Towards a Self-Organizing Digital Business Ecosystem: Examining IT-Enabled Boundary Spanning Practice of China's LeEco

Research-in-Progress

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Abstract

The emergence of digital business platforms, ecosystems and non-linear value chains fosters hyper-connections among human actors, organizations, and processes. Such digital moves have brought cross-industry convergence and the blurring of business ecosystem boundaries, bringing about the possibility of overlapping business ecosystems, generating complex socio-technical issues. In this research-in-progress paper, we unpack the processes of how China's LeEco develop from an emergent digital platform to a self-organizing digital business ecosystem. Drawing on theoretical notions of boundary spanning practice, we posit that towards a self-organizing digital business ecosystem, managers must seek to instill a conducive environment that reinforces, reciprocates and reproduces digital infrastructure through organizational coalition, congruence and hybridity respectively. Towards theoretical and practitioner contributions, ongoing analysis seeks to unpack the process of managing overlapping digital business ecosystems, the conditions under which they operate, the role of digital infrastructure in transition across organizational forms, the implications and outcomes.

Keywords: Digital business ecosystems, Self-organizing, Case study/studies

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Introduction

"Uber Eats: The Ride Sharing Company Now Delivers Takeaway Food"

– Headline from Huffington Post, April 2016

"China's SAIC Motor, Alibaba to invest $160 million in Internet-connected cars"

– Headline from Reuters, April 2016

Business ecosystems, or communities of interacting and co-evolving organizations (Moore 1993), represent an emergent organizational form and a keystone strategy for entrepreneurs and companies (Markus and Loebbecke 2013; Muegge 2013). These ecosystems are increasingly being catalysed by digital technologies (Nachira et al. 2007) and exist as IT-enabled business networks of entities with differing interests bound together in a collective whole (Iansiti and Levien 2004a; Iansiti and Levien 2004b). Inspired by natural ecosystems, business ecosystems possess the properties of self-organisation, self-management and scalability (Stanley and Briscoe 2010). The business ecosystem approach has been widely used by Intel, Microsoft and Apple, such that their digital business strategies cannot be conceived independently of their business ecosystem, partnerships, and competitors (Bharadwaj et al. 2013). Correspondingly, the emergent digitally-intensive economy (Tapscott 2014) has brought further cross-industry convergence and the blurring of boundaries between industry and product ecosystems. The emergent sectors mentioned in the headlines above demonstrate this, specifically in terms of internet-connected vehicles (where the automotive and e-commerce sectors overlap) and food delivery (where the car sharing and food sectors overlap). However, this *emergence* (De Wolf and Holvoet 2004; McKelvey 2016) of non-linear value chains, platforms and infrastructures, and other digitally enabled networks and ecosystems, also fosters hyper-connections among human actors, organizations, and processes, generating complex socio-technical issues (Bharadwaj et al. 2013; McKelvey et al. 2015).

When multiple business ecosystems *overlap,* the possibilities for innovation and business diversity increase, while simultaneously making the semantics of collaboration, processes and stratagems more complex (Markus and Loebbecke 2013). This complexity becomes even greater when managers make the strategic choice to separate an organization into smaller, interdependent subsystems and work is divided into smaller, specialised tasks. When an organization emerges as a complex social system that consists of interdependent subsystems, special arrangements are required to manage the blending of logics and different operational principles (Battilana and Dorado 2010; Kortmann 2012) during the accumulation of external resources for collaboration and integration across and within boundaries (Billis 2010; Ménard 2004). However, such arrangements in overlapping ecosystems have received little theoretical scrutiny, leading scholars to call for increased efforts to address the processes and implications of such arrangements, which comprise emergent forms of digital moves, processes, collaboration and infrastructures (Bharadwaj et al. 2013; Markus and Loebbecke 2013). Currently, no acknowledged process model exists for how to establish and manage overlapping ecosystems. Research in this area will therefore give IS researchers the opportunity to expand the knowledge of how contemporary platforms and ecosystems cultivate alignment of digital strategies, infrastructure, governance and business value (Tiwana 2013). Correspondingly, in-depth case studies may help to identify the social, economic and technological processes and dimensions that lead to the formation of digital business ecosystems and the evolution of new organizational forms (Corallo et al. 2007).

This paper presents preliminary findings from an ongoing study on the evolution of self-organizing digital business ecosystems and the implications of new infrastructure, processes and boundary practices when ecosystems overlap. The research question is "How does boundary spanning practice enable organizations to develop a self-organizing digital business ecosystem?" To address this question, we are conducting a case study of LeEco (formally LeTV), the first known Chinese company to implement the "ecosystem" business concept (LeEco 2016). Our examination centres on the evolution of LeEco and its digitally-enabled ecosystem strategy, products and services. This research makes the following contributions. For research, the empirical case study shows the evolution of overlapping ecosystems, building on the work of Markus and Loebbecke (2013). Drawing on Levina and Vaast (2006), this paper also unpacks the process by which IT shapes boundary spanning practice. For practice, the case study illustrates how IT companies and entrepreneurs can adopt and implement an ecosystem strategy to overcome the threat of commoditization and a host of compatibility, computability and other complex issues present in an increasingly digital and mobile era (McKelvey 2016; Tapscott 2014).

Literature Review

In this section, two sets of themes central to the study are discussed: (1) digital business ecosystems and platforms, and (2) the theoretical notions of boundary spanning practice.

Overview of Digital Business Ecosystems and Platforms

Digital business ecosystems are a specific type of business ecosystem supported by an IT infrastructure that facilitates cooperation and knowledge sharing (Corallo et al. 2007). Scholars refer to business ecosystems as meta-organizational structures that manage tension between the heterogeneity of organizational resources and the homogeneity of human actors, and that exhibit the properties of self-organisation, self-management, sustainability and scalability (Iansiti and Levien 2004a; Muegge 2013; Stanley and Briscoe 2010). In particular, self-organization occurs among agents in a system when tensions are imposed on them and the agents are motivated to change (McKelvey 2016). According to De Wolf and Holvoet (2004), self-organisation is a "process where systems acquire and maintain structure themselves, without external control" (p. 7). This is contrary to a system in which "there are coherent and novel emergents (e.g. properties, behavior, structures etc.) at the macro-level that dynamically arise from the interactions between the parts at the micro-level" (p. 3). Stable business ecosystems possess the capabilities of novelty, transient networks, a heterogeneous structure, multiple network roles, interconnectedness and shared fate, and the ability to absorb external shocks (Iansiti and Levien 2004a). A business ecosystem evolves into a digital business ecosystem when each organization within the ecosystem adds one or more distinct aspects of product/service value (Corallo et al. 2007). Markus and Loebbecke (2013) discuss the evolution of business communities, formed by a set of possibly overlapping ecosystems in a defined area of business activity that enable new combinations of digital and physical components. However, the semantics of collaborations become more complex when multiple *ecosystems overlap* (Boley and Chang 2007; Markus and Loebbecke 2013) so that the components in any one ecosystem interact with the components in another. In their article, business community research allows us to study the organization of actors (ecosystem) and the venue for service exchange (platforms).

Markus and Loebbecke (2013) looked at the overlapping ecosystems and platforms in a single business community as a larger unit of analysis and uncovered a number of issues. The conceptual development in Markus and Loebbecke (2013) suggests that digital strategies represent a meaningful stratification mechanism, whereby ecosystems and communities can be differentiated from a platform perspective (Skilton 2015a; Skilton 2015b). It is noteworthy that platforms enable firms to operate in IT-enabled commercial network of constituents specific to it including suppliers, intermediaries and customers (Boudreau and Hagiu 2009; Hagiu 2009; Hagiu 2014). Many of such platforms exist in multi-sided markets which have subsidised groups, namely, groups of platform users (typically sellers) who, when attracted in volume, are highly valued by the paying groups (typically buyers) (Gawer and Cusumano 2008). The pervasiveness of platforms in the current digital age, with their flexible open affordances confer a new competitive dynamic, such that that previously uncoordinated constituents can produce unexpected, novel combinations and changes in the ecosystem (Yoo 2013; Yoo et al. 2010). Notable platforms include Yellow Pages and eBay for consumers and advertisers (Eisenmann et al. 2006; Rochet and Tirole 2003); Apple for consumers and developers (Hagiu and Wright 2015). Platforms that own and operate their own ecosystem of players are referred as *orchestrators,* and platforms that support interoperable business processes across ecosystems are business community platforms. Tilson et al. (2010) posit that it requires an examination of both processes and digital infrastructures that overlap, reinforce or compete across ecosystems, to reveal the aspects of digitization and actualization of actors and artefacts that can reshape an organization and its services. Digital infrastructures represent new IT artefacts, which are "the basic information technologies and organizational structures, along with the related services and facilities necessary for an enterprise or industry to function" (Tilson et al. 2010, p 1). They can best be comprehended by analysing the process of embedding capabilities and standards into organizational practices, enabling new social behaviours and/or regulations (Tilson et al. 2010). According to Whyte and Lobo (2010, p 557, 565), digital infrastructures link to the rich work on boundary objects, such that the "reconceptualization of boundary objects as a digital infrastructure" provides an

opportunity to enrich the discussion of boundary spanning practices used in coordination across boundaries. Hence, a larger unit of analysis can be used to examine processes and artefacts that span vertical boundaries, including technical specifications designed to promote coordination within or across industry sectors so that no break in the communication paradigm occurs (Markus et al. 2006; Steinfield et al. 2005), as well as spanning horizontal boundaries to coordinate and integrate across businesses, agencies and markets (Franke Kleist et al. 1999; Layne and Lee 2001).

Theoretical Lens: Boundary Spanning Practice

Boundary spanning, which generally describes, but is not limited to, the transfer of information from outside the organization to inside (Marrone et al. 2007; Tushman and Scanlan 1981), engenders rich discussion across the areas of management, organizational science and information systems. To date, studies have reported the attributes and abilities of boundary spanning individuals (e.g. Dollinger 1984), the role of leadership in creating the boundary spanning effect in communities (e.g. Fleming and Waguespack 2007) and IT-enabled boundary resources that stimulate value creation and reconfigure boundary relations (Barrett et al. 2015; Levina and Vaast 2005). Studies have also introduced boundary spanning mechanisms, including increasing the competence of personnel (Bassellier et al. 2003) and creating integrative boundary spanning roles (Levina and Vaast 2005; Tushman and Scanlan 1981). The literature has referred to the mechanism of boundary spanning, in which IT did not transform practices by itself but was rather part of a complex series of changes in practice that included the role of intermediaries, objects, and agents (Levina and Vaast 2006).

In this study, we adopt a practice-based approach (Bromiley and Rau 2014) and examine organizations as systems of practices, looking at the capabilities needed to perform actions competently, the temporal organization of such actions, and the resources that makes actions possible. In examining boundary spanning practices, two notions are central. First, *boundary objects-in-use* refer to artefacts used by agents to acquire both a local usefulness (which agents jointly recognize and value) and a common identity in practice. As discussed earlier, it is posited that boundary objects and digital infrastructure are similar. Second, *boundary spanners-in-use* refer to organizational actors who establish the local usefulness of boundary objects-in-use and establish their common identity. Competent boundary spanners act as mediators, traversing boundaries to enhance informal communications across networks (Titlestad et al. 2009; Williams 2002). In order to better understand the emergence of organizational competence in boundary spanning, one needs to investigate how agents in the ecosystem become boundary spanners in practice by drawing on their nomination, or by looking at them independent of their expected roles (Levina and Vaast 2005; Levina and Vaast 2006). A practice-based view has emerged from the strategic management field, enabling researchers to study how the firm implements organizational practices in a given context and to draw a better understanding of the business value of IT (Peppard et al. 2014; Whittington 2014). Practice, "a defined activity or a set of activities that a variety of firms might execute" (Bromiley and Rau 2014, p. 1249), is a central part of this view. Focusing on the mode of practice production, one can better understand "how IT is incorporated into organizational practices in different ways so as to either reinforce or help bridge existing boundaries within and across organizations" (Levina and Vaast 2006, p 47). Levina and Vaast's (2006) article argues that any practice involves varying degrees of embodiment (i.e. relying on personal relationships) and objectification (i.e. relying on the exchange of objects). IT is then conceptualized as a medium for sharing objects in the production of practices, such that IT use either reinforces institutional boundaries or helps bridge them.

Research Method

Recognizing that digital business ecosystems form an inherently complex and multi-dimensional phenomenon, an objective research approach might be difficult to employ (Koch and Schultze 2011). The case study research methodology is particularly appropriate for such an exploratory research endeavour (Siggelkow 2007). Using the qualitative case research method, researchers can unearth operational processes and address our "how" research question (Pan and Tan 2011; Walsham 1995). We adopted an interpretive approach (Klein and Myers 1999) because we found no established theoretical model available to explain how boundary spanning practices are used to digital business ecosystems. Applying

the existing knowledge on business ecosystems and using boundary spanning as our theoretical lens, which is a "sensitizing device to view the world in a certain way" (Klein and Myers 1999, p. 75), we conducted the study and analysed the data.

We used several criteria to select our case study. First, the case organization needed to be situated in a competitive environment that necessitated new digital moves and organizational forms. Second, the case organization needed to serve and possibly orchestrate overlapping and even competing groups so that we could study the underlying boundary spanning mechanisms used in managing the ecosystem. Third, the case organization needed to have appropriately sophisticated internal structures and external operations so that the practices and capabilities (both IT and non-IT enabled) could be studied. For these reasons, we chose LeTV, also known as *LeEco* (www.le.com), the largest online video company in China. LeEco, formally LeTV, is a Chinese digital business ecosystem that is renowned for its innovation in media and entertainment. LeEco set out to address poor customer experiences with online video streaming due to boundaries created by the numerous vertical markets and standards determined by incumbent video platform providers, video service providers, and video application providers, and by horizontal markets (e.g. finance, media, automobiles and entertainment).
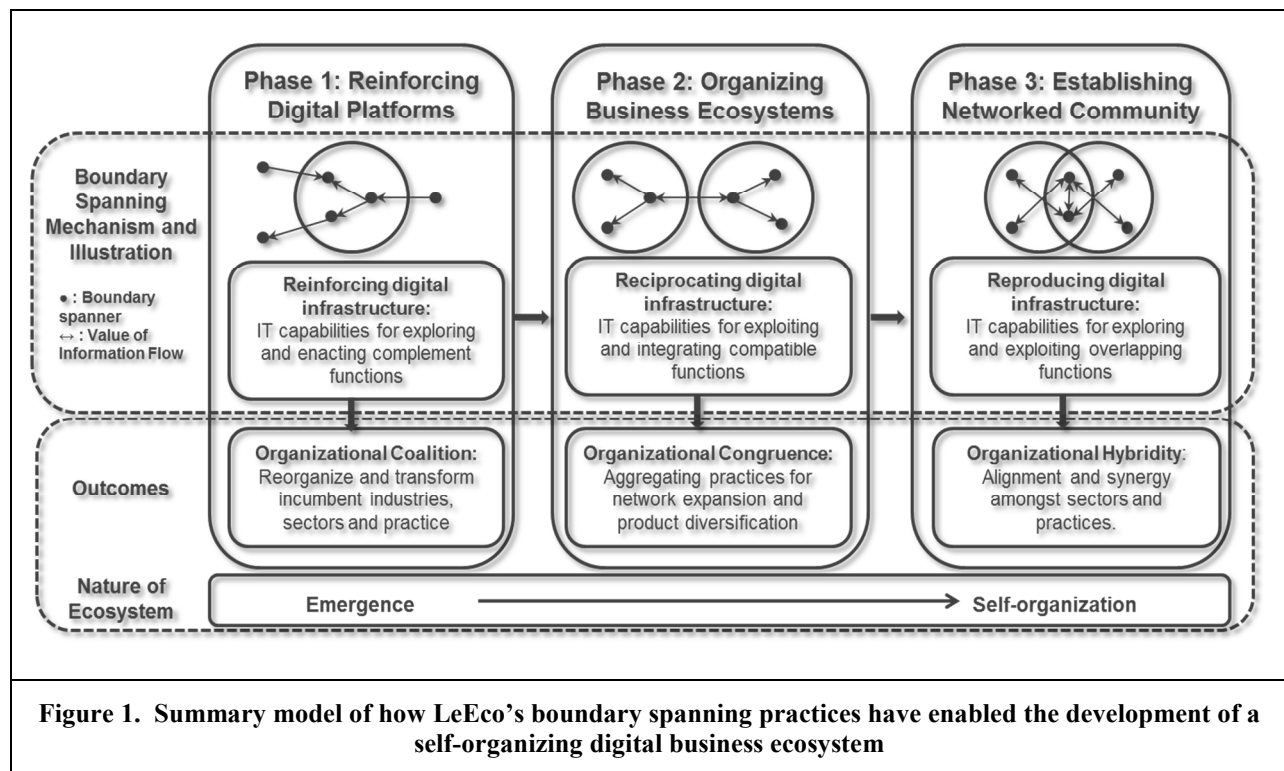
Data Collection and Analysis

Data collection began in December 2015. The purpose of the data collection was to investigate how LeTV has built a dynamic and fully-integrated ecosystem that promises its consumers a new, seamless way to experience content, innovation, transportation and global culture. To date, we have conducted 11 face-to-face interviews with various stakeholders at LeTV.com, during site visits in early 2016. We have applied Klein and Myers's (1999) seven principles for conducting interpretive field research. In line with our literature review, we narrowed our focus of inquiry to three pertinent themes during data collection: 1) LeTV's strategic goals and the evolution of LeEco, 2) the LeTV.com platform and its boundary spanning practice, and 3) the development and business value that LeTV.com and its constituents have achieved. The internal informants were predominantly senior and middle management at LeTV.com and its subsidiaries. We chose these informants deliberately in order to leverage the depth of knowledge, experience, and leadership (especially in championing IT use) that managers often possess (Bassellier et al. 2003). We conducted face-to-face interviews so that we could effectively capture the participants' interpretations, illuminate important factors in depth, and follow up with questions for clarification (Oppenheim 1992; Walsham 1995). Secondary data sources, including newspaper articles, books, and information from le.com's corporate website, were used to supplement our analysis and enhance our understanding of the data collected during the interviews. We also triangulated the data using documents and archival records accessible via online public domains (Neuman 2010). Our study is ongoing, and we plan to interview relevant individual consumers. Table 1 lists a sample of interviewees.

We analysed the data as it was collected to take full advantage of the flexibility of the case research approach (Eisenhardt 1989). If findings emerged that went beyond our lens's propositions, or if we discovered propositions that our empirical data did not support, we conducted additional interviews to iteratively explain these findings and propositions (Walsham 2006). By moving between the empirical data, our guiding lens, and the related literature (Eisenhardt 1989), we uncovered new themes in the data, developed further mappings of the coded responses, and, subsequently, extended our theory. We also performed open, axial, and selective coding (Strauss and Corbin 1990) on the translated notes and documents from secondary data collection. As part of our data analysis, we also combined temporal bracketing, narrative, and visual mapping to organize the empirical data (Langley 1999; Langley 2009). We then verified the event timeline (our interpretive account of the events that unfolded) and the diagrammatic representations of our theoretical ideas resulting from the use of these sub-ecosystems and ecosystem strategies with our informants. We mapped the case data against the research themes based on the events that unfolded in each stage of LeTV's development and established a stage-wise model that addressed our research question in an emergent manner. We will continue to perform this process iteratively until we reach the point of theoretical saturation (Eisenhardt 1989). Our preliminary findings, ongoing analysis and future work are presented in the following section.

No.	Interviewee	Topics discussed
**Table 1: Sample List of Interviewees and Topics Discussed**		
1	LeTV CTO, Chairman of LeCloud	Initial strategy of LeTV, evolution of the LeTV ecosystem strategy, revenue model and expansion of LeEco, Initial strategy for LeCloud, evolution of customer needs.
2	Vice President of Strategy Management, Director of President Office LeTV	LeEco and its sub-ecosystems, ecosystem strategy of LeTV, business model of LeTV, evolution of LeTV, development of LeEco, working relationships between LeTV ecosystems, global strategies of LeEco, the embedding of culture in LeTV's operations.
4	Vice President of Le Holdings, Le Finance	Establishment and motivation of Le Finance, relationships between LeTV and external entities, revenue model of Le Finance, relationship of LeFinance with other LeTV ecosystems.
5	Marketing PR Director, Le Finance	Marketing and services of LeTV, motivation for setting up Le Finance, revenue model of Le Finance, relationship of LeFinance with other LeTV ecosystems.
7	Senior Director Entertainment, LeTV, LeVision	Motivation for acquiring exclusive broadcasting and entertainment rights, business objectives of LeTV and LeVision, competitive advantages stemming from the acquisition of broadcasting rights, changing customer needs, relationship between LeTV ecosystems.
8	Director of O2O (Online to Offline)	Initial online strategy of LeTV, evolution of LeTV products and services, LeTV's competitive environment, LeTV's ecosystem, revenue models, competitors.

Preliminary Findings and Future Work

LeEco's CEO Jia Yueting founded LeTV in late 2003 as an internet-based provider of online video streaming (LeTV 2016). The company is based in Beijing and employs over 8,000 employees worldwide. In 2015, the company rebranded itself as LeEco as part of its global expansion plans and made its entry into the Indian and US markets, most recently opening its American headquarters in San Jose, CA in 2016 (Evangelista 2016; Fan 2016). Today, LeEco offers live-streaming, cloud, smartphones, TV set-top boxes, smart TVs and electric cars, among many other products and services. According to its Vice President of Strategy, "LeEco's strategic goal is not just to make its products available in major global markets but also to bring its entire ecosystem to other countries." From our interviews and secondary data sources including published reports to date, LeEco holdings consist of seven distinct and overlapping digital business sub-ecosystems; these "open loop" ecosystems share resources, businesses, customers and capital across ecosystem boundaries (LeEco 2016). The sub-ecosystems Internet and Cloud (LeCloud), Content (LeVision), Big Screen (LeTV), Mobile (LeMobile), Sports (LeSports), Internet Finance (LeFinance) and Electric Vehicles (LeAuto). Each sub-ecosystem's boundary is distinguished by its own platforms, content, devices and applications. Next, we present an interpretive account of LeEco's digital business ecosystem development to infer a preliminary stage-wise model (figure 1). In figure 1, we unpack the processes of how LeEco develop from an emergent digital platform to a self-organizing digital business ecosystem, consisting of three inter-related stages. In terms of future work, further site visits and interviews with LeEco customers and partners have been planned later in the year to extract, confirm, and use other pieces of data that supports our model. This is to canvas different perspectives and to probe deeper into the continual interplay between LeEco platforms, their partners, customers and the wider community, to better understanding how a digital business ecosystem operates.

Figure 1. Summary model of how LeEco's boundary spanning practices have enabled the development of a self-organizing digital business ecosystem

Reinforcing Digital Platforms through Organizational Coalition (2003-2006)

Up until 2003, LeTV was an IT company and platform that provided video streaming services. Because of this, it is often referred to in the popular press as the "Netflix of China" (Evangelista 2016; Fan 2016). In the two following years, LeTV became the largest owner of copyrights for TV series and movies in the online video industry. As LeTV's CTO and Chairman of LeCloud describes, "At the time (2003-2005), the CEO felt that the television is the future. It is the platform for home entertainment and therefore to connect with our future customers. And the exclusive rights to broadcast local TV productions were cheap then." In the next two years, the CEO exercised a pull strategy that went against other Internet and IT service companies. According to the Vice President of Le Holdings, "the CEO made the decision that User Generated Content market [was] not going to be the immediate direction for LeTV." LeTV thus began to explore new complementary platforms. By acquiring intellectual property arrangements, LeTV built and diversified its range products and services, increasing the number of visits to its vast library of exclusive content. As the Director of LeFinance explained, "The preference is for more current, short-tailed content over long-tailed content and to increase consumer bandwidth through gaming and advertisement... [and buying] rights to shows with huge followings." LeTV became the early mover in China's video streaming service space, reportedly investing in companies with the most cellular and mobile-related patents (e.g. China's Coolpad). The Vice President of Le Holdings stated: "The PC and mobile manufacturing markets were red ocean. We soon realized content is the new oxygen fuelling our customers." LeTV's content and customer-centric approach thus became the central tenet of LeTV's digital strategy. According to the Vice President of Strategy, "The Internet era has brought new and unintended problems, particularly in integration and compatibility... We wanted to fix the poor customer digital experience created by Apple [platform]" Investments and expenditures over the early years were made with the aim of delivering the best virtual experience. As a result, several sub-ecosystems were identified as new businesses.

In this first phase of the development, it is posited when LeEco seek opportunities to diversify to develop business ecosystems, managers seek digital infrastructure to reinforce established networks with

partnering platform businesses to explore and enact emergent complementary functions (Pierce 2009). This practice shapes the emergence of new knowledge, artifacts and communities of practice (Venters and Wood 2007) that challenges the incumbent technologies and associated socio-technical norms.

Organizing Business Sub-Ecosystems through Organizational Congruence (2007-2010)

By 2006, LeTV had become one of the largest video streaming services in China. Senior LeTV executives realized that a digital ecosystem strategy was not only central to delivering diverse platform services, but to also dissolving the boundaries between different products and between different industries through a structured video streaming experience created by service innovators in China and abroad. According to the Director of LeFinance, "an ecosystem is recession-proof and the ecosystem [strategy] was a natural progression in several ways." LeEco soon began to combine emergent IT functions and businesses to promote cross-functional collaboration and drive innovation through ongoing mergers and acquisitions. For example, the objective of LeTV's financial institutionalization was to create a credit bloodline. As the Director of LeFinance explained, "Previously, the [LeTV] platform had no content control, no bandwidth and no financial vessel, but if you control content currency and customer bandwidth, the price and risks are controlled ... We had to involve/partner with other companies in close discussions as new channels of distribution and financial services are very restrictive." Besides meetings with external partners, the strategy and finance teams held weekly meetings to establish communication channels. Correspondingly, whilst it is important to build reciprocally interdependent sub-ecosystems through horizontal integration, some components of individual ecosystems that were purposefully not exploited or integrated. As Director of Content Development explained, "Gaming increases the quality of life but it has negative impacts, so it's not the focal point of our growth." Another example of developing interdependencies across sub-ecosystems was in the development of the home entertainment. According to LeTV's CTO and Chairman of LeCloud, "the plan [was] to bring the Internet to the TV... [but] there was a tension of standards between new and old media, PC and television." In the years that followed, LeTV developers worked closely with community groups and TV associations to empower TV viewers. The home entertainment project revealed technological specifications and new vertical boundaries that led to poor service experiences for consumers when streaming videos. As the Senior Director of Entertainment for LeTV explained, "Problems with internet TV and with Wi-Fi routers are continuity and compatibility. This [incompatibility] issue will only happen in the BAT [Baidu.com, Alibaba.com and Tencent.com] era."

In this second phase, the development of digital infrastructure to support reciprocal interdependencies (Caglio and Ditillo 2012; Gerdin 2005; Macintosh and Daft 1987) created between sub-ecosystems created is required for horizontal integration to organize co-creation opportunities. The use of IT for integrating compatible functions determines organizational congruence where organizational boundary spanning practices are aggregated to develop a platform to support product and service diversification.

Establishing a Networked Community through Organizational Hybridity (2011-present)

The strategic overlap of congruent sub-ecosystems to deliver a seamless customer experience led to higher levels of diversity but also brought with it a new set of issues, particularly with the need to support numerous types of businesses, constituents, developers and consumers. As the Directors of Content and Technology Development highlighted, "We experimented with putting a search engine, an E-commerce and a social media platform all in one. What we got [was] a chemical reaction." The new platform allows the simultaneous display of content and reduces the need to switch between apps, TV/movies, sports, games, shopping and more. It breaks the boundaries between messaging, calendar and video; calendar, notes and e-mail; video and audio; lifestyle services and content; and all components of the sub-ecosystems. From 2012 onward, Letv.com also began exploring a joint venture with Foxconn, known for its high-quality manufacturing standards, for the production of super TVs and set-top boxes. The idea was to achieve synergies between different technology-based practices through content. According to the Directors of Content and Technology Development, "the mobile operating systems [and] the EUI (Eco

User Interface) deliver a unified experience for our customers." The EUI, an Android system launched in 2015, provides synergies between different technology-based products of the sub-ecosystems. The resulting accumulation of external resources has forced managers to manage the tension across ecosystems. This has required the transformation of both overlapping artefacts and agents. As the Vice President of Strategy Management explains, "the [LeTV] shares being distributed would amount to 50 per cent of the company's value." This initiative to distribute shares to the future value in the event of a sale or initial public offering, to interviewees, provides a mutual agreement, responsibility and shared purpose.

In this third phase, negotiating overlapping ecosystems establishes an open networked community, and there is no permanent need for centralised or distributed control. The vertical integration of content, platforms, applications and terminals creates digital infrastructures and standardized processes used by all members in the community. Although IT capabilities may function autonomously, the role of each of the LeEco's platforms is not just a mere orchestrator, digital infrastructure support the reproduction of a conducive environment and support a process that deliberately places one type of activities into another to form a blend of exploitative and exploratory activities. When such tensions are imposed on agents, managers from sub-ecosystems introduce new mechanisms to overcome difficulties in gaining alignment and organisational legitimacy rather than compel agents to exhibit a commitment, giving rise to self-organization (McKelvey 2016). This process of hybridity or the sectoral blending of operational principles and their logics becomes a very comprehensive effort, tending towards complex demands.

Limitations and Conclusion

This paper provides a starting point for understanding practice-based IT instantiations in the development self-organizing complex digital business ecosystems. Drawing on the processual, situated and emergent nature of boundary spanning practice, future work seeks theoretical development in understanding overlapping digital business ecosystems, the conditions under which they operate, the role of digital infrastructure, implications and outcomes. As previously uncoordinated constituents can produce unexpected changes in an ecosystem (Yoo 2013; Yoo et al. 2010), our findings can serve as a catalyst for future discussions about the delicate balance of generativity and control in platformsOngoing analysis seeks to 1) develop richness in a boundary spanning-centered discourse on digital business ecosystems, particularly how to effectively mobilize boundary spanning mechanisms and digital infrastructures (Kortmann 2012; Levina and Vaast 2005; McKelvey et al. 2015) in order to thrive, 2) discover the role of orchestrators to develop transient networks that match connectivity and adaptiveness of interconnected industry segments, 3) discover how new arrangements that manage the contradictions and tensions that ensue within the ecosystem enable new forms of resource integration and service provision(Barrett et al. 2015),and 4) better understand the relationship between organizational resources and the nature of innovation in ecosystems (Chesbrough and Brunswicker 2014), practice based approaches can help scholars better understand IT instantiations. A common criticism of research that adopts the case study approach is the problem of transferability or generalizability (Walsham, 2006). While it is acknowledged that statistical generalization is impossible, ongoing work and analysis will seek to establish research findings that will be generalizable beyond the current context and are corroborated by, and built on, other studies' findings in the literature. Nevertheless, future research could be directed towards statistically validating our findings to better define the boundary conditions of the stage model that is developed in this paper.

Acknowledgements

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