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Resource Orchestration and Scaling-up of Platform-Based Entrepreneurial Firms: The Logic of Dialectic Tuning

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ABSTRACT The emergence of platform-based entrepreneurial firms (PBEFs) and their rapid scaling holds considerable implications for the theory and practice of firm growth in the digital economy. Building on the resource-based view, we seek deeper insights into the question of how PBEFs orchestrate resources to scale up in the context of platform ecosystems. We conduct an in-depth longitudinal case study of Tencent, one of the largest PBEFs in the world, and develop an inductive process model based on the logic of 'dialectic tuning'. We uncover the specific actions and capabilities that PBEFs possess and employ to scale up a platform ecosystem, as manifested in a complementary set of concrete organizational practices enacted at different stages of the growth trajectory. We unveil an important boundary condition that has hitherto remained implicit in the literature on firm growth driven by platform-based business models. Our findings diverge from the conventional perspective which predominantly associates firm growth with the characteristics of internal resources and capabilities. We argue that the relational properties of interaction and integration between internal and external resources are what gives rise to the capabilities needed to scale up a platform. Thus, we extend and refine the resource-based view by explaining the evolving patterns of resource orchestration and management of PBEFs in terms of the interplay between the focal platform and its ecosystem partners.

Keywords: platform-based entrepreneurial firms, resource-based view, firm growth, scaling-up, resource orchestration, ecosystem

INTRODUCTION

Our study contributes to a bourgeoning literature on high growth firms (HGFs) by investigating the scaling-up process of platform-based entrepreneurial firms (PBEFs) that

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operate in multi-sided markets. PBEFs enable direct transactions or value creation by linking markets from different groups of external users, and extract a significant proportion of their revenue from such direct interactions (Armstrong, 2006; Parker et al., 2016; Rochet and Tirole, 2003). Influential works on scaling and HGFs generally agree that idiosyncratic internal resources (Barney, 1991; Penrose, 1959) and resource management capabilities in particular (Sirmon et al., 2011; Teece et al., 1997) play a crucial role in determining their high growth performance (DeSantola and Gulati, 2017; McKelvie and Wiklund, 2010). The emergence and rapid growth trajectories of platform-based business models have profoundly transformed the nature of entrepreneurial dynamics in the digital age (Amit and Han, 2017; Browder et al., 2019; Nambisan, 2017), raising questions in regard to the applicability of the conventional view of high growth (Helfat and Raubitschek, 2018; McIntyre and Srinivasan, 2017; Nambisan et al., 2018). Two issues frame this challenge.

First, a distinguishing feature of PBEFs is that their value propositions are largely based on autonomous user participation, whereby value is co-created with a community of geographically dispersed, diverse, and evolving ecosystem users (Chen et al., 2019; Nambisan et al., 2019). Such external users are distinguished from complementary assets since the former is a more loosely connected structure where the platform has to grant access and relinquish control to unknown complementors in order to initiate a positive network effect (Boudreau, 2012). The latter, by contrast, is a more formal structure where firms need to secure the gatekeeping rights to select appropriate complementors and to control and govern their conduct (Adner and Kapoor, 2010; Teece, 1986). The boundary of value creation in the context of PBEFs, therefore, is more open, porous and fluid, going beyond the management of internal resources, and being driven by ecosystem-level interactions rather than unilateral firm or individual commitment (McIntyre and Srinivasan, 2017; Nambisan et al., 2019). Although previous research has provided important insights on traditional firms' scaling from an internal organization perspective (DeSantola and Gulati, 2017), it leave little room for understanding PBEFs' scaling driven by external organization and ecosystem-level resources (Helfat and Raubitschek, 2018; Nambisan et al., 2018).

Second, fuelled by generative technologies with the potential to produce unprompted change and to create a significant variety of potential future applications (Gruber et al., 2008; Zittrain, 2006), PBEFs often grow as if on steroids (Huang et al., 2017), rapidly expanding their boundaries through constant morphing (Rindova and Kotha, 2001), thus making their resource management less fixed on the so-called 'best practices' (Arndt et al., 2017). As the extant research has paid little attention to the role of diverse and autonomous platform ecosystem users and the uncertainty associated with platform growth, theoretical contributions that were useful for explaining traditional firms' high growth patterns may not provide sufficient insights to answer the myriad of novel questions on the growth dynamics of PBEFs. Thus, many scholars have recently called for a new perspective on how PBEFs engage in deliberate actions for orchestrating ecosystem resources to navigate opportunities and challenges for scaling-up (Helfat and Raubitschek, 2018; Nambisan, 2017; Nambisan et al., 2018).

To address the significant research gap on the upscaling of PBEFs, we conduct a longitudinal case study of Tencent, one of the largest PBEFs in the world. Scaling is inherently

a longitudinal process, as organizations evolve through life-cycle growth stages that are accompanied by very significant changes in their capabilities and resources (Helfat and Peteraf, 2003; McKelvie and Wiklund, 2010; Van de Ven and Poole, 1995). Approaching scaling from a longitudinal process perspective thus captures the sequence of the conditions and events to explain how firms orchestrate resources to scale up (Langley, 1999). Despite being underrepresented and under-theorized in both the strategy and entrepreneurship literatures, this perspective is essential to understanding the transformative process whereby desires become goals, actions, and systemic outcomes (McKelvie and Wiklund, 2010; McMullen and Dimov, 2013; Sorenson and Stuart, 2008; Wiklund et al., 2011).

Our study makes the following contributions to the scaling-up and HGFs literature. First, we extend the existing literature – which has hitherto predominantly focussed on general industrial firms – by providing a more granular understanding of the scaling process of PBEFs. Our findings shift the attention on scaling-up from the firm to the ecosystem level as the relational properties of internal and external resource interaction and integration are what essentially gives rise to the capabilities for scaling up a platform. Such relational and interactional view on platform scaling departs fundamentally from the traditional view that focuses on the firm-level analysis. This theoretical insight enables us to see platform scaling from an alternative perspective that considers PBEFs no longer as isolated or separate entities but rather as part of a complex web of network relations (Van Alstyne and Parker, 2017; Zeng and Mackay, 2019).

Second, we offer new insights to the increasingly vibrant research community involved in the study of resource orchestration for scaling by drawing attention to PBEFs (Demir et al., 2017; DeSantola and Gulati, 2017). A central assumption in the extant resource orchestration theory is that internal resources play a vital role in driving firm growth (Sirmon et al., 2007; Sirmon et al., 2011). By contrast, we propose a logic of 'dialectic tuning', highlighting that resource orchestration by PBEFs is shaped by the dynamic interactions between the focal platform and its external ecosystem partners including customers and complementors. As PBEFs co-construct their resources and gain a strategic foresight of the emerging issues from such interactions, they use it to guide their actions to orchestrate a pool of resources and drive rapid growth. Such re-conceptualization of resource orchestration captures the resource orchestration patterns that are embedded in the broader ecosystem context, and emphasizes their emergent, situated, and distributed nature and the specific temporal context in which they evolve. By refining and partly reorienting the growing body of the resource orchestration literature, we provide a compelling response to recent calls for a new perspective on how digital firms, such as PBEFs and their ventures scale up by navigating opportunities and challenges in the platform ecosystem context (Amit and Han, 2017; Helfat and Raubitschek, 2018; Nambisan, 2017; Nambisan et al., 2018, 2019).

Third, we develop an inductive process model that uncovers the specific actions and capabilities that enable PBEFs to scale up a platform ecosystem, as manifested in a complementary set of concrete organizational practices enacted at different stages of their growth trajectories. We argue that the scaling-up process of PBEFs are constitutive of the temporal (*when*), spatial (*where*), and relational (*how*) dimensions. The three-dimensional view offers significant insights in unpacking the contextual dynamics of

scaling in the platform economy. While extant research is dominated by the outcomes or antecedents of scaling, we investigate and specify when, where and how scaling happens (e.g., Mitchell and James, 2001; Wiklund et al., 2011). The scaling process of PBEFs is nonlinear and subject to potential changes and modifications depending on how they interacts with external ecosystem resources and partners. Our process model therefore contributes to the scaling-up literature by looking inside the black box of the firm's high growth journey.

THEORETICAL BACKGROUND

High Growth Firms and PBEFs

Defined as '*firms growing at or above a particular pace, measured either in terms of growth between a start and end year, or as annualized growth over a specific number of years*' (Coad et al., 2017, p. 95), HGFs have received considerable attention from academics, practitioners, and policy makers. A small number of HGFs can not only create a disproportionately large number of jobs, but also play a crucial role in improving productivity and diffusing new products and technological innovations (Coutu, 2014; Du and Temouri, 2015).

HGFs, often referred to as scale-ups, have been studied from a variety of perspectives, including the economics literature – with an analysis of the effects of size and age on the odds of growth (e.g., Becchetti and Trovato, 2002) – and the entrepreneurship and strategic management ones explaining their potential antecedents, such as individual traits (e.g., Baum and Bird, 2010; Senderovitz et al., 2016; Stam and Wennberg, 2009) and the firms' internal processes, practices, resources, and capabilities (e.g., Chan et al., 2006; Gilbert et al., 2006; Sims and O'Regan, 2006), and the consequences of growth – e.g., market share, profitability, and sales level (Goedhuys and Sleuwaegen, 2010; McKelvie and Wiklund, 2010). In a recent review of the literature, Demir et al. (2017) identified the five most common drivers of high growth: human capital, strategy, human resource management, innovation, and capabilities. These authors also highlighted the education levels and skills, cognitive abilities, and domain expertise of founders as key indicators for high growth. In their review, DeSantola and Gulati (2017) found that internal mechanisms such as organizational design, team composition, and organizational culture play important roles in scaling entrepreneurial ventures. In general, the overarching emphasis of the literature on HGFs is exclusively on the individual and firm levels (Demir et al., 2017), wherein any growth outcomes are largely attributed to founder traits and knowledge, top management team composition, internal planning, practices, resources, and culture.

Although the extant literature has generated considerable insights on HGFs, research thus far has fallen short of fully engaging with PBEFs. PBEFs possess several important features that distinguish them from established industrial firms. First, platforms operate within ecosystems in which they rely on multilateral interdependence among external participants (Adner, 2017) and can create value only when all the complementary components are present (Adner and Kapoor, 2010). Diverging from the traditional growth measures such as market share, profitability, and sales volume

(McKelvie and Wiklund, 2010), the size of user base is at the heart of the rapid scaling-up of PBEFs because network externality is the key mechanism for driving platform value (Armstrong, 2006). As benefits consumers reap from the use of a platform increase with the number of its users, PBEFs endeavour to incorporate and coordinate shared external resources. This observation challenges the extant assumption that the individual- and firm-level resources are the key factors that drive their upscaling process.

Second, platforms typically rely upon generativity – the overall capacity of a system to produce new output – fuelled by unfiltered contributions made by broad, diverse, and autonomous participants with evolving and porous membership (Zittrain, 2008) who act outside of their direct control, making entrepreneurial outcomes intentionally incomplete (Garud et al., 2008). Such generativity brings a great level of unpredictability and nonlinearity to how platform growth unfolds (Huang et al., 2017). Therefore, the traditional emphasis on the roles played by agency and deliberate strategic choices in orchestrating resources may have limitations in explaining PBEFs' growth.

Third, extant HGF studies have almost exclusively viewed scaling as either an 'input' or an 'output' (McKelvie and Wiklund, 2010, p. 271), focussing on the macro-level factors that can support growth in general or on the antecedents that lead to superior firm scaling outcomes. This stream of research offers a parsimonious explanation of how firms grow (McKelvie and Wiklund, 2010), identifying the contributory factors that affect the initial growth of platforms (McIntyre and Srinivasan, 2017), which include entry timing (Eisenmann, 2006; Schilling, 2002), platform features and quality (Zhu and Iansiti, 2012), and product pricing (Clements and Ohashi, 2005). Despite its valuable insights, more research is needed to understand the evolutionary paths of developing organizational capabilities that enable a platform ecosystem to grow over time (Cennamo and Santaló, 2019; Mcintyre and Srinivasan, 2017). PBEFs often grow as if they were on steroids (Huang et al., 2017), rapidly expanding their boundaries through constant morphing (Rindova and Kotha, 2001) and mobilization of shared external resources. As a result, they may encounter unique opportunities and challenges at different stages of their growth-cycle.

In summary, the extant literature has predominately focussed on linking internal firm characteristics to high growth outcomes (Demir et al., 2017; DeSantola and Gulati, 2017). While its theoretical insights hold considerable significance in explaining firm scaling from an internal resource and organization perspective, the rise of PBEFs raise important issues pertaining to external resources and organization. As the locus of PBEFs' value creation moves from inside to outside of the platform, relying on the orchestration of the external resources and assets (Nambisan, 2017; Parker et al., 2016), scholars call for research to investigate how PBEFs orchestrate ecosystem resources to navigate opportunities and challenges (Amit and Han, 2017; Helfat and Raubitschek, 2018; Nambisan, 2017; Nambisan et al., 2018, 2019). We will next review the relevant literature on resource orchestration.

Resource Orchestration and PBEFs

The proponents of the resource based theorizing argue that firms can be defined as idiosyncratic collections of tangible and intangible skills and resources, and attribute firm growth to the availability of strategic resources (Barney, 1991; Penrose, 1959). Such resources – which need to be valuable, rare, inimitable, and non-substitutable (VRIN) in external markets – are expected to generate economic rents and provide the foundation for the long-term growth of the firm. However, scholars have argued that the mere possession of resources does not guarantee the creation of economic value (Barney and Arikan, 2001; Penrose, 1959; Sirmon et al., 2007). Instead, the full value of resources can only be realized through their effective and innovative management (Penrose, 1959; Sirmon et al., 2007). Addressing the managerial actions that are involved in creating value from resources, Sirmon et al. (2007) suggested that, to create value for the firm, it is essential to *structure* the resource portfolio (i.e., acquire, accumulate, and discard resources), *bundle* resources to build capabilities (i.e., stabilize, enrich, and pioneer), and *leverage* capabilities in the marketplace (i.e., mobilize, coordinate, and deploy). In parallel with research on the development of resource management, scholars have proposed the concept of asset orchestration (Helfat et al., 2007; Teece, 2007), which requires managers to identify assets, invest in them, and then design a governance structure and create a business model for the firm. Following these actions, the configuration and deployment processes require the coordination and productive use of co-specialized assets.

Building on previous research on resource management and asset orchestration (Helfat et al., 2007), Sirmon et al. (2011) proposed the resource orchestration theory and suggested three areas in which strategic resources can be developed to achieve competitive advantage: breadth (the scope of the firm), depth (throughout different levels within the firm), and life-cycle (Sirmon et al., 2011). The extant research on resource orchestration has explicated how resources are orchestrated at the firm level (e.g., Chirico et al., 2011) or at the supply chain one (e.g., Liu et al., 2016) through various levels of supporting managerial actions (involving top, middle, and operation managers) (Sirmon et al., 2011). As such, orchestration spans the breadth of the assets controlled by a firm and involves the depth of its managerial hierarchy (Sirmon et al., 2011).

PBEFs, however, have unique characteristics that fall outside the scope of the established discussion on resource orchestration. First, the locus of PBEF value creation follows an externalization logic (Chen et al., 2019) and hinges partially on the bundling of the external complementary assets. In order to facilitate the diffusion of platforms and trigger network effects, PBEFs are motivated to grant platform access to a large, diverse, and evolving network of external actors (Boudreau, 2012). However, prior research has primarily examined the managerial orchestration resources found within a single firm (Sirmon et al., 2011). We therefore still lack detailed insights into how PBEFs orchestrate resources in platform ecosystems in order to drive platform growth.

Second, PBEFs do not know *ex ante* the capabilities of such complementors – that are beyond their direct control – and have to facilitate the latter's direct interactions

with users (Furr and Shipilov, 2018). Whereas ordinary firms can exert a tight control on the timing and quality of a product with their complementary assets, platforms relinquish such control to users they do not even know (Lehdonvirta et al., 2018; Parker et al., 2016). Compared to complementary assets that are directly embedded in a firm's system, the platform ecosystem encompasses a more diverse and broader set of resources that are either indirectly or currently not at all related to a firm (Amit and Han, 2017; Teece, 2018). An important yet unexamined issue concerns how such diverse and unknown external resources might be orchestrated across gradually evolving platform ecosystems.

Signalling the importance of the gaps discussed above, scholars have also noted that in-depth longitudinal case studies would be particularly valuable in order to further develop growth process theory (McKelvie and Wiklund, 2010). As firms are constituted by the continual unfolding and patterning of actions and interactions between these parts over time (Tsoukas and Chia, 2002), there is a need to adopt a processual view that focusses on firm growth as an evolving phenomenon and explicitly incorporates temporal progressions of patterned actions to provide useful explanatory mechanisms for firm growth (McMullen and Dimov, 2013; Wiklund et al., 2011).

Based on these observations, we consider PBEFs as an ideal research setting that is likely to provide novel insights to develop a more comprehensive and richer understanding of resource management and scaling of HGFs. In the following section, we explain our case research design, data collection, interview protocol, and data analysis method.

Research Design and Method

Our study is based on an inductive inquiry (Glaser and Strauss, 1967), and involved carrying out an in-depth, longitudinal analysis of the revelatory case (Yin, 2003) of Tencent that provides an excellent research setting because of its exponential growth over 21 years. Founded in 1998, Tencent, which started as a social network platform (QQ), expanded significantly over time to become one of the largest platform ecosystems in the world. As such, it is well suited to address our research question on the upscaling of PBEFs. First, it achieved rapid growth to become one of the most influential digital platforms in the world (with approximately one billion active users in 2019). Second, its business offerings and value propositions constantly changed throughout the years. Third, it evolved into a platform ecosystem involving a broad and diverse network of partners to achieve system-level objectives.

Our research was carried out in three stages. In the first stage, we primarily relied on secondary sources and internal documents to develop a chronology of Tencent's development from its inception to 2018. We further identified the key activities and decisions that had marked the course of the platform's growth. In the second stage, we conducted a series of interviews with informants from Tencent to discuss such activities and decisions and the rationales behind them. In the third, we ran two workshops with our Tencent informants, which led to the further refinement of the emerging themes. Our dataset, described in Table I, was drawn from a large archive, three rounds of semi-structured interviews (reflecting the different seniority levels of our informants), and facilitated workshops.

Table I. Data description

Data source	*Description*	*Use in the analysis*
Corporate archival data	Books published on Tencent Inc. and its chairman by business journalists (e.g., Tengxun biography, 2018; Tengxun Strategy, 2018; Hua Teng Ma's Tengxun story, 2016). Press articles published by Chinese and English newspapers and magazines (between 1998 and 2018) Published video interviews with leadership teams at Tencent (Transcribed verbatim-a total 326 pages) Internal archival data (e.g., minutes of meetings, key strategy memos, company newsletter, company reports) Videotaped archival interviews at Tencent Key announcement and messages from Tencent's top leadership team Tencent white papers	To understand the research context. To support, integrate, and triangulate evidence from other sources. To establish a timeline of the events, track changes in practices. To understand Tencent platform's ecosystem context, map out the platform's structure, and identify key issues in this platform sector.
Semi-structured interviews	First round (June–August 2012, 11 informants): co-founder, senior product managers, marketing director, project managers, growth operations leads, community coordinators, data analysts. Second round (July–September 2015, 9 informants): senior product managers, senior experience designer directors, project managers, growth operations leads, senior product managers, senior data analysts Third round (April–June 2018, 14 informants): senior growth and strategy managers, senior product managers, marketing managers, senior IT engineer, social marketing manager, senior UX developers/managers	To gain an overall understanding of Tencent's business activities and business development journey. To support, integrate and triangulate evidence from conversations. To discuss insights drawn from archival data and conversations.
Facilitated workshops	The informants were invited to the two workshop to induce alternative explanations and to improve the validity and reliability of the findings.	To present and discuss preliminary findings, to validate data, eliminate biases, and obtain additional feedback.

Note: We interviewed four informants multiples times during the three data collection stages.

While these three stages broadly describe our data collection, the actual process was much more iterative. Whenever we gathered new information – either through an interview or archival material – we triangulated it (Miles and Huberman, 1994) by conducting

further interviews with different members of the organization or by consulting other archival material before refining the key themes.

Stage 1. Analysing archival data to develop a case chronology. We used diverse data sources (e.g., interviews, internal documents, archival sources and books on Tencent, and other media sources) to build a detailed narrative of the history of the organization from 1998, the year of its founding, to 2018. Through this analysis, we established an accurate timeline of events and actions. At a later stage, this helped us relate our emerging interpretations to the organizational and strategic context of our setting. We closely followed Yin's (1989, p. 84) suggestion to trace the '*chain of evidence*' that enables others to '*follow the derivation of any evidence from initial research questions to ultimate case study conclusions*'. The first step of analysis can provide insights into '*what led to what, and when*' (Miles and Huberman, 1994, p. 110), thus depicting the sequence in which capabilities are developed.

Stage 2. Collecting interview data. Over the 2012–18 period, we conducted 34 semi-structured interviews with members of Tencent's senior management team, whose tenures at the firm ranged from three to over 15 years. The interviews were conducted in Chinese, lasted from 60 to 150 minutes, and were recorded (when allowed by the interviewees) and transcribed verbatim within a week. The interviews were structured into four sections. In the first, we asked questions about the firm's and informant's backgrounds. In the second, we invited the informants to describe and explain the use of resources throughout the process of platform development, and to discuss the actions and decisions that had enabled Tencent to maximize resource value in order to achieve such exponential growth. Following Langley's recommendation (Langley, 1999), we focussed on questions pertaining to specific past factual events. In subsequent interviews, we asked further questions to probe for specific details on the information shared by the informants during our initial interviews. This approach enabled us to investigate the emerging themes and to return to specific topics for clarification (see the list of interview questions in Appendix 1).

Adhering to the guidelines specified for naturalistic inquiry methods (Strauss and Corbin, 1990), we began to analyse the data after our first round of interviews. To safeguard the internal consistency of the emerging coding structure, we open coded the interviews individually sentence by sentence (Miles and Huberman, 1994) and periodically compared notes with each other (Locke, 2001). As we discerned similar codes, we grouped them into first order categories, whenever possible on the basis of the language used by the informants. We continued coding our interview transcripts until we reached theoretical saturation (Glaser and Strauss, 1967) – i.e., when we were no longer able to identify any additional categories shared among our informants. We then started to identify the linkages among the categories and consolidated them into second order themes. This process enabled us to make sense of the emerging patterns of themes and frequently mentioned areas that required additional analysis of the complete sample (Strauss and Corbin, 1990). We then assembled the second order themes into aggregate dimensions, which enabled us to develop a grounded model suited to capture these dimensions. Once the process model had emerged, we re-examined the data's degree of fit with our emergent theoretical understanding (Eisenhardt, 1989). Figure 1 provides an overview of our coding process.

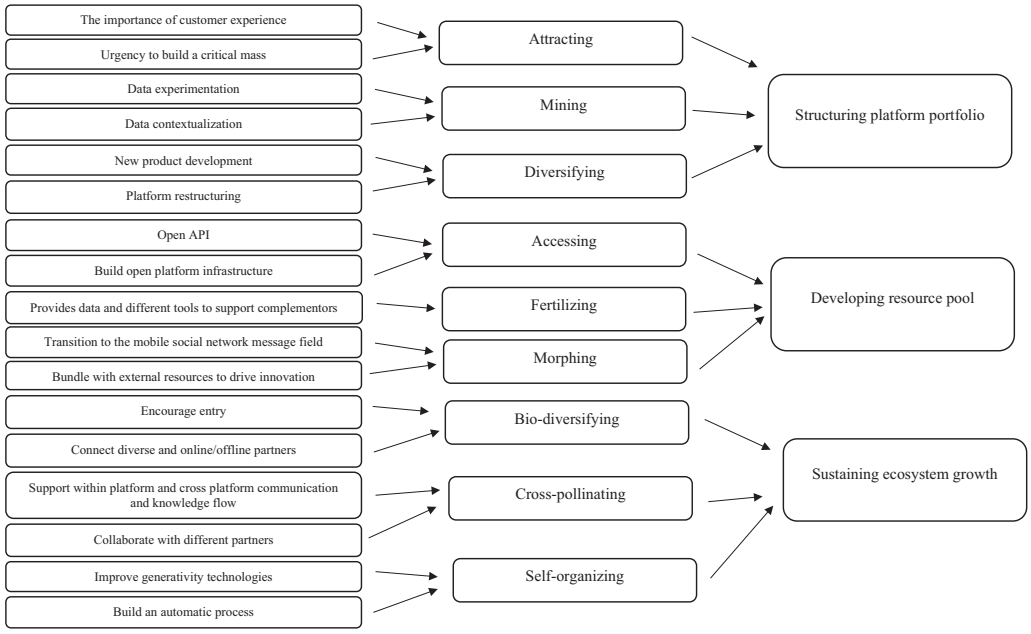

Figure 1. Data summary

In the second round of interviews, we discussed the preliminary maps we had constructed from the first round ones and archival data. We discussed all the key activities and decisions emerging from our previous analysis with long-tenured Tencent managers. Following the guidelines provided by well-established qualitative scholars (e.g., Eisenhardt, 1989; Huber and Power, 1985; Langley and Abdallah, 2011), we adopted several measures to address any potential informant bias. First, we conducted our interviews based on a 'courtroom questioning' style – i.e., focussing on facts, events, and direct interpretations, rather than on hearsay or vague commentary (Eisenhardt, 1989). Second, we used secondary data – such as archival data in the form of published news articles, industry reports, and internal documents, including strategic meeting memos that were not publicly available – in order to validate and confirm the views expressed by the interviewees (Jick, 1979). Third, in order to gain a variety of perspectives, we interviewed informants from multiple hierarchical levels. Sourcing our data from multiple informants enabled us not only to mitigate any potential biases held by individual informants by seeking confirmation of all information from several sources (Yin, 2003), but also to obtain richer and more elaborated explanations (Jick, 1979). Lastly, we provided our informants with assurances of anonymity in order to encourage candour. In Table II, we provide a timeline of the emergence and evolution of the key actions we identified in Tencent's development process.

Stage 3. Building a process model. Analysing our data across the different steps described above enabled us to develop a process model based on the recursive resource management patterns that had emerged. This led us to refer back to the literature in search of concepts that might help to explain such patterns. In order to avoid any

Table II. Summary narrative of Tencent's platform development at different growth stages

	Stage 1: structuring platform portfolio (1998–2010)	*Stage 2: developing resources pool (2010–2014)*	*Stage 3: sustaining ecosystem development (2014–2018)*
Description of business	Launched QQ IM application, attracted large amounts of customers and gained customer data. Developed a series of products – such as QQ show, QQ game, Qzone and QQ music – fuelled by customer data and also channels to absorb more data back to the platform. Established close connection with customers that it commits its products to provide better service while benefiting from the customer data driven back from the usage of products.	Tencent gradually opened multiple platforms such as the QQ platform, Myapp.com, advertisement platform, WeChat platform and game platform by sharing its API, platform infrastructure, multiple services and tools with external developers. By cultivating the growth of its external partners, Tencent enlarged its product portfolio and absorbed more data and technology from them.	Tencent continued to try to build connections with external partners from different industries to keep absorbing data, knowledge, and technology from different areas and enlarge its ecosystem. At the same time, Tencent also used big data and AI technology to recombine and integrate its business resources in order to provide comprehensive services to more external partners.
Key resources	Venture capital, technological resources to support the increasing platform adaptation, data collected from customer interaction, feedback from customer experiences.	A large customer base, a huge database collected from customers, an open platform infrastructure, technological advancement to support third party developers and external partners to interact with its customers, venture capital	An evolving platform infrastructure supporting the platform's ecosystem, a huge database (foundation for AI), a continuously growing customer base, a heterogeneous network of ecosystem partners, venture capital, newly developed partners to develop an IoT market.
Key activities	Launching the QQ IM platform Launching QQ-related products such as QQ show, QQ game, Qzone, QQ music, etc. Launching the QQ portal website to recombine all of the services and products into a single website.	Opening the API: opening to third party developers and accessing the first batch of externally-developed applications in 2010. Gradually opening up different platforms such as the QQ platform, Myapp.com, advertisement platform, etc. Constantly improving the services and tools provided by the platforms.	Further developing the Tencent Industry Forest and connecting with more external partners. Opening up the AI platform, providing multiple services such as tools, networking services, and cloud services in 2015. Entering traditional industries and helping them with their digitalisation. Launching the Westart project to further integrate resources and provide hatching services to start-ups.

(Continues)

Table II. (Continued)

	Stage 1: structuring platform portfolio (1998–2010)	*Stage 2: developing resources pool (2010–2014)*	*Stage 3: sustaining ecosystem development (2014–2018)*
Outcome	Over one hundred million QQ average concurrent users (ACU). Over six hundred million QQ active users. Revenue kept growing and reached 19.66 billion RMB by 2010. Earning kept growing and reached 80.53 hundred million RMB by 2010.	Over two hundred million QQ ACU; eight hundred million QQ active users. Over 4.6 hundred million WeChat active users. The platforms attracted five million third party developers; and generated 10 billion RMB third-party income by 2014. Revenues kept growing and reached 78.932 billion RMB by 2014. Earnings kept growing and reached 23.810 billion RMB by 2014.	Over one billion WeChat active users; WeChat-driven traditional consumption in home services, entertainment and travel reached 333.9 billion RMB. The platforms attracted six million third party developers. Revenues kept growing and reached 312.69 billion RMB by 2018. Earnings kept growing and reached 77.47 billion RMB by 2018.

errors arising from halo effects and interpretation biases (Strauss and Corbin, 1990), we wrote down those concepts on note cards – symmetrically arranging them into themes and concepts – and reviewed our notes to identify patterns and themes across interviews. We cross-checked our interview scripts to ensure that all patterns were supported by at least two sources of evidence. Then, we mapped the different ways in which the firm had maximized the potential of its resources, and submitted such map for review by several informants as a further validity check for our emerging interpretations. We continued with this procedure until we were able to explain all the processes that we had observed, and further data did not provide any new insights into resource management development (Glaser and Strauss, 1967). In order to validate the informants' statements, we compared our data with those drawn from secondary sources, which included media articles, business magazines, and reports on Tencent's key events. We also organized two workshops by inviting the informants and academic experts to revise the model.

Our process model was formulated inductively through repeated rounds of data analysis and inferences. However, explaining the emergent model – consisting of three stages and nine themes – while, at the same time, showing the actual evolutionary process of Tencent's strategies and practices over time was a rather complex endeavour. Therefore, to improve this paper's clarity, we decided to present the conceptual development of the model emerging from our data and the case findings separately in the following two sections.

Dialectic Tuning: A Process Model of Resource Orchestration at Tencent

The extant resource management research stream of the firm growth literature takes an inward-looking perspective, attributing any successful growth outcomes to the key resources and capabilities possessed by a firm (DeSantola and Gulati, 2017; Goedhuys and Sleuwaegen, 2010; McKelvie and Wiklund, 2010) and to how such resources are orchestrated at the firm level. Diverging from the existing literature, we observed how Tencent had adopted distinct, yet complementary patterns of resource reconfiguration in altering how it had built and sustained its rapid growth at the ecosystem level. Based on our data analysis, Table III presents such distinctive patterns.

Representative Quotes Pertaining to these Patterns Are Illustrated in Table IV

The initiation of a network effect aimed at achieving a critical mass is a primary objective during the platform portfolio structuring stage. PBEFs need to leverage their limited resources to quickly build a critical mass (*attracting*) through a continuous feedback loop (*mining*) by gradually adding features and products (*diversifying*) in order to achieve demand-side economies of scale. The examination of *attracting*, as a capability, through a snapshot taken during the initial stage of platform development would not have revealed the significance of the eventual change. We noted that *attracting* is both highly intentional and gradual in its effectiveness; this is because an ecosystem's diverse resources, connected over time through *attracting* capabilities, will initiate and

Table III. The resource management patterns of Tencent

Stages/Resource management patterns	*Description*
Structuring platform portfolio	
Attracting	The process of attracting customer attention to using the platform to drive the initial network effects
Mining	The process of analysing the data generated from demand-side customers to drive the network effects
Diversifying	The process of adding features and additional products to drive the network effects
Developing resource pool	
Accessing	The process of opening the API to access external complementors
Fertilizing	The process of supporting and connecting external complementors through platform resources/capabilities
Morphing	The process of continuous change both at the platform and platform ecosystem levels
Sustaining ecosystem development	
Bio-diversifying	The process of encouraging heterogeneous resources to join the platform ecosystem
Cross-pollinating	The process of connecting heterogeneous resources to form different resource combination patterns
Self-organizing	The process of building an autonomous infrastructure to support an ecosystem level of interaction

stimulate long-term network effects. By engaging in a more granular observation, we saw that *attracting* has a dynamic attribute that enables the repeated addition and connection of platform assets through the discovery of new and different ecosystem resources, subsequently providing diverse and greater opportunities for their novel reconfiguration. *Mining* is important because the more a platform learns from the digital data footprint left by its users, the better it becomes at improving its existing features (products) and at developing new ones suited to attract more users. As the value perceived by each user is dependent on the scale of data-driven learning and improvement realized through artificial intelligence, the *mining* capability enables the platform to continuously offer much more personalized, updated, and efficient services to users (Gregory et al., 2020). Both *attracting* and *mining* further enable a platform to add features and products through *diversifying*, which gives rise to new platform externalities suited to create a lock-in effect for platform growth (Danneels, 2008). Such capability can add an indirect network effect via complementary goods, which is crucial to driving superior firm performance (Danneels, 2010) through cross-platform network effects (McIntyre et al., 2021).

The new resources accessed and the emergent capabilities manifested in stage 1 become essential and pre-requisite for driving the second wave of rapid growth, in which

Table IV. Second order themes and illustrated quotes

Second order themes	*Illustrated quotes*
Attracting	*'We were using it every day among ourselves to identify the bugs, to monitor user feedback and to check user experiences. We had daily targets about how many customers we needed to grow. This was the priority'.*
	'We went to different universities to make our platform known to the students. Students were the initial driving force for QQ. We also went to different internet cafes to download QQ on individual desktops. We were constantly thinking about different contexts of how young people would actually use such social messaging product, how we could connect them with each other, how we could increase customer stickiness'.
Mining	*'We would describe our relationship with our users as fish and water. Without water, we simply cannot survive. And this water also gives us guidance and directions in terms of what we need to do next. Everyone from the founder teams to the operation teams, everybody knows the importance of user experience and, every day, everyone – including our founder and engineers – was browsing the QQ forum to see customer feedback. We were constantly collecting data and feedback, and kept changing the features and functionalities of QQ'.*
	'Without customers, we would be shooting in the dark. We had a rule whereby we tested our new features and functions among a small group of people, gather feedback and data, then update it again, then gather feedback again, and so forth. We did a lot of a/b testing to see how our customers would react'.
Diversifying	*'We were constantly building new context and new features based on the data, and gradually increased our product portfolio. We introduced QQ Show, where users can personalize their avatars and buy virtual gifts for each other, QQ Zone, which is more like a personalized blog attached to a QQ account, and QQ Game, where people can play games on their QQ accounts'.*
	'QQ itself remains the same, it's the same beast, but we wanted to make it fun, make it more social, and also take advantage of the existing customer numbers and also introduce new products to ensure we could keep our existing customers happy and also attract new ones coming in not just for social purposes, but for others such as music and gaming. We also ventured into other sectors, portal, group buying, etc'.
Accessing	*'Our fight with 360 (a newcomer focussed on anti-virus software) made us realize that it's not winner takes all. Even though we were in a monopolistic position in China, we found it rather difficult to defeat them. At the end of the day, the customers end up suffering, who to choose, QQ or 360. We were both (QQ and 360) injured during the process. Afterwards, we re-centred our focus, if we were not to be left without customers, we needed to think about different ways to improve the user experience, what we could do was rather limited, even though we tried to cover everything, most of the things we did not achieve that much success. Facebook's open platform and its subsequent development also influenced our decision a lot, so we decided to open our platform and let others (external developers) help us to create a better customer experience'.*
	'With many customers migrating from desktops to smartphones, it required a radically different user experience. If we did not play our cards right, we would be at risk of losing many customers, customers that it had taken us years to build. And, around that time, many competitors were also venturing into the mobile internet area and the battle was fierce; simply put, we needed allies'.

(Continues)

Table IV. (Continued)

Second order themes	*Illustrated quotes*
Fertilizing	'*We started to see the benefits of opening up the platform. We also experienced a paradigm-shift whereby, previously, we were focussed on building a QQ empire through which we wanted to build a monopoly; but, with the open platform, we could see it was no longer a win-lose situation, it could be win-win. So, we provided many programmes and our own resources to support third party developers and other platforms. The bigger they were, the stronger we became*'. '*We introduced many new services to help them* [third party developers and partners] *including platform data exchange and exclusive launches. We also provided physical offline office spaces, training programmes and funding to support start-ups to take advantage of our open platform*'.
Morphing	'*With the shift from desktops to mobile internet, from close to open, from a monopolistic to a win-win mind-set, our DNA changed. We were no longer a QQ, we became much bigger, we were building our ecosystem. It was no longer QQ or Tencent, it was much more. We also made the transition from desktop to mobile through WeChat. The transition required us to build new resources for WeChat, but we were lucky that we were not alone, we had a lot of help from our ecosystem partners*'. '*Our business never stood still and was always changing. In this environment, you snooze, you lose, or you play solo, you lose. Essentially this is the rule for all platforms, at least this is what worked for us. Our resources and their resources* [external] *changed the nature and scope of what we could do. The opportunities were endless*'.
Bio-diversifying	'*We started to talk about the concept of ecosystem much more often around 2014, and this is the concept or strategy everybody is talking about now. We often described that we wanted to build a forest in which there could be different species, because the more diverse we became, the more resilient we would be. We worked with many different partners, covering different elements of business, online, offline, and partners from different industries. We started our IoT project around 2014 or 2015, where we worked with electrician experts, architects, supermarkets, car parks, we also established our online payment system, connecting millions of merchants, public and private services, and customers together*'. '*We wanted to be invisible and embed our network into everyone's life. You cannot see us, but we are everywhere. We have been investing in many firms and start-ups, worked closely with universities and students, worked closely with government to drive the next wave of smart cities, worked closely with many other firms to venture into the IoT market, it's a long list*'.
Cross-pollinating	'*We had to improve our technological competency – or what we called AI competency – to provide spaces and opportunities for our community members to connect with one another, to share ideas, knowledge, and information. From such connection and knowledge flow, they could identify many new opportunities to pursue*'. '*We provided channels, opportunities and spaces for them to interact with each other. Online, offline, different industries, firms with different DNA, start-ups and established firms. We were taking a background role in supporting and connecting them through the fundamental technological infrastructure and marketing reach so they could engage in different ways*'.

(Continues)

Table IV. (Continued)

Second order themes	*Illustrated quotes*
Self-organizing	*'With a network this big, it is impossible to manage or control. We heavily rely on real time data through machine learning algorithms that enhance coordination and connectivity. With the scale of our platform, it all relies on automation. With more and more customers using our services online, the process has become more digitalized, which makes it much easier to automate through AI. We are definitely not telling them what to do, we simply provide tools to support them in connecting and organizing among themselves'.* *'The real time interaction has created a constant flow of data, which creates something that is "intelligent", that supports a decentralized and flexible process. With our scale being this big, covering millions or even billions of customers and different businesses, without data and such intelligence, it would be impossible to sustain our business. We are entering an era that is dominated by networks and data. We just provide the necessary tools and spaces for them to organize themselves around our central platform'.*

broadening the network scope to create opportunities for more novel resource reconfigurations becomes the priority. The customer base built by the platform during stage 1 stimulates further network effects, which enables the platform to *access* a large pool of complementor resources and capabilities by opening its Application Programming Interface (API). Such action can generate several positive outcomes that alter how a platform generates revenue. First, it can cultivate and expand the scope of its ecosystem by inviting new external actors, resources and capabilities through network effects. Second, such openness can stimulate innovation and broader network connectivity. By accessing more complementary resources, a PBEF can avail itself of more opportunities to create novel innovations and to sustain a competitive advantage (Sirmon et al., 2011). Third, a broader ecosystem can improve data quantity and quality, which enables a platform to provide a better and more tailored user-centric design. *Fertilizing* is an important capability because the locus of value creation is not inside but outside a platform (Amit and Han, 2017). Therefore, the way in which external resources can be transformed is crucial to the growth trajectory of a platform ecosystem. By *fertilizing* such ecosystem resources, a platform is better equipped to provide better complementary services to customers and to further improve the performance of the ecosystem, which is instrumental in fostering continued growth. Given the uncertainty and rapid growth trajectory, *morphing* is pertinent for platform ecosystem development as a platform undergoes constant transformation (e.g., through changes in product and service offerings and organizational structure) to compete in a rapidly evolving market. Indeed, in significantly uncertain environments, a firm's ability to effect continuous change (Adner and Helfat, 2003) by enriching its existing capabilities and pioneering new ones (Sirmon et al., 2007) is crucial to drive its growth.

Through the new data, additional resources and capabilities, and the organizational re-structuring derived from stage 2, PBEFs are able to build self-organized ecosystems that enable them to continue to scale up. In stage 3, sustaining ecosystem growth is heavily dependent on three capabilities: *bio-diversification*, *cross-pollination*, and *self-organizing*. At this stage, PBEFs can enjoy the benefit of *bio-diversification*, whereby heterogeneous resources form adaptive and interconnected networks. The more diverse ecosystem resources become, the more opportunities they provide for novel mixed and matched combinations (*cross-pollination*) drawn from different backgrounds and disciplines. Such cross-platform network effects further strengthen the lock-in effect, which is crucial for ecosystem growth. Such intertwined network connectivity provides the platform with ample opportunities to collect more data in order to strengthen its AI competency; this enables it not only to more swiftly and accurately detect patterns and predict outcomes, but also to build a *self-organizing* infrastructure suited to support ecosystem-level resource coordination.

In order to capture the dynamic and emergent process whereby ecosystem resources evolve and a platform orchestrates them to drive its growth over time, we provide the holistic framework in Figure 2, which illustrates the distinctive resource management patterns found at the different stages of a platform's ecosystem development.

Our emergent conceptual model highlights how the externalization of PBEF value creation does not imply that a platform's internal resources and capabilities are no longer valuable on their own; quite the contrary. For example, without demand-focussed and

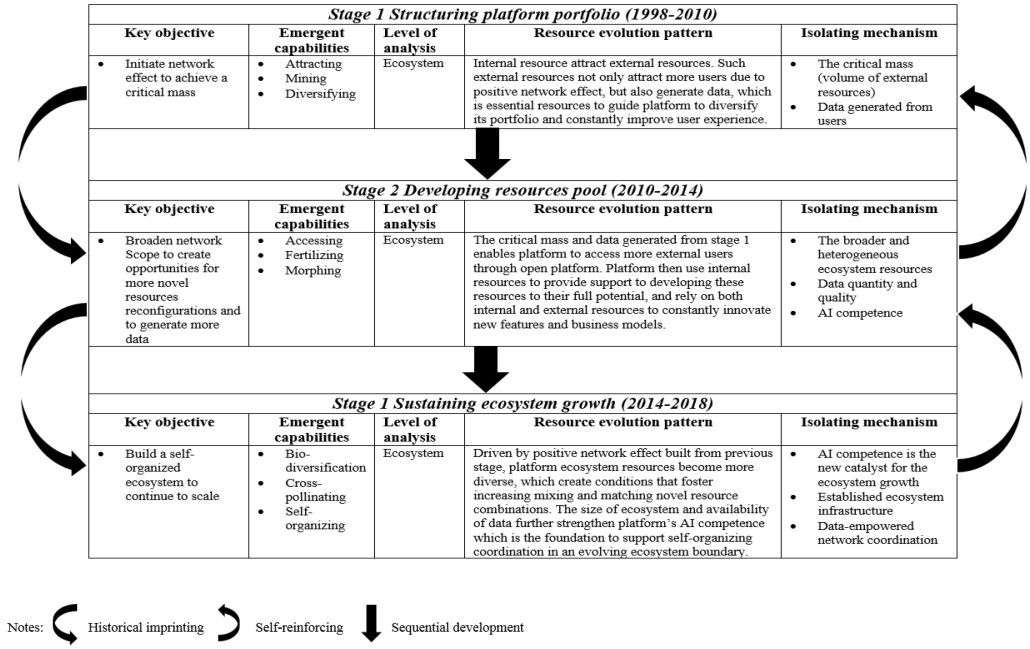

Figure 2. Theoretical framework for the life-cycle of resource orchestration of PBEFs

internally developed *attracting* capabilities, PBEFs are unable to draw external resource attention to build a critical mass. The value of other capabilities, such as *mining* and *diversifying*, however, can only be developed and fully realized when PBEFs are interacting with their ecosystem resources. Without the critical mass and the data generated from such large customer bases, PBEFs have nothing to mine, and therefore lack the detailed insights they need to experiment and add additional products/services to drive platform growth through cross-platform network effects. In a similar vein, without the input from a critical mass and the data generated from their interactions, PBEFs are unable to leverage their user bases in order to further expand the scopes of their ecosystems by tapping into large pools of complementor resources and capabilities through open APIs. As PBEFs need to continuously seek growth opportunities and expand their scales and scopes, they need to invest in providing support and cultivating relationships with their ecosystem partners, which enables them to revitalize and constantly innovate, experimenting with new business offerings. By doing so, PBEFs are able to sustain platform ecosystem growth through the self-organizing capabilities – powered by platform-level AI competencies – that connect the broader scopes of ecosystem resources through cross pollination, which essentially drives bio-diversification by forming networks that are highly adaptive to rapidly changing business environments.

Customer bases and data – as the most important and recursive resources that drive rapid platform growth – are definitely not seen as resources to be protected and controlled tightly to create the resource-position barriers by which platform owners can secure exclusive economic rents (Barney, 1991; Wernerfelt, 1984). On the contrary, they are seen as versatile resources that need to be shared and further developed to maximize

their full application potential. We observed many data-related applications that had enabled our case platform to drive, develop, and sustain growth. While a platform exhibits a network effect – whereby the more people use it, the more valuable it becomes – data usage also displays a network effect, or a so called data network effect (Gregory et al., 2020), whereby the more a platform learns from the data it collects from its users, the more valuable it becomes to them. This led us to see resources as dynamic and versatile, as they can be put to alternative uses by a platform and its ecosystem partners. Platform resources then become intertwined in complex ways that enable the platforms themselves to become deeply embedded in their ecosystems.

We called the logic behind these sequential and interactive patterns of resource management 'dialectic tuning' because it reflects the dynamic interplay between the capabilities developed at different stages of the platform ecosystem's growth trajectory, and the dynamic interplay between Tencent and its ecosystem partners, which had led to different and novel resource combinations. We theorized such interaction by drawing on Pickering's (1993) concept of 'tuning', which specifically accounts for the '*reciprocal and emergent intertwining*' among '*a network of heterogeneous actors who are dealing with multiple interdependent technological artefacts*' (Pickering, 1993, p. 15). While the extant studies have used the 'tuning' concept to understand the process of singular technology development and its application to innovation, we extend the scope of this concept by explaining the emergent, co-creative, and autonomous process of resource orchestration that PBEFs undergo to drive rapid platform growth. We used the term 'dialectic' to highlight the symbiotic process whereby capabilities are built through the relationship between a platform and its ecosystem partners, with separate entities influencing each other to the point that all parties are transformed as a result of such dynamic interactions. Such a view challenges the established conception of resource orchestration, although varying in detail, sharing a similar assumption on reconfiguring internal resources to cope with rapid changes. According to the logic of 'dialectic tuning', resource combinations are situated, gradually emergent, co-constructed, and co-transformed by a platform and its ecosystem partners. As a result, the scale and diversity of platform users, the data collected from them, and the AI competencies developed from these data play critical roles in developing a platform's 'isolating mechanisms', which are essential to ensuring its ecosystem performance. This is a useful insight because the resources needed for PBEFs to scale up are no longer static but constantly updated, connected, and broadened, and enable PBEFs to develop the capabilities they need to gain temporary competitive advantages over time.

THE DIALECTIC TUNING PROCESS AT TENCENT (1998–2018)

We will next describe our findings on Tencent's development between 1998 and 2018, according to the process model of dialectic tuning.

Stage 1. Initiating the Network Effect to Build a Critical Mass

Attracting. Attracting refers to Tencent's efforts to draw customer attention from the demand-side and encourage peer to peer social interaction over its digital platform.

The *attracting* process by which Tencent had quickly built a large customer base is a pre-requisite condition to driving the network effect. Having a large demand-side customer base greatly affects a firm's ability to drive rapid growth through resource orchestration. In 1999, Tencent had introduced its most original product, QQ (formerly OICQ). QQ enables internet users to chat in a digital room on their personal computers. Coming from a software engineering background, Pony Ma – the founder of Tencent – placed great emphasis on user experience; he was perceived as Tencent's 'Chief Customer Experience Officer'. One informant explained, '*he was using it* [QQ] *every day, thinking about the font size, the colour, even the sounds it makes during user interaction. He pushed us to engage with users every day, listening to their voices, and think about better ways to design user experience. This practice is now part of our DNA, which we still maintain on an everyday basis*'. With an emphasis on user experience and fast bug-fixing, QQ had quickly gained popularity and had surpassed other instant messaging (IM) products on the market. As a result, it had attracted one million users in just nine months after its launch and had accumulated over one hundred million registered users between 2000 and 2001.

Although QQ had quickly accumulated a large customer base, Tencent was struggling to monetise its platform. The first opportunity had appeared when mobile phones had started to become popular in China in 2000. Around the same time, the Chinese Mobile Communication Company (CMCC) had started to introduce the 'Monternet' project in many cities. By working closely with the CMCC, Tencent had developed a mobile QQ service that enables users to send QQ messages through mobile phones for a small fee. The cooperation was so successful that, by the second month of 2001, the mobile QQ service had channelled 3000 million messages and the number of QQ online users had reached one million. This cooperation had helped QQ to survive the cash crisis and to continue to attract more customers. By frequently improving the QQ application and creating better customer experiences through its cooperation with the CMCC, Tencent had attracted a significant number of customers and had generated a healthy data flow, establishing a strong foundation for the development of future businesses.

Mining. Mining refers to Tencent's ability to generate insights from the data accumulated from customer interactions and user experience. During this stage, Tencent had mainly focussed on maximizing the value drawn from the data and had built an effective customer feedback loop suited to continuously generate more data and use them to improve and create products.

After experimenting with the data and monitoring user feedback, Tencent had introduced multiple value adding services such as QQ show, Qzone, and QQ music. All of these services were aimed at monetising the large volume of data generated from the IM platform and enrich user online social experience. One informant recalled, '*Monetization was a huge hurdle, even with our collaboration with the CMCC. As the number of customers grew sharply, it ate up our services, which were very expensive to run. We were constantly thinking about new ideas, experimenting with them on the market, monitoring the data feedback to understand user experience; and then we made another change by looking at the data again*'. The data-driven logic for new product development provides clear insights into Tencent's

launch of several other related products. For example, product prototypes were often first tested internally at Tencent and then introduced to customers. The 'Support Product Exchange Centre', where customers were able to leave feedback and engage in further discussions on product features, was being visited on a daily basis by product managers and software developers to provide tailored solutions to tackle any emerging problems. One informant explained, '*There is not much top-down communication, but more communication with the outsiders either through data or other communication channels, as our priority is on developing the best user experience. Data and customers are our guidance*'. As a result, Tencent had been able to develop a much more holistic picture of its users – in terms of purchasing, socializing, relation chains, and browsing – in order to develop better products. Following this data-driven logic, QQ services and the QQ IM tool were being constantly improved under the guidance of customer feedback. Tencent had quickly modified the interface and functions of these products based on customer reactions; many of its products thus surpassed those of its market competitors.

Diversifying. Diversifying refers to the process whereby Tencent had gradually introduced many new features and additional products to drive cross-platform network effects. For example, between 2004 and 2010, Tencent had launched an internet content platform, an auction platform, an anti-virus software product, an audio-video software, a QQ mail service, and a QQ group buying platform. These diversified online services and the 'portal net + IM platform' strategy had helped Tencent to reinforce its monopolistic position in the market.

With more customers and customer data, Tencent had quickly developed more products and linked them to create a network effect, which had caused the products to become more connected to each other. When the data flow on one product increased, so did the data flow on another. For example, in 2005, Tencent had launched a 'one-stop' online services project aimed at integrating all of its services into a single website capable of satisfying people's multiple life demands – such as news, communication, entertainment, and e-commerce. To channel more data onto this website, Tencent had included a link to it in its IM application. When people used QQ, a pop-up window would occasionally appear, enabling people to visit the website if they were interested in the content. Later, as the website had become more popular, it had helped to sway more customers to use QQ. Tencent was successful in terms of layering its products to increase profitability. This strategy had helped to achieve an in-depth exploitation of the value of customer data and to facilitate the entry of Tencent into various markets.

Stage 2. Leveraging the Critical Mass to Broaden the Scale of the Ecosystem's Resource Pools

Accessing. Accessing refers to opening up an API to enable external partners to access resources and capabilities. With its aggressive expansion strategy, Tencent was perceived as a 'national copycat' that copied other firms' business models, and was constantly criticized for its unethical behaviour and lack of innovation. In 2011, Tencent had started a three month 'Tencent diagnosis' event by inviting internal employees, external experts, competitors, and university academics not only to reflect on its development trajectory, but also to identify

new opportunities. In 2012, Tencent had decided to open its platforms to third parties, thus starting to share its customer base, customer data, technologies/algorithms, and platform infrastructures. This opportunity to access some of Tencent's resources had enticed many third-parties to use its platforms; in return, Tencent had also been given access to more algorithms, data, customers, and a bigger product portfolio. In other words, Tencent had been able to generate greater value by attracting more external resources and bundling them to develop more capabilities.

The number of such third party users had quickly reached one billion and, by 2014, Tencent had opened its application platform – myapp.com – to offer more services to them. Myapp.com is an application store for the Android system in which third-party developers can launch and promote their products while customers can download apps. This open application platform showed a high level of participation from both third-party partners and customers. On the one hand, its stability (stable platform infrastructure) and flexibility (multiple options of platforms and cross-platform services), and the comprehensive services offered by each platform had made it the first choice of many small application developers. On the other hand, third-party developers had kept enriching Tencent's product portfolio and helped it to better serve its customers. As a result, by July 2014, Myapp.com had recorded 7.6 billion downloads. Besides Myapp.com, Tencent had also opened other platforms such as WeChat, QQ, games, start-ups, and artificial technology. These platforms provided a series of services and fulfilled various business needs by attracting increasing numbers of business partners.

Fertilizing. Fertilizing refers to the process whereby external complementors are supported and connected through the utilization of platform resources and capabilities. By opening its platforms, Tencent had not only given its business partners access to its resources but had also offered solutions based on its key resources and capabilities to help their businesses grow, thus fertilizing them. In other words, Tencent had managed to grow with its partners and to build up an organic business ecosystem suited to gain competitive advantages.

After opening the Myapp.com platform, Tencent had gradually added more services to it. First, it had offered multiple promoting services. For example, it had developed a 'platform data exchange' programme wherein it would assess the data management abilities of its external partners and support them with the matching data flow. Tencent had also started offering a service called 'exclusive launch', whereby certain new products were first launched on its platform, thus being given immediate access to a large customer base. Moreover, before the launch event, Tencent would provide a series of pre-launch activities or campaigns to secure a substantial data flow on launch day. Second, Tencent had offered a series of data retaining services to keep hold of customers once the products had survived and grown successfully on the platform. For example, it had offered a service that helped to design and promote the gift packs of certain applications in the website's 'Gift Pack Zone', thus retaining current customers and attracting more data flow to the apps. Further, Tencent had provided third parties with a stable platform infrastructure and supporting tools. One of these was a 'smart updating system' aimed at helping customers to smoothly upgrade the application's version, hence reducing customer loss during the process. Third, in the

case of outstanding partners – such as 58.com and JD.com – Tencent had offered customized services ranging from promoting to retaining, and even value-adding ones. This strategy had worked well in serving Tencent's external partners to grow and extend their products' life-cycle. As a well-known Tencent motto states, '*Tencent gives half of its life to partners*'; i.e., it links its fortunes with the profitability of its external partners. Thus, by helping them to grow faster and better, Tencent also benefits.

Morphing. *Morphing* refers to the process of continuous business model innovation at both the platform and ecosystem levels. By utilizing and learning from complementary products, technologies, and customer data provided by external partners, Tencent had been able to take advantage of its existing network and had established itself in the mobile internet by introducing the mobile messaging WeChat app. By transferring its existing customer network relations, Tencent had thus built an initial network effect for its new mobile messaging service.

Having achieved a series of successes with its opening strategy, Tencent had then strived to further expand its business scope and ecosystem. First, it had continuously added more services to its existing platforms in order to improve the support system for its external partners. For example, it had added more tools and solution services (e.g., promoting plans and technical support) to its myapp.com application platform and had implemented a more accurate targeting service on its advertisement one. Second, Tencent had gradually launched different types of platforms in response to market trends. For instance, in 2011, it had launched the abovementioned WeChat platform, an IM product created to capitalize on the mobile phone usage trend. Soon after this product had reached maturity, Tencent had introduced a series of features such as the 'WeChat Official Account' and 'Mini Program', enabling its external partners to use the resources found on WeChat. By virtue of these opening strategies, WeChat has since become another strong Tencent platform, achieving a leading position in the mobile platform industry. Additionally, Tencent managed to create new ways whereby not just application developers, but also tool developers could make use of the products and technologies on its platforms. Tencent had integrated resources from both sides and had enabled them to cooperate with each other. One of the sub-platforms – called 'Blue Whale' – enables tool developers not only to create programming tools by using its resources, but also to sell such tools to the application developers on it. By 2017, the 'Blue Whale' platform owned more than 300 different game development tools created mostly by external developers and including the majority of the most popular ones on the market.

Stage 3. Building a Platform Ecosystem to Sustain Growth

Bio-Diversifying. *Bio-diversifying* refers to the process whereby heterogeneous resource providers are encouraged to join a platform ecosystem. Having built a series of successful platforms, Tencent had continuously endeavoured to attract more external partners in order to upscale its business and grow its platform ecosystem. On the one hand, to encourage more entries, Tencent had kept expanding its service portfolio. For example, it had added investment support by launching a '10 billion' project aimed at funding

potential third party developers. It had also added more intelligent services by attracting talent from top Chinese universities and setting up support teams to tutor third-party developers. Additionally, Tencent's platforms had been provided with a user-friendly application system whereby, by following simple instructions found on the website, potential partners could easily apply for entry within a couple of minutes.

On the other hand, Tencent had continued to collaborate with more firms from different industries by incorporating new online and offline businesses. In terms of the former, Tencent had continued to enrich its partner portfolio. These partners were not only from different business domains but also played different roles – such as developers, operators, or tool developers. For example, Tencent's game business involved upper stream (content developers, and key technology developers), middle stream (programmers, picture beautifiers, launch activity designers, and promoters), and downstream (customer services and game-related product makers) partners. In terms of offline businesses, Tencent had entered areas such as medicine and healthcare, higher education, public service management, and dining and restaurants. It had opened its platforms to traditional businesses to help them accelerate their digitalisation process and improve operational efficiency. For example, Tencent had offered its cloud technology to help universities build a digital data sharing system whereby students could register and upload their assignments and lecturers could share lecture slides and readings. In the medical industry, Tencent had offered a digital service system whereby people could register and buy medicine through their smart phones.

Cross-Pollinating. Cross-pollinating refers to the process whereby heterogeneous resources are connected to drive knowledge flows. Many of Tencent's business areas did not run in isolation. Especially after 2016 – when Tencent's cloud technology had become more mature, with complex algorithms that could process huge volumes of data sourced from different areas – Tencent had gradually started to 'mix and match' its businesses to develop better products and services and to exploit network effects.

For example, Tencent had partnered with firms from literally every business area – including clothing, restaurant chains, fast food, and cosmetics – all of which required different promotion services targeted at different customer groups. To solve the issue, Tencent had encouraged these businesses to connect directly with partners from the content industry (such as video, games, and digital books) through its advertisement platform. This platform involved a large database, strong algorithms, and a stable infrastructure suited to facilitate collaboration between different businesses and content providers. Tencent did not intervene by directing or leading in the process of collaboration; rather, it encouraged direct interactions among partners and let them mutually benefit from each other with their professional skills and business knowhow.

As Ma emphasized, Tencent's main strategy involves '*building a digital community*'. Tencent has been striving to be a good 'connector', bringing together different businesses and services to extract new value from the ensuing connections. In the digital ecosystem established by Tencent, the boundaries between different industries become blurred and each actor in the system can reach out to avail itself of the good services provided by its counterparts from other industries.

Self-Organizing. While opening the platform and sharing resources, Tencent had

improved its artificial intelligence (AI), cloud, and big data technologies. More importantly, it had accumulated a significant volume of data drawn from both customers and businesses. With its huge database and smart algorithms, Tencent could immediately gain insights into the actors in the ecosystem in order to make simple judgements and respond to certain enquiries. Once the AI technology had been properly programmed into the platform system, it facilitated effective information delivery and exchange. Hence, Tencent could run its services efficiently and integrate business resources with ever decreasing human input.

As a matter of fact, it would have been difficult for Tencent to integrate its enormous resources, including data and partnerships, through human efforts alone, especially with its decentralized organizational structure. Therefore, Tencent had relied on AI technology to continue to upscale its business by integrating many projects and platforms, which involved a huge range of services, partnerships, and businesses. For example, platforms such as QQ, games, advertisement, and WeChat usually contain the functions of opening APIs, sharing technologies, design solutions, and matching services and partnerships. Tencent's AI technology is currently partly capable of operating these functions with the power of big data analytics and machine learning. Therefore, customers and partners can get most types of assistance by using the self-applying system without accessing traditional customer services.

DISCUSSION AND THEORETICAL CONTRIBUTIONS

Previous studies analysing HGFs have shown that a collection of internally controlled idiosyncratic resources (Barney, 1991; Penrose, 1959) and the capabilities needed to manage them (Helfat et al., 2007; Sirmon et al., 2007; Sirmon et al., 2011; Teece et al., 1997) lead to superior firm high growth performance. The overarching emphasis within this research stream looks inside the firm, upstream in the value chain, and market factors to explain the potential effects of the possession of superior resources or capabilities on firm growth. Our study unveils an important boundary condition that has hitherto remained implicit in the literature on HGFs linked to platform-based business models. Specifically, it provides theoretical insights that capture the challenges and opportunities faced by high growth firms, such as PBEFs, in orchestrating resources and capturing value in the context of platform ecosystems. Thus, our findings contribute to the HGFs and resource orchestration literature.

First, the extant literature on scaling-up and HGFs is dominated by the analysis of general industrial firms. Scholars often identify the sources of high growth outcomes residing primarily inside the firm, including founder traits and knowledge, cognitive abilities, team composition, organizational strategy and culture, and financial and innovation capabilities (Demir et al., 2017; DeSantola and Gulati, 2017). The problem of scaling is therefore attributed to a lack of synchronization between internal organizing and growth.

Due to the unique value creation process of PBEFs, we made an explicit attempt to investigate how PBEFs scale. The key to understanding scaling a platform is to appreciate how internal and external organization are inextricably and intimately intertwined. This

implies that the role played by internal organization in driving the scaling-up process may not be as central as was previously believed, and that the traditional assumptions about firm growth do not readily generalize. This theoretical insight enables us to see PBEFs no longer as isolated or separate entities but rather as part of a complex web of network relations (Van Alstyne and Parker, 2017; Zeng and Mackay, 2019). At the very least, our emergent process model calls for a careful reassessment of the prior research on high growth, as our study suggests a logic shift from the internal/equilibrium one to the network/disequilibrium one. The new logic opens up novel opportunities for investigating platform-based business models.

Second, the extant literature has conceptualized the locus of resource orchestration at the firm level (e.g., Chirico et al., 2011) through various types of supporting managerial actions (Sirmon et al., 2011) to drive scaling. Implicit in the literature is that 'atomistic' firms can exercises resource orchestration to achieve high growth outcomes independently of others. We proposed the logic of dialectic tuning and argued that resource orchestration by PBEFs is shaped by continuous dynamic interactions between the focal platform and its external ecosystem partners including customers and complementors. Based on dialectic interactions with ecosystem partners, PBEFs continuously co-construct their resources, gain strategic foresights of emerging issues, and guide the actions for orchestrating a pool of resources to drive rapid growth. Our reconceptualization emphasizes that PBEFs' resource management is no longer seen as unilateral and manager-led but rather as emergent, situated, and distributed, being shaped and reshaped.

This processual view regards resource orchestration and reconfiguration as taking place in a continuous state of becoming, rather than as a wholly rational and purposeful process within a fixed and determinate entity. The resource orchestration patterns we identified shifts our attention from the firm to the ecosystem level, where the relational properties of internal and external interaction and integration of resources give rise to the capabilities necessary for scaling up a platform-based business model. This view directs us to see the intricate ties of a platform to a larger ecosystem in which the platform boundaries are constantly changing when new resources and capabilities are being formed, connected, and combined to drive novel applications. Thus, we argue that PBEFs' resource orchestration should be viewed relationally, in terms of interconnections and interdependence with ecosystem partners.

Third, the extant literature have almost exclusively focussed on the macro-level factors that can support growth in general or on the antecedents that lead to superior firm scaling outcomes. As a result, it shows an incomplete story about how entrepreneurial firms shift their resources and capabilities as they develop. This calls for research to understand the evolutionary paths of developing organizational capabilities that enable firms to grow over time (Cennamo and Santaló, 2019; McIntyre and Srinivasan, 2017). Our analysis uncovered the specific actions and capabilities of PBEF aimed at scaling up a platform ecosystem over time, as manifested in the complementary set of concrete organizational practices enacted at different stages of their growth trajectories.

Our process model contributes to the HGF literature by highlighting the temporal (*when*), spatial (*where*), and relational (*how*) dimensions of firm scaling. In particular, we argue that the concept of time, space and relationship are important in unpacking the

context that offers significant insights on the dynamics of high growth. Many scholars have suggested that research should move beyond the causal relationship between X and Y, and investigate and specify when and how things happen (e.g., Mitchell and James, 2001; Wiklund et al., 2011). Our process model shows that, as the malleability of digital innovation enables the constant post-launch evolution of platform design and scope (Helfat and Raubitschek, 2018), the resources required to drive platform growth evolve over time in terms of different stages of platform development (when), the locations of such resources (where), and the interaction between the platform and its ecosystem resources (how). Thus, our model reveals that the platform scaling process is emergent, nonlinear, and subject to potential changes and modifications, depending on how it interacts with external ecosystem resources and partners. We, therefore, contribute to the HGF literature by looking inside the black box of the firm's high growth journey.

We also noticed that the strategic priority of the focal platform is not to take a brokerage position in order to secure a higher economic rent for itself – as suggested by the extant literature (Adner and Kapoor, 2010; Teece, 1986) – but to align the diverse interests of autonomous partners in co-creating value for the entire ecosystem. Consequently, we observe a different governance mechanism in which the focal platform no longer controls the conduct of complementors through contracts and price, but provides the infrastructure, basic rules, and incentives needed to ensure the connectivity, modularity, and data flow that are essential to coordinating diverse and evolving players at the ecosystem level. The previous view on resource management therefore needs to be revised to account for the shared resources and joint activities that enable PBEFs to mobilize their ecosystem resources in driving novel resource combinations. The strategic priority here is no longer owning and controlling all the valuable resources, but attracting, accessing, fertilizing, and cross-pollinating external ones. This implies a shift in thinking from resource ownership to resource orchestration. Specifically, a PBEF is an open and evolving system because the availability of diverse and autonomous resources garnered through its platform ecosystem assumes significance in shaping its high growth strategies.

A central question in strategy research related to growth is why some firms are capable of renewing and reconfiguring resources and activities in alignment with environmental dynamics while others are not (Helfat and Winter, 2011). The dominant explanation tends to focus on individual traits and internal dynamics of individual firms. The emergent model we developed reveals an interactional logic of organizational growth that emphasizes the interconnectivity and interdependence between a platform and its associated ecosystem. By investigating strategic issues from the resources that reside both internally and externally to the firm, and the interaction between them, we are more likely to shed light on any undiscovered sources of firm heterogeneity and thereby to develop a more comprehensive understanding of strategy fundamentals. The organization we studied here is a platform-based firm that is inherently pluralistic, permeated by a variety of external influences and norms that are not always reconcilable with traditional firms. However, the infusion of new digital technologies such as artificial intelligence, cloud computing, 3D printing, and the internet of things (IoT) has led to similar ways of organizing that are open, fluid, and nonlinear, involving a broad, heterogeneous, unbound, and often unpredictable set of evolving actors in value creation (Nambisan, 2017). The logic of 'dialectic tuning'

could then be generalized to the context in which firms must build complex and flexible relationships with the diverse, heterogeneous, and evolving ecosystem players, while responding to the uncertainty inherent in the strategizing process in the digital age.

Our study also has important practical implications for managers. First, managers of PBEFs need to understand that sustaining growth relies on the effective network of interconnected actors to build an ecosystem with shared resources, network externalities, knowledge spill-overs, local endowments, and governmental support. As digital transformation drives markets to move faster than ever, managers of PBEFs need to view the process of scaling-up as part of an ongoing conversation with their ecosystem partners in capturing the market needs that never stops changing. Therefore, they should embrace openness, flexibility and empowerment and cultivate an organizational culture of boundary spanning and distributed leadership rather than hierarchical control to counter continuing uncertainties surrounding the evolution of the platform ecosystem. Shared cognition and fluid coordination among PBEF managers and ecosystem partners are likely to enhance normative legitimation and sustained platform growth in their ecosystems. Second, regulatory authorities in China as well as the United States and the European Union have recently begun clamping down on digital platforms forcing businesses into exclusive arrangements and abusing consumer rights based on sensitive personal data. New rules are introduced in China to stop anti-competitive behaviour of powerful PBEFs such as Alibaba, Tencent and Meituan. Therefore, leaders of PBEFs need to pay more attention to radically changing regulatory policies by devising a more cautious strategy for data mining and algorithmic control and avoiding monopolistic behaviours. Such a new environment also requires more effective non-market strategy and stakeholder engagement of PBEFs as their rapid growth and dominant market power are increasingly called into question.

CONCLUSION AND RESEARCH IMPLICATIONS

Based on an in-depth longitudinal case study of Tencent, we explain how PBEFs scale up by reconfiguring critical resources with their ecosystem partners. Using a new logic of 'dialectic tuning', we shifted the research attention on scaling-up from the firm to ecosystem level, emphasizing the interconnections and interdependence between PBEFs and their ecosystem partners. Our findings show that the scaling process of PBEFs are emergent and situated as it is shaped and reshaped by the dialectic interactions between the focal platform and its ecosystem partners, rather than being orchestrated by a unilateral and manager-led process. Therefore, we make important contributions to the scaling and resource orchestration literatures.

Although the selection of Tencent as our case granted us unique insights into the upscaling process of PBEFs, it also forces us to acknowledge two important boundary conditions. First, Tencent represents a relatively new type of platforms that differ from their traditional technological counterparts – such as game consoles and digital payment systems – in which the platform providers typically view value creation as a function of diffusing the technological standards and operating policies that govern how

complementors can contribute to it (Adner and Kapoor, 2010; Wareham et al., 2014). In the case of Tencent, akin to Facebook, Uber, and Airbnb, the heterogeneous needs and behaviours brought to the platform by ecosystem partners cannot be sufficiently controlled by technical specifications or formal rules (Kyprianou, 2018). The contributors enjoy great flexibility as they can opt in and out on a voluntary and ad hoc basis according to their own needs (Nambisan, 2017). Therefore, the unique patterns we observed in Tencent can only be generalized to other similar platform settings that operate around an open-ecosystem in which greater uncertainties arise in terms of the potential contributions of autonomous ecosystem partners. Their contributions are made under conditions of a lack of hierarchical control due to the generative technologies that underpin the expansion and evolution of the platform ecosystem (Wareham et al., 2014). Second, as platforms relying on network effects have a propensity towards natural monopolies, the rapid growth and economic power gained by platform giants have recently generated regulatory concerns over their monopolistic effects. Governments around the world are starting to regulate digital platforms through anti-trust policies aimed at prohibiting monopolistic power. Therefore, caution should be exercised when applying our process model to settings in which the growth potential of platforms is constrained by the enforcement of anti-trust actions.

Our study, of course, has some limitations that could be addressed by future research. First, given that they were yielded by a single case, our findings bear the risk of being idiosyncratic and not generalizable (Eisenhardt, 1989). However, single case studies are often used for the exploratory investigation of new research problems or to refute the validity of established theories, leading to scientific development through 'force of example', as the related findings are not generalizable statistically but analytically (Flyvbjerg, 2006). As a revelatory case (Yin, 2003), Tencent offered us an excellent setting in which to explore the resource orchestration of PBEFs in driving the platform upscaling process. Our findings indicate that future research on PBEFs and platform growth would benefit from building a stronger theoretical basis from an ecosystem perspective. For instance, the analysis of resource reconfiguration could focus on the versatility of resources and on their alternative applications by the platform and its ecosystem partners. Thus, resource orchestration could be analysed more at the ecosystem or system level of analysis to understand the evolutionary path of platform growth. Future studies could also investigate whether the 'dialectic tuning' logic can be replicated on a larger sample of PBEFs in the context of different industries and regulatory regimes.

To conclude, platform-based business models have become increasingly prominent over the last two decades. The emergent process model developed in our study offers a step forward in recognizing how the interconnected nature of a platform within an ecosystem in orchestrating the combinations of both internal and external resources over time shapes the upscaling process of PBEFs. We hope that our work will stimulate future research and offer insights on firm growth and scaling in the context of digital transformation.

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APPENDIX 1
List of interview questions

1. Could you please quickly introduce yourself; i.e., your background, job title, and key responsibilities at Tencent, and how long you have been working at Tencent?
2. What were the key milestones and turning points for Tencent's growth over the years? Could you please mention some specific examples and events that really marked its growth journey?
3. Let us go back to the initial growth stage where Tencent's only product was QQ. Could you please describe and explain how a platform start-up like Tencent was able to quickly attract user attention and gradually dominate the social networking market in China?
4. Could you please describe how resources were used and transformed during this process to achieve this milestone? Could you please give us specific examples?
5. I can see from the platform's history and from the top management team's statements that the move from laptops to smartphones marked another era for Tencent. Why was this so important?
6. Moving from a closed to an open platform, how were the resources used and transformed to drive the next wave of growth at Tencent? Could you please give us specific examples?
7. What was the key milestone that followed the smartphone transition? How were the resources used and transformed to sustain its growth? Could you please give us specific examples?