosystem growth mechanisms, the ecosystem as a whole is regarded as the unit of analysis. Therefore, we complemented our data with interviews with various ecosystem actors, including senior managers from related strategic suppliers/business partners, bike-sharing experts, social reporters, political, and quasi-political agencies. Since the respondent access problem is a typical feature of an empirical study in this new emerging industry, we applied the “snowball strategy” to get access to new interviewees. The first author interviewed seminal respondents and asked them to suggest relevant potential interviewees they were familiar to within or outside their organization.

Third, all respondents are anonymized for confidentiality reasons. Before every interview, participants were offered to sign an ‘informed consent form’, which strictly adheres to the first author’s institution’s ethic guidelines. Additionally, our data partly came from two unsuccessful firms, and the anonymized data protects their interests encourages frank answers.

Fourth, we applied the critical incident interviewing technique (CIT), which is an approach to obtain procedural retrospective reports of managerial decision making on important issues (Flanagan, 1954). During our interviews, people originally reported their organizations’ relationship with the industry, the industry’s stages and history, and elements that describe an ecosystem. This part of questions helped the respondents to understand the general context and to get a holistic understanding of the emerging ecosystem. The second and main part of the interview asked them to chronologically describe at least one latest incident, which they regarded as critical to explain how focal ventures respond to co-evolution challenges from ecosystem actors. To be critical, the referred events or incidents should be successful (positive) or unsuccessful (negative).

In efforts to get more accurate and complete information, interviewees were also asked to reflect on earlier events when relevant problems, obstacles, or troubles started to occur and the relevant actions taken by the focal ventures. With their stories unfolding, the interviewer occasionally pressed them to provide additional factual details, such as “*How do you know?*”,

“*What happened next?*”, “*What does this lead to?*”, or “*Who will be affected?*”. To not distract the respondent’s track of thinking, above explanatory questions were asked after they finished describing an entire event or incident. Sometimes, interviewees were unable to recall any (especially unsuccessful) events or incidents. We therefore in advance prepared a list of categorized critical incidents that was derived from two Chinese entrepreneurship service dotcoms (e.g., 143 incidents on *Redbike*). The interviewees were asked to complement, correct, or delete these incidents, but importantly tell more about unsuccessful or negative ones. We used follow-up calls or emails to ask for additional information where necessary. Consequently, all interviews were entirely recorded, transcribed, and coded within NVivo 11 software for qualitative analysis.

Data analysis

Our data analysis involved three steps: initial open, axial, and selective coding analysis (Eisenhardt, 1989; Miles & Huberman, 1994; Strauss & Corbin, 1990). During open coding, we first reconstructed the incidents in a chronological order due to respondents’ separated discussions. Then we used the critical incidents to identify ecosystem challenges encountered by focal new ventures, each supported by at least two or more evidential quotes. For each of the identified challenges, we revisited the data to determine the applied strategies by the focal actor, and if applicable, by other ecosystem actors. Then we classified the challenges and strategies according to our theoretical framework, and, focused on identifying relational links between ecosystem challenges, ecosystem strategies, and ecosystem success or failure. During axial coding, we consolidated foregoing links that were in essence similar by use of tabulation or graphs. While during the selective coding, we strove to integrate all identified codes and inductively formulate storylines that could offered coherent and insightful accounts of emerging ecosystem co-evolution processes. The third stage we again were guided by preliminary research framework as we tried iteratively to compare the conceptual meanings/definitions in prior literature and empirical facts for generating new insights.

To verify the plausibility of identified patterns, we further reviewed our dataset for corroboratory evidence and used data from secondary sources to ensure the validity of findings (Miles & Huberman, 1994). We contrasted with industrial reports, company white papers, news press, and other document materials. In addition, we checked some key information with industry insiders and experts. As information gaps were identified, we searched varied data resources in an iterative fashion for clarifying or complementing. Subsequently, as the write-up evolved, all

narrative parts were read and commented by authors and key informants, and if necessary adjusted accordingly.

As a result, our analysis not only illuminates key relations of ecosystem challenges and different ecosystem strategies on ecosystem co-evolution processes, but above all the interactions between ecosystem strategies and ecosystem environments on ecosystem growth.

RESULTS

The empirical section is divided into 4 parts in line with our research purpose and theoretical framework. We identify what are 1) typical challenges, problems, or obstacles, that focal new ventures suffered during their ecosystem building and sustaining processes; 2) events/activities that focal new ventures regard as critical/significant; 3) deliberate/emergent actions by focal new venture to react to these challenges/problems; 4) most importantly, the positive or negative impacts of deliberate/emergent actions on different ecosystem actors that causes varied ecosystem growth. An overview of the key findings is presented in Table 2.

-----Insert Table 2 around here-----

The challenges, strategies and outcomes of Redbike's ecosystem

Redbike was one of the first two ventures to supply bike-sharing services from January of 2015. At the beginning, they faced unique technical problems in terms of re-designing and manufacturing a specialized bike for public sharing. *“At that time no one has invented such a kind of smart bikes. We have no experience and established model out there we can based on. We can only depend on our imagination to show how a sharing bike should be”* (RB1). After they took efforts to finish a project prototype, no one would like to manufacture it because of the small volume of orders Redbike needed. Therefore, Redbike turned to manufacture crazily designed bikes by themselves. They initiated their own R&D centers and factories in Wuxi, where the first version of hand-made smart bikes was produced. Although it costed a considerable amount of time and resources, it afterwards rewarded in terms of operation, maintenance, and particularly easing themselves to lobby local governments, who drove bikes without smart locks out.

With one year of technical preparation, Redbike started to run operations in metropolises: Shanghai (April 2016), Beijing (August 2016), Guangzhou (October 2016), and Shenzhen (December 2016), as some city districts had the urgency to solve the ‘first and last mile’ problem and to build non-motorization transport systems. Redbike faced problems such as different local

governmental bureaus holding non-aligned different attitudes to sharing bikes. For instance, the transport and environment bureau welcomed them, while the urban management bureau and sub-district offices saw them as trouble or burden as they took extra efforts to manage. As with these, Redbike complied with different political needs with flexible reactive actions, in order to quickly adapt bike-sharing services to regional citizens. Additionally, local governments requested industrial guidelines from central governments, but the latter preferred to let the whole industry move forward and see what happened next. As a result, the lagging governmental industry guidelines and market entrance systems encouraged more entrants, and unfortunately gave rise to disordered competition. One respondent confirmed, *“Since we started, we gave suggestions to governments that the bike-sharing industry, providing public goods for the society, should have regulations/market entrance requirements. To our disappointment, they did not take that. As a definite result, you can see a sea of bikes on the streets”* (RB1).

-----Insert Figure 2 around here-----

At the beginning of 2017, increased industry competition prompted Redbike to expand faster than before, leading to new challenges (see figure 2). First, instability of smart locks and heaviness of first version bikes impaired users’ riding experiences. Redbike collaborated with Ericsson and China Mobile to enhance smart locks with NB IoT technologies, with Baidu Cloud to develop electric fence technologies, and with Qualcomm to develop Mobile SIM card technologies. Combining state-of-the-art technologies, Redbike released lighter and stable bikes in rapid succession—“New Lite 1.0” and “Fengqingyang”. These bikes needed less power and could have more application scenarios by users. Second, Redbike was pressured to attract wider customers in more niche markets as customers had many options in markets. Redbike searched for incumbent partners with ‘versatility’. For instance, collaborating with Tencent (WeChat APP) not only acquired numerous users but also attracted Tencent to invest. Third, the limited production capacity could not match Redbike’s high scale-up speed. This problem became more serious after the spring of 2017, when there were over 100 bike-sharing entrants. *“At that moment [fierce competition stage], anyone can put their colored bikes without smart locks on the streets as long as he/she has the money”* (RB1). Redbike exclusively partnered with HL Corporation (bike components providers) and Foxconn (assembler), whose production capacity meets the gap. In addition, Redbike continued to call on governments to regulate the chaotic market, but reaped no

fruits. *“Though the central and local governments had realized of this problem [excessive bikes on streets], they do not know how to regulate without any established laws or regulations out there. Their regulating logic is still about that you cannot make any trouble to their urban management. I have to say such attitude permit more entrants”* (RB1). Fourth, how to manage millions of bikes efficiently seemed challenging for Redbike without any prior operation experience. To overcome this, they set up a big data management platform - ‘Magic Cube’ - and connected it to the Microsoft Azure data service platform, which allowed Redbike to distribute, monitor, and relocate bikes more accurately and efficiently. Moreover, they intentionally launched some marketing activities, such as ‘Hongbao bikes’. Users were incentivized to ride underused or misplaced bikes meanwhile getting rewarded with cash bonus. This had three benefits: 1) more customers used bikes and as a result their riding stickiness was strengthened, 2) users’ active involvement in operation saved a considerable portion of costs, and 3) it further caused less complains from local governments as it resulted in less illegally parked bikes in public areas.

Concerned with enduring competition, the Transport of Ministry released regulative guidelines on August 3rd 2017, following which many local governments did with followed industrial instructions. Redbike participated in most legislative activities and successfully lobbied governments to accept their advocacy of entry restrictions. As a result, governments stipulated that all bikes must be managed by GPS-enabled smart locks, big data platforms, and electric parking fences. More stringently, at least 7 big cities proclaimed “no more” bikes to keep the status quo.

These restrictions consequently mitigated fierce competition whereas exposed Redbike to some new problems. The primary problem was to increase customers’ riding frequency with the fixed number of bikes. Second, venture capitalists became more cautious than before, leading to decelerated developing speed of the bike-sharing industry.

To address the former problems, Redbike took a combined set of actions. They continued to iterate bike versions, making bikes safer, more comfortable, and fashionable. Also they organized ‘saving zombie bikes’ promotions (i.e., customers were rewarded by riding underused bikes), and they connected their digital app to some incumbents, such as Samsung and Meituan.com. Further, they allowed free-deposit-riding in a wide range of cities (i.e., people used bikes with zero security deposit if their credit records met certain requirements), and most importantly they added ‘four wheels’ to ‘two wheels’ business by offering complementary car-sharing services. Hence, customers were retained and investors thought better of its future business growth.

While for the latter, the corporate social responsibility (CSR) strategy and vision disusing strategy were carried out to accelerate global expansion. To finish their plan of entering into 200 global cities, Redbike joined hands with UN agencies (e.g., launch the “World Cycling Day”), the China Chamber of International Commerce, and even local Chinese embassies, as “...*leveraging their prestige and influences can make local people accept them quickly and easily*” (RB2). Consequently, they are funded by Qualcomm and LINE.com at the end of 2017, when all ventures were thirsty of money.

DISCUSSION

While in the literature there is an increasing focus on how new ventures deliver radical innovations by playing leader roles in their ecosystems (Hedman & Henningsson, 2015; Kwak et al., 2017; Overholm, 2015; Rong et al., 2017), there is a limited understanding in terms of how these focal new ventures can achieve a rapid ecosystem co-evolution under multiple ecosystem challenges (de Vasconcelos Gomes et al., 2016). Insights into this issue can contribute to ecosystem management theory and provide useful guidance to new ventures that seek sustainable competitive advantages, as well as to policymakers who want to facilitate ecosystem growth for social benefits. Our study seeks to answer the research question of how focal new ventures can address multiple co-evolution challenges to build and sustain their emerging ecosystems. For this study, we integrated ecosystem management literature (e.g., Autio & Thomas, 2014) and industrial co-evolution theory (e.g., Geels, 2014; Lewin & Volberda, 1999) to examine how a focal new venture in the Chinese bike-sharing industry enables ecosystem growth by applying a set of ecosystem strategies.

Theoretical contribution

Our first contribution is the integration of institutional theory to adapt and extend the conceptual ecosystem model by Moore (1996). Extant literature paid less attention on how focal new ventures deal with political and social pressures, as most research regarded political and social actors as peripheral roles and presumed their enabling influences during ecosystem growth (e.g., Adner & Kapoor, 2010; Hedman & Henningsson, 2015; Overholm, 2015; J. Zhang & Liang, 2011). However, our case study shows that focal new ventures can suffer pressures from actors in economic and socio-political environments concurrently, which hinders ecosystem development.

To be specific, ecosystem challenges particularly existed in economic environment at the very beginning. As ecosystem developed, the degree of direct supplier pressures decreases, while

pressures from venture capitals, end customers, and competitors endure. Besides, extending prior ecosystem literature (Dedehayir & Seppänen, 2015; Peltola et al., 2016), our analyses demonstrate governments pose restrictive influences on bike-sharing ecosystems with an increased rate, instead of being the ecosystem enablers all the time. With a result, we even see challenges from both environments were intertwined (i.e., political restrictions negatively affected venture capitals), which slowed ecosystem's rapid growth down. Therefore, we suggest the first proposition as follows:

Proposition 1: *Ecosystem co-evolution is affected by the variety and magnitude of challenges from two distinctive ecosystem environments – economic and socio-political – which requires focal new ventures to apply different ecosystem strategies to address them.*

As the second contribution, beyond previous ecosystem management literature (Adner & Kapoor, 2010; Hellström et al., 2015; Iansiti & Levien, 2004; Rong et al., 2017), our analyses reveal a set of viable ecosystem strategies can help achieve the alignment between non-focal actors and focal ventures, meanwhile show some interactive properties (see Table 2). For instance, the marketing strategy and platform organizing strategy can enhance the efficacy of implemented CPS (e.g., launching promotions and platform management activities decrease complaints from local governments); the supply chain management strategy largely improves the effectiveness of vision diffusion strategy (e.g., collaborations with car-sharing companies restore venture capitals' confidence). Besides, there are few negative interactive effects between ecosystem strategies. For example, the failure of persuading governments to regulate messy markets makes Redbike harder to defend against competitors. While participating in lawmaking processes brings them political advantages but at the same time makes potential venture capitals more cautious about such service. Combining these observations lead to our second proposition:

Proposition 2: *The success of ecosystem co-evolution not only depends on addressing co-evolution challenges by sets of viable ecosystem strategies, but also on the positive effects between ecosystem strategies.*

Additionally, our analyses demonstrate the intertemporal 'spillover effects' between ecosystem economic and socio-political environments, which extend most extant studies' concentration on ecosystem dynamics at an actor level (see e.g., Adner & Kapoor, 2016; Davis, 2016). In our case, Redbike creates a viable economic ecosystem environment by overcoming

various economic ecosystem challenges during initial development stage. That is, they achieved value co-creation and co-capture with economic actors in the first place (Walrave et al., 2017). As showed by Table 2, it is evident that the positive effects of a viable economic environment spillover to the socio-political environment, especially through multiple ecosystem strategies producing intertemporal positive interactive effects. The ‘spillovers’ in this way means that proactively adopted technologies meet subsequent regulation requirements, which further ease Redbike to persuade governments. In reverse, such positive spillover effects from socio-political to economic environment become visible during bike-sharing ecosystem’s later growth stage. Specifically, the early collaboration with international political agencies not only behaves social responsible, but also importantly can make them known by overseas customers, business partners, and investors afterwards. Hence, we suggest the third propositions:

***Proposition 3:** the success of ecosystem co-evolution further depends on focal new ventures dynamically aligning two ecosystem environments through viable ecosystem strategies producing intertemporal positive interactive effects.*

Managerial implication

This study has implications to strategic managers of new ventures, particularly those who build and sustain their emerging ecosystems in public-good related industries, such as FEV, solar energy, and drones. First, since they deliver innovations that are closely related to public goods, they have to proactively pay extra attention to mitigating influences from regulatory governments, even if they build an ecosystem that currently operates with an absence of regulations. Moreover, these managers might be skilled in addressing single or short-term challenges, but they are advised to consider possible intertwined and persistent (economic or socio-political) co-evolution challenges.

Second, in order to enable ecosystem co-evolution, strategic managers are also suggested to formulate and implement ecosystem strategies that target different ecosystem actors in a combined rather than a separate way. In face of resources and experience limitations, it might be beneficial if they can get collaborations with ‘multifunctional’ partners, who are able to provide varied key resources that can help solve multiple ecosystem problems. Sometimes, sub-optimal actions are necessary if they intend to leverage large firms’ technologies or platforms. They should also be aware of the intertemporal interactive relationships between ecosystem strategies. In doing so,

proactively identifying the positive effects not only saves resources but also accelerates ecosystem growth by co-creating and co-capturing technology, customer, and social value.

Third, more broadly, strategic managers should take a holistic vision of their nascent ecosystems. Considering multiple challenges from various competitors, economic actors, and socio-political agencies, aligning actors in economic environment is a priority for focal new ventures (Rong & Shi, 2014; Walrave et al., 2017). On top of a viable economic environment, at the same time, they can respond effectively to socio-political agencies with positive spillovers that produced by combined economic and social-political ecosystem strategies. Finally, in a perfect sense, it is expected that accelerated ecosystem growth depend on the two dynamically mutual-supported ecosystem environments.

Future directions

We envision a number of opportunities for future research. First, although we have explored the co-evolution dynamisms in terms of focal new ventures' strategic responses to ecosystem challenges, future research can improve ecosystem development understanding by considering non-focal actors' ecosystem strategies (Ansari et al., 2015; Iansiti & Levien, 2004). Further, future studies can extend our conceptual framework by detecting how and when the trade-off effects between focal and non-foal actors' strategies will happen, and the corresponding influences on ecosystem co-evolution. Moreover, such observations might complement our current work through multiple comparative cases in the bike-sharing or public-good related industries (e.g., car-sharing, FEV, and drones).

Second, as opposed to statistical generalization, we emphasize that the ecosystem growth to some extent depends on focal new ventures' ecosystem strategies with a qualitative investigation like many prior studies. We argue future research is able to add more quantitative knowledge to ecosystem co-evolution, which is facilitated by some feasible guidance (cf. Graça & Camarinha-Matos, 2016; J. Zhang & Liang, 2011).

Third, future research also has opportunities to refine and extend current theorization of ecosystem co-evolution beyond the emerging ecosystem development stages. We suggest more longitudinal studies to examine how focal ventures manage ecosystem challenges during post-expansion stages (Dedehayir & Seppänen, 2015; Moore, 1996). In doing so finds other kinds of stage-based ecosystem strategies that are not covered in our case.

Limitations

Some limitations in this study need to be mentioned. The first limitation is that we focus on a single in-depth qualitative case, which limits generalizability to other cases in the same industry. However, we can generalize to theory by relying on more comparative cases (Yin, 2013). A second limitation concerns the external validity given the exploratory character of, and researchers' possible personal bias in, data analysis. However, we believe our multiple types of data and constant triangulations during data analyses keep that in a lowest level. A third limitation relates to CIT method we depend on that there is always a degree of 'zoom-in' effects. Although we take the whole ecosystem as the unit of analysis, a choice of limited critical events allows focusing on specific actor interactions whereas ignoring others.

CONCLUSION

How can new ventures like Better Place better play the leader role to enable their ecosystem growth in a sustainable manner? Previous literatures' emphasis on addressing economic (including technology, key supplies, customer, and finance) challenges and cooperative tensions approaches part of the question. We extend current theory by adding and integrating social and political environments. Our qualitative study of a focal bike-sharing venture demonstrates that the success of ecosystem co-evolution depends not only on a focal venture's sets of ecosystems strategies, but particularly on their deliberate efforts to dynamically align the economic and on socio-political ecosystem environments. Such complex activities definitely require concerted proactive strategic attention.

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Figure 1 the emerging ecosystem (adapted from Moore (1996: 27))

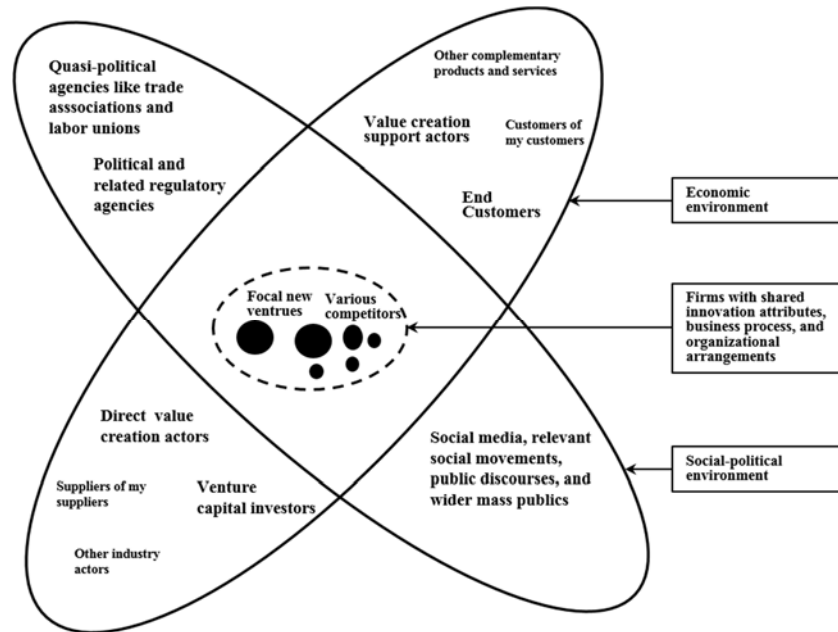


Table 1 A brief comparison between traditional and new bike-sharing mode (Source: set by authors).



Item	Traditional mode	New mode
Provider	Mainly by governments	Mainly by independent new ventures
Intention	For social welfare	Mainly for commercial profit
Customer	Mainly for local citizens with ID number/credit card	For smartphone holders over 12
How to use	<ol style="list-style-type: none"> 1) Register with ID card, pay the deposits at relevant bureaus and get a customer card; 2) Find the docks nearby and swipe the card on docks and ride away; 3) Put bikes back to docks after use; 4) Swipe customer card again and finish the use. 	<ol style="list-style-type: none"> 1) Install the APP on smartphones; 2) Register with telephone and ID number and pay the deposits through third-party mobile payment; 3) Find available bikes nearby and scan quick response (QR) code on bikes and ride away; 4) Lock the bikes after use and ensure that on smartphones.
Pictorial diagram		

Figure 2 Multiple co-evolution challenges, ecosystem strategies, and interactive strategy effects. The red arrows serve the purpose of visualization of ecosystem co-evolution. The thick solid lines represent pressures from multiple actors; thick dotted lines represent Redbike's ecosystem strategies; curved solid lines mean positive strategy effects; curved dotted line means negative strategy effects. It is based on qualitative considerations derived from interviewee's statements, industrial documents, and newspapers.

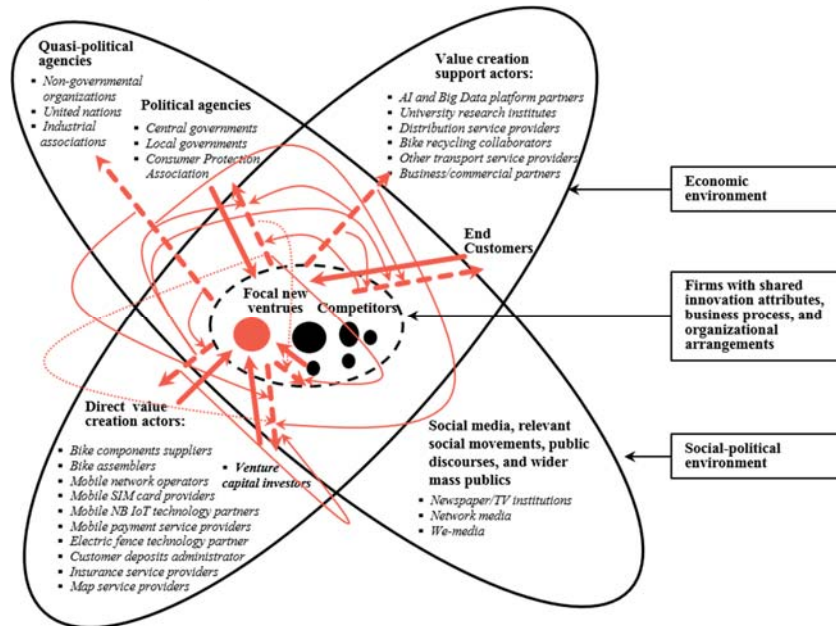


Table 2 Summary of co-evolution challenges, critical events, ecosystem strategies, and effects on ecosystem actors

Co-evolution challenges	Critical events/activities (date)	Actors (belong to ecosystem environments)	Ecosystem strategies	Effects on ecosystem actors (positive effect denotes “+”; negative effect denotes “-”)
1. How to produce large scale of prototype bikes in aim of regional experimentations?	Produce the first version of sharing bikes with smart locks in Wuxi factory (2015-10-29)	Direct value creation actors (economic environment)	Innovation strategy	<ul style="list-style-type: none"> •It has lobbying advantage as latter central and local governments rule out bikes without smart locks. (Intertemporal interactive +)
2. How to align different motives of various local and central governments on new bike-sharing service?	Start to widely run its business in Shanghai (2016-04-22), Beijing (2016-08-16), Guangzhou (2016-10-27), and Shenzhen (2016-12-16)	Political agencies (socio-political environment)	<ul style="list-style-type: none"> Reactive corporate political strategy Defensive corporate political strategy 	<ul style="list-style-type: none"> •The new bike-sharing mode helps to solve city problems and thus acquire legitimacy from local governments. (+) •But lagging governmental industry guidelines and lack of market entrance systems allow more entrants and exacerbate the market competition. (Interactive -) •Enhanced smart locks improved user riding experiences and cohesiveness. (+)
3. How to enhance stability of smart locks and user riding experience?	Collaborate with Ericsson, Baidu, and China Mobile to deliver several bike versions with developed technologies (2016-12-15)	Direct value creation actors (economic environment)	Orchestration strategy	<ul style="list-style-type: none"> •Developed smart lock technologies are taken as political requirements by many local governments afterwards. (Intertemporal interactive +)
4. How to get access to wider customers quickly as customers have so many bike options in markets?	Successfully collaborate with Tencent (WeChat APP) (2017-01-09)	Direct value creation actors (economic environment)	Supply chain management strategy	<ul style="list-style-type: none"> •Customers can get quick access to using bikes and pay fees on Wechat while do not have to download another Redbike APP. (+) •Tencent who wants to popularize their mobile payment instrument strategically invests Redbike. (Intertemporal interactive +)
5. How to find actors that can supply thousands of bikes in a stabilized way?	Exclusively collaborate with Foxconn (2017-01-23)	Direct value creation actors (economic environment)	Supply chain management strategy	<ul style="list-style-type: none"> •Keep full capacity to compete with other bike-sharing rivals. (Interactive +)
6. How to stimulate customers to ride underused or misplaced sharing bikes?	Release “Hongbao bikes” promotions (2017-03-23) and “saving zombie bikes” activities (2017-10-31)	End customers (economic environment)	Marketing strategy	<ul style="list-style-type: none"> •Customers’ cohesiveness is enhanced with rewards. (+) •Less complains from local governments as less illegally placed bikes. (Interactive +)
7. How to manage thousands of hundreds of stationless sharing bike on streets?	Connect to Microsoft Azure data service platform (2017-05-31) and launch mobile AI data platform: Magic Cube (2017-04-12)	Value creation support actors (economic environment)	Platform organizing strategy	<ul style="list-style-type: none"> •More accuracy in distributing bikes and customers’ diversified demand is meet. (+) •Less complains from local governments as less illegally placed bikes. (Interactive +)
8. How to persuade central governments to regulate messy markets?	The China Ministry of Transportation issued regulative guidelines (2017-08-03)	Political agencies (socio-political environment)	Proactive corporate political strategy	<ul style="list-style-type: none"> •Hot industrial competition is mitigated in a sense. (Interactive +) •But capitals become cautious with following stringent regulations. (Interactive -)
9. How to complement single bike-sharing services to improve user experiences?	Collaborate with Shouqi (2017-10-20), DiDa (2017-10-27), and Sitech (2017-11-03)	Value creation support actors (economic environment)	Supply chain management strategy	<ul style="list-style-type: none"> •Customer can get complementary transport services on Redbike and other Apps. (+) •Capitals are attracted again for its future market potential. (Interactive +)
10. How to attract international investments as home market becomes restrained?	Successfully entry into German and other countries in cooperation with international organizations (e.g., United Nations agencies) (2017-11-22)	Quasi-political agencies (socio-political environment)	Corporate social responsibility strategy	<ul style="list-style-type: none"> •Acquire much attention from local customers and business partners and capitals (such as Qualcomm). (Intertemporal interactive +)
11. How to sustain their services in overseas markets?	Strategically collaborate with LINE (2017-12-10)	Venture capital investors (economic environment)	Vision diffusing strategy	<ul style="list-style-type: none"> •All capitals are happy with the global market growth. (+)

Appendix An overview of interviews and other resources

Source types	Detailed information					
	<i>Case (number)</i>	<i>Respondent (code)</i>	<i>Still in position?</i>	<i>Interview situation</i>	<i>Date</i>	<i>Duration</i>
Anonymized (pilot) interviews by authors	Redbike (5)	Network partner (Pilot1)	Y	Face-to-face	2017-12-05	74 min
		Bike design partner (Pilot2)	Y	Face-to-face	2017-12-05	56 min
		PR manager (RB1)	Y	Face-to-face	2018-01-18	78 min
		Product manager (RB2)	Y	Face-to-face	2018-03-19	95 min
		Operation collaborator (vice president) (RB3)	Y	Telephone	2018-02-01	34 min
	Bike-sharing scholar (2)	Distribution staff (GB2)	N	Face-to-face	2018-03-21	67 min
		Scholar 1 (BS1)	Y	Face-to-face	2018-01-25	38 min
		Scholar 2 (BS2)	Y	Face-to-face	2018-03-12	47 min
		Social reporter 1 (BR1)	Y	Telephone	2018-01-20	50 min
		Social reporter 2 (BR2)	Y	Telephone	2018-01-20	23 min
	Bike-sharing reporter (5)	Social reporter 3 (BR3)	Y	Telephone	2018-01-20	25 min
		Social reporter 4 (BR4)	Y	Face-to-face	2018-01-22	37 min
		Social reporter 5 (BR5)	Y	Telephone	2018-02-04	48 min
		Quasi-political agency (PA1)	Y	Face-to-face	2018-04-03	58 min
		Quasi-political agency (PA2)	Y	Face-to-face	2018-04-26	29 min
Political agency (3)	Central political agency (PA3)	Y	Face-to-face	2018-04-23	115 min	
	Co-founder (RB4)	Y	Face-to-face	2017-02-28	99 min	
	Redbike (3)	Co-founder (RB5)	Y	Face-to-face	2017-07-20	14 min
		Co-founder (RB6)	Y	Face-to-face	2017-07-06	29 min
	Political agency (1)	Central political agency (PA4)	Y	Face-to-face	2017-12-19	12 min
Online formal (transcribed) interviews by others						
	<i>Institution</i>	<i>Issue date</i>	<i>Website link</i>			
Quarterly industrial reports used	bdata.bigdata	2017-02-08 (2016)	http://www.bigdata-research.cn/content/201702/383.html			
	iiMedia Research	2017-03-29 (Q1)	http://www.iimedia.cn/50357.html			
	iResearch	2017-09-12 (Q2)	http://report.iresearch.cn/report/201709/3056.shtml			
	CAICT	2017-12-17 (Q3)	http://www.caict.ac.cn/kxyj/qwfb/ztbg/201712/P020171218533843571639.pdf			
	CAICT	2018-03-05 (Q4)	http://www.caict.ac.cn/kxyj/qwfb/ztbg/201803/P020180305560121853239.pdf			
Regulative documents	Chinese Ministry of Transport	2017-08-03	http://www.mot.gov.cn/zxft2017/yss_0803/xiangguanziliao/201708/t20170803_2803520.html			
	Beijing Municipal Commission of Transport	2017-09-15	1. http://www.bjjtw.gov.cn/xxgk/flfg/fgbz/201709/t20170915_187384.html 2. http://www.bjjtw.gov.cn/xxgk/flfg/r764/201709/t20170921_187532.html			
	Transport of Changsha Municipality	2018-03-07	http://www.changsha.gov.cn/xxgk/gfxwj/szfbgt/201803/t20180308_2191925.html			
	China Consumer Association	2017-12-10	http://www.cca.org.cn/zxsd/detail/27806.html			
Open company documents used	1 marketing and expansion plan, 1 annual report, 2 white papers 1 Big Data application document					
On-site observations	Redbike (2)		2018-01-15 (2 hours) 2018-03-30 (1 hour)			
Third-party data base used	1. huxiu.com (News flash about new ventures)	2. 36kr.com (News flash about new ventures)	3. crunchbase.com (Investment news about global new ventures)	4. index.baidu.com (Media attention index)		
Industrial conference	The 2017 Urban Transportation E-Forum in China	2017-03-30	http://kns.cnki.net/kcms/detail/11.5141.u.20170602.2009.001.html			