A path for infrastructural ambidexterity: balancing reliability and flexibility in digital ecosystems

A path for infrastructural ambidexterity: balancing reliability and flexibility in digital ecosystems

Sub-theme: 42: Managing Tensions in Innovation: Balancing Feasibility, Viability and Desirability

*** work-in-progress ***

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Abstract

Sustainable digital ecosystems show that the reliability of general purpose IT functions can be successfully combined with the flexibility of customized applications with evident benefit for the economic performance of the resulting system. Theories on organizational learning and digital architectures provide conceptual frameworks to explain this phenomenon. However, the process through which such combination of complementary capabilities can be successfully exploited is still unexplored. In this paper, we adopt a practice lens to investigate the integration process of digitally enabled services provided by innovative startups into large scale infrastructures operated by big organizations. By focusing on the transformative paths for managing tensions in digital business, the study contributes to both research, practice and policy making in the area of digital innovation.

Introduction

Recent developments of information technologies (IT) such as cloud-computing and internet of things are expected to play a key role in the near future due to their pervasiveness and the possibility they show to spur economic growth through the improvement of process efficiency, the enhancement of analytics capabilities and the availability of a wide range of applications in downstream markets. However, in order to exploit such possibilities, firms need to enact business models that are appropriately suited to the characteristics of their physical and digital ecosystem. Currently, two contrasting business models are mainly adopted by large and small companies operating in the IT-based sector (Cesaroni, Abbate, & Villari, 2016). On the one hand, large companies that manage large scale IT infrastructures (such as large telecom

operators) sustain huge investments for the development and organization of the whole system and gain profits by allowing the access to the latter to actors located downstream in the value chain. On the other hand, small (often start-up) companies are specialized in providing digitally enabled customized services to downstream users (including final consumers) and make use of available IT infrastructures. However, such firms often operate in niche markets and struggle in scaling up their customer base by providing higher value services in a sustainable way. Furthermore, while large companies are characterized by relevant reliability, given their size and the amount of resources and capabilities they possess, small start-ups are characterized by certain agility, given the ability they show to adapt general purpose knowledge and capabilities to widespread application domains. Thus, both types of companies possess strengths and weaknesses and face the challenge of finding a right balance to the trade-off between flexibility and reliability.

Against this background and with the awareness that a digital business ecosystem must evolve in a sustainable way, the present proposal intends to investigate the following overarching research questions: *How new digitally enabled services are successfully integrated into existing infrastructures? How do large firms and startups combine their complementary capabilities in order to manage tensions and trade-offs of digital innovation?* Answering these questions requires bringing together parallel strands of literature that, up to now, have produced fragmented views of the problem and have failed to generate a unifying framework, which takes into account technological, managerial and organizational aspects. We adopt a practice-based view (Feldman & Orlikowski, 2011) for investigating the integration process of digitally enabled startup services into large-scale infrastructures of firms located upstream in the value chain. We focus on interactions among material and nonmaterial resources, social actors and activities in order to conceptualize the dynamics of digital business ecosystems. The proposed framework will be empirically applied to the context of a digital startup accelerator.

The paper is structured as follows. First a literature review on digital innovation is presented in order to introduce the notion of infrastructural ambidexterity. Then a conceptual framework linking the emerging properties of digital ecosystems to the micro-level practices and their imbrications is proposed. Finally, the research design of a case study within the context of a startup accelerator is described in order to show how we will empirically instantiate our original theorization of digital innovation practices.

Literature review

Prior research on Open Innovation (Chesbrough, 2003) has clearly shown that firms may benefit from collaborations with external partners by allowing the in-flow of external technologies and technological competences. In fact, external technologies may be integrated with the internal technological base in order to generate new products and services and thus enhance the firm's ability to create value. This process of technology in-flow may be undertaken along the entire process of innovation development, since the initial stages of basic research, to the latter stages of product and service design. The firms' possibility to exploit an Open Innovation approach may only be limited by two conditions: i) the lack of adequate absorptive capacities (Cohen & Levinthal, 1990; Zahra & George, 2015); and, ii) the difficulty to set-up strong appropriability mechanisms that protect partners' intellectual property from uncontrolled deployment by third parties (Cohen, Nelson, & Walsh, 2000). As for the former, firms thus need to invest in both scientific and technological research that allows them to monitor the external technological environment, identify the owners of complementary technological skills and competences, integrate external technological knowledge with the internal knowledge base, and eventually convert the potentialities offered by external technologies into actual products and services capable of generating a competitive advantage. As for the latter, firms both need to protect their technologies with patents and other forms of intellectual property rights, and to negotiate with potential partners the allocation of property rights on exchanged technologies.

Only once these two conditions are met and difficulties associated to their implementation overcome, firms may take full advantage of collaborations with external technology suppliers. Traditionally, firms that have undertaken such an approach have pursued an open business model (Chesbrough, 2006; Teece, 2010; Zott & Amit, 2010) characterized by a strict control over the core elements of the technology to be embedded into innovative products and services, while external technology acquisitions have been limited to marginal and complementary technological components, often customized by the external supplier for the benefits of the potential technology user. In other words, technologies and technological knowledge exchanged in innovative collaboration processes are often specialized and (co-) developed ad-hoc to solve contextual problems.

However, when technologies object of exchange are General Purpose Technologies (GPTs), as in the case of IT infrastructures, a different form of open business model may be pursued by partners, with advantages for both technology suppliers and technology users. As prior research has shown (Helpman, 1998, Gambardella & McGahan, 2010), GPTs allow a different

configuration of division of labor at the industry level and a different organization of the innovative process.

In this sense, the rise of large-scale digital infrastructures (Hanseth & Lyytinen, 2010; Williams & Pollock, 2008) has shown how alternative approaches to system design and to the management of intellectual property rights can lead to extraordinary levels of generativity (Yoo, Henfridsson, & Lyytinen, 2010; Yoo, 2013). Digital platform architectures offer an example of how companies can bridge a set of general purpose functionalities to a variety of customized and idiosyncratic applications that fulfil heterogeneous needs from user communities (Resca, Za, & Spagnoletti, 2013; Spagnoletti, Resca, & Lee, 2015). In turn, a division of labor among upstream developers of general purpose IT systems and infrastructures, and downstream developers of context-specific, customized solutions can be established. Companies can specialize in one core activity, according to possessed resources and capabilities, without having to incur the huge costs of organizing the entire value chain. Within such digital ecosystems (Corallo, Passiante, & Prencipe, 2007) innovative products and services emerge from the interaction among large firms, start-ups and their environment.

The development of sustainable forms of digital business in which innovative services are provided to downstream users in a reliable way follows the rules of a new organizing logic (Yoo et al., 2010; Yoo, 2013) in which different capabilities (Selander, Henfridsson, & Svahn, 2013), knowledge regimes (Bygstad, 2015; Hanseth & Bygstad, 2015), and digital services (Spagnoletti, Resca, et al., 2015) are combined. In fact, while basic services can be effectively and efficiently provided by private or public institutions operating large scale IT infrastructures, start-up companies have a better ability to match user needs with technological solutions.

Ambidextrous behaviors enable the combination of complementary capabilities possibly resulting in successful integration of complementary capabilities within the enlarged business ecosystem. This in turn fosters economic and market performance. It is in fact widely recognized that ambidexterity, seen as the ability to combine exploration and exploitation for long term organizational performance, is a key issue for organizational learning and adaptation (March, 1991; Raisch, Birkinshaw, Probst, & Tushman, 2009; Tushman & O'Reilly, 1996). We refer to infrastructural ambidexterity (Spagnoletti, Hanseth, & Prencipe, 2015) as a property of digital ecosystems that improves innovation management capabilities within large firms (Deichmann & van den Ende, 2014; Kijkuit & van den Ende, 2010) and offers startups the possibility to scale up their services by cultivating their innovation habitat (Selander et al., 2013). In this paper, we contribute to the ongoing debate on ambidexterity, specifically applied

to digital business ecosystems. Indeed, while the benefits of ambidexterity in organization are well recognized, what remains unclear is *how* ambidexterity is performed in the context of digital innovation.

Theorizing practices on digital innovation

The proposed framework is informed by a practice-based view with its focus on social life as an ongoing production that emerges through people's recurrent actions (Feldman & Orlikowski, 2011). Figure 1 presents the main concepts articulated in the framework.

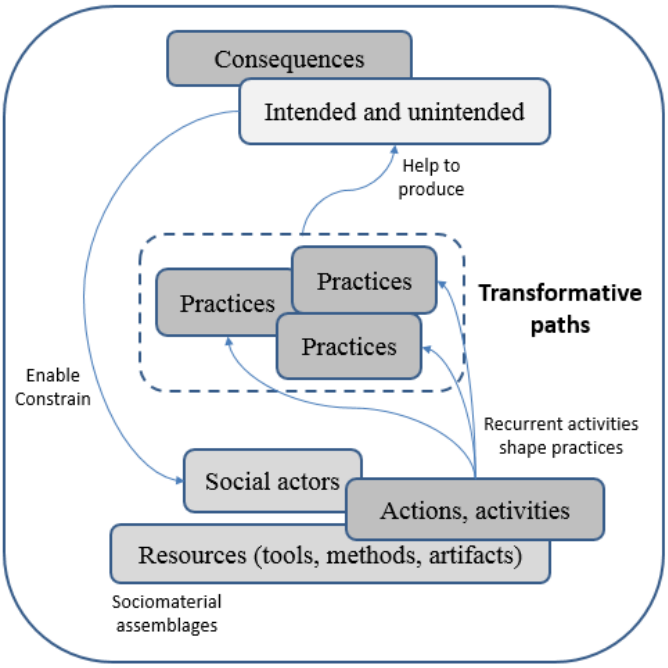

Figure 1 – Practice-based framework (adapted from Pozzebon & Tello-Rozas, 2016)

The starting point are social interactions involving social actors and resources (Feldman, 2004). Social actors are not taken individually, but as part of subgroups, coalitions or teams. People are acknowledgeable and reflexive actors that do not act in this word in isolation, but related to the social groups they take part (Pozzebon, Diniz, & Jayo, 2009). In her work on resources, Feldman (2004) recalls the definition of structure put forward by structuration theory: rules and resources recursively implicated in the reproduction of social systems. In this framework, we pay particular attention to the mobilization of resources (or resourcing), which could be material (e.g., tools, devices and artefacts) and nonmaterial (e.g., knowledge and methods).

The social interactions – that we might also see as sociomaterial assemblages, as the imbrications between the social and the material are difficult to separate, they are intrinsically and relational linked (Orlikowski, 2009) – are expressed in actions and activities. This corresponds to the first approach proposed by Orlikowski (2010) when defining different modes to engage with practice: the recognition of the centrality of people's actions to organizational or societal outcomes (Feldman & Orlikowski, 2011). However, not all actions and activities are relevant to understand social change or permanence, outcomes and impacts. While some actions and activities might be seen as ephemeral or non-influential, others might become recurrent or routinized (Feldman, 2004), ending by shaping social practices. Social practices are therefore a categorization of recurrent activities, activities that are somehow permanent, that are structured and institutionalized to different degrees. Finally, social practices are not without consequences, which might be intended and unintended (Orlikowski, 2000). In their turn, intended and unintended consequences enable or constraint social actors in their everyday life, triggering progressive modifications on ongoing actions and activities, a "shifting attunement" according to Feldman (2012).

The underlying assumption of this framework is that, more than just identifying social practices shaped by social interactions, we should identify transformative paths (Pozzebon & Tello-Rozas, 2016). Transformative paths mean that each practice do not act in isolation. Different practices enacted by social interactions have an imbricated effect, which could end by explained or making sense to intended and unintended consequences. We argue that transformative paths are the result of the imbrication and interdependent effect of different social practices.

Translating the practice-based framework to our investigation, we start the identification of some intended consequences. For instance, to combine complementary capabilities, particularly reliability of general purpose IT functions and flexibility of customized applications. This combination might lead, in its turn, to the successful integration of new services into existing large infrastructures. The main social actors involved are large firms, start-ups and investors, but we could infer that customers and other suppliers, as well internal sub-groups, will also take part of the social interactions. The main resources are IT infrastructure, IT applications, collaborative spaces, business model templates and they might involve particular methodologies and services. Finally, central concepts to this framework are the activities and actions that shape certain practices such as pitching, prototyping, etc. We are particularly interested on those practices that help to manage and enable the complementarity of capabilities not easy to integrate. We call them infrastructural ambidextrous practices and we argue that

they do not act in isolation but they are interdependent. Their imbrication form paths, transformative paths. The main goal of this investigation is to identify them.

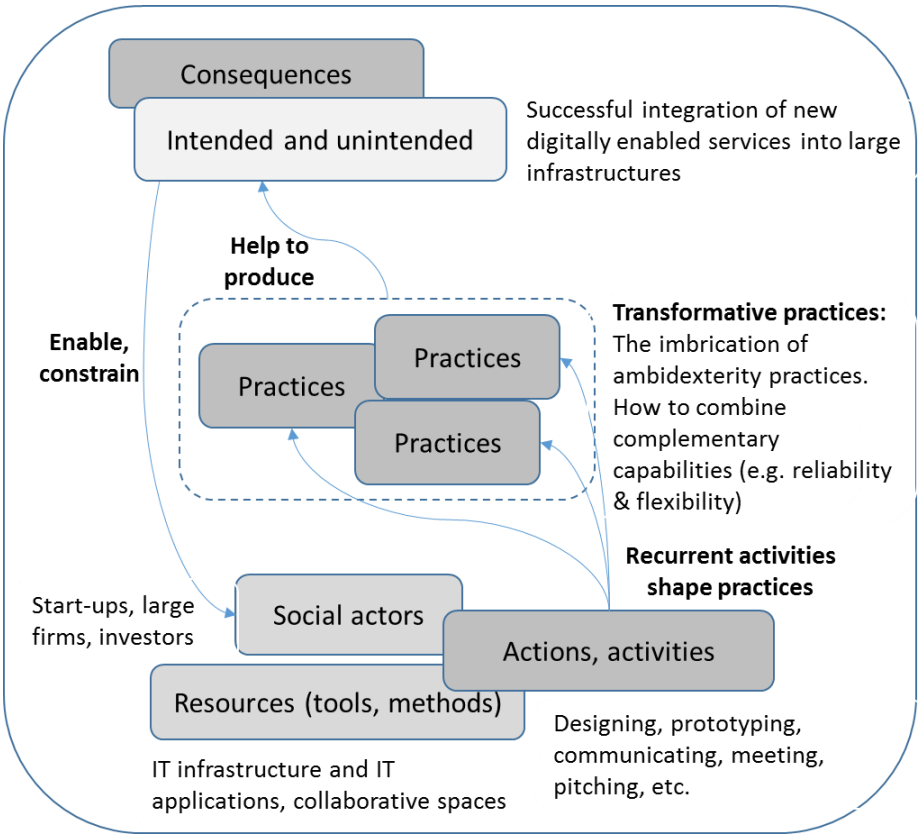

Figure 2 – Investigating infrastructural ambidexterity transformative paths

Research Method

Our inquiry on infrastructural ambidexterity within the context of digital ecosystems is based on the analysis of the transformative paths performed within one of the most active venture capital investors in EU. The venture capital company (VCC) only targets startups operating in the IT sector and collaborates with partners from the academia, big companies, government institutions, external advisors, and business angels in order to provide financial resources and hands on assistance to startups in their early stages of development.

Currently VCC has more than 30 startups in its portfolio and each startup follows a different path in its attempt to become profitable during the acceleration process. Moreover, the VCC offers facilities and professional support to startup companies that are already active in providing services to their customers. Our focus is on the integration process of VCC startups into large-scale infrastructures. As a first step we analyze actions and activities performed by

startup teams and other social actors (e.g. big companies) in mobilizing material and nonmaterial resources. Second, among these actions and activities, we identify recurrent activities and categorize them into social practices that are somehow structured and institutionalized to different degrees. Finally, we concentrate on the intended and unintended consequences of social practices, which in their turn enable and constrain startup teams in their everyday life. As a result of this three step process, we theorize on the imbricated effects of different social practices leading to both intended and unintended consequences when dealing with tensions generated by digital innovation.

Research context: the VCC ecosystem

Given the early stage of the research project, in this paper we report the research design and the preliminary findings of our empirical investigation at VCC. A qualitative field study will be further conducted to systematically analyze the transformative paths characterizing the successful development of new digitally enabled services by innovative startups. The case study embeds multiple units of analysis (Yin, 2009) corresponding to the startups that belong to the VCC ecosystem including both the ones that are engaged in the acceleration program and those that are already operating profitably in the market.

Startups engaged in the acceleration process are selected on the basis of an open call after submitting their business ideas to a panel of analysis and investors during the "investor day" which takes place twice a year according with the industrial plan of the VCC. Each startup team is composed by 3-6 members with different background and experiences. At the core of the selection process there is a short presentation, named "pitch", in which the team summarizes the main strengths of the business idea. Once a startup has been selected for funding, it enters the acceleration program and officially becomes part of the VCC ecosystem. At this stage, a co-working space is assigned to the startup team together with the resources needed for implementing the initial part of the business plan. A continuous monitoring process is then activated by the VCC to control that resources are properly used and to assist the team when difficulties are encountered. A typical example of support offered by the VCC is related to legal assistance when contracts must be signed with both investors, customers and suppliers.

Almost half of the startups hosted in the VCC premises have successfully completed the acceleration program and operate as private companies in the market according with their business model. Although the relation of these companies with the VCC is mostly financial, the investors and the startup teams find beneficial to stay in touch on a daily basis and hence to establish their working space in the same floor. Therefore, startup companies, partially owned

by the VCC, are offered the possibility to rent a room in the VCC building and work in close proximity with other startups and the VCC staff. As a consequence of this choice, four years after the start of its business in 2012, the VCC has moved into a new building very close to the initial one by substantially increasing the available space which has now the ambition of becoming a global "Tech hub" according with the strategic plan of the company.

The proximity among startups, investors and other players of the VCC ecosystem, enable many interactions with different degrees of institutionalization. In some cases, startups have to report to the investment analysts their progress against the milestones of their business plan. In other cases, they take advantage of capabilities and skills that are not available in their teams. Moreover, the physical proximity allows the VCC teams to better perform their fund raising, acceleration and communication activities and to assist the startup teams in developing their business.

Research design

Our methodological design is influenced by the work of Pettigrew (1985) and Langley (1999). From this perspective, process research is concerned with understanding 'how things evolve over time and why they evolve in that way' (Langley, 1999, p. 692). Process data consist largely of stories about what happened and who did what when – events and activities ordered over time. Longitudinal comparisons are important for recognizing patterns of events and understanding how and why things evolve in a particular way (Pettigrew, Woodman, & Cameron, 2001).

In order to investigate the transformative paths of digitally enabled services in the VCC ecosystem, we focus on the development process of the startup portfolio. Each startup is a unit of analysis embedded in our case study (Yin, 2009) and its development process is a chain of events whose outcome represents a transformation of the ecosystem. In each of these chains of events, we will identify the nature and form of the practices implemented. A transformation means the achievement of a new state in which some intended consequences are accomplished, including improvement of customers' quality of life, legislative changes, changes in consumer behavior, efficiency in service delivery, workplace transformation, new coordination mechanisms. A new state can also be the outcome of unintended consequences within a transformative path. Something that enable or constrain actions performed by social actors when new digital services are made available. We will identify 'transformations' based on our interpretation of claims made by startup members in electronic communications, but we will 'triangulate' those claims with interviews and media research. This design is similar to that of

several studies applying and recommending this type of process-based logic (Langley & Abdallah, 2011; Tello-Rozas, Pozzebon, & Mailhot, 2015). Indeed, this type of data corresponds to what process-based authors such as Pettigrew (1990) and Langley (1999) suggest as enabling an understanding of how things evolve over time. Processual analysis deals with sequences of 'events'. The analysis of process data requires a means of conceptualizing events and of detecting patterns among them. The researcher attempts to document as fully as possible the sequence of events related to the processes being studied.

Data collection and analysis

Our qualitative data will mainly consist of semi-structured face-to-face interviews (Gubrium & Holstein, 2001) with startup team members and VCC representatives. A minimum number of two members for each team will be selected for data collection, resulting in a core group of about 60 informants. Employees and board members of VCC will be also involved in data collection as a source of information on the activities performed in the areas of fund raising, communication, and acceleration. Interviews will last one hour and will be recorded and transcribed into field notes. Although interview protocols are different for startups and VCC members, they both include questions concerning the integration of startups into large infrastructures, the resources involved, the recurrent activities, and the tensions between reliability and flexibility. The interview guide for startup team members is presented in Appendix 1.

In addition to interviews, the research team will also perform field observations, by attending public events organized by the VCC. The core process at VCC consists in collecting investment proposals through different channels such as events, the official website and contacts with entrepreneurial associations, universities, incubators, venture capitals, etc. A deal flow of about 400 investment proposals is managed every year, resulting in 15 startups selected, funded and supported during the acceleration program. Many of these events are open to the VCC network made by Universities, business angels, and representatives of private and public organizations. The collection of field notes on the activities and rituals performed during these events, will represent an additional source of information on the relevant resources and social actors involved.

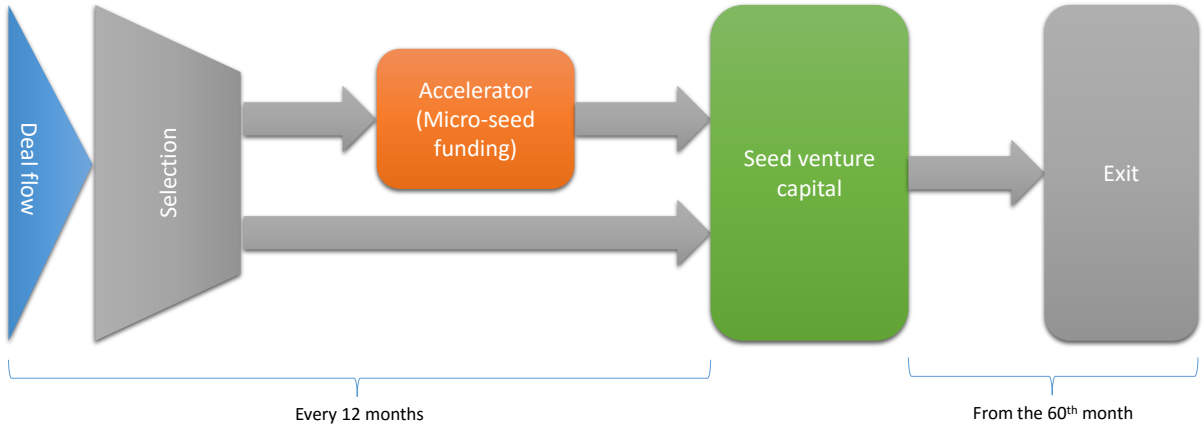

Figure 3 – The VCC core process

Finally, since each stage of a startup development is well documented and communicated, the dataset will be enriched by presentations, brochures, websites, contracts and other documents provided by the informants or available online. A summary of data collection is provided in table 1.

Data sources	*Description*	*Period*	*Role*
Interviews	60 in-depth interviews with startup team members and 10 in-depth interviews with VCC staff	From June 2016 to February 2017	Main source of data for coding and identification of transformative practices.
Participant observation	Field notes from participation in public forums, training sessions, investor days, etc.	From September 2016 to June 2017	Important for understanding the dynamics of interactions among social actors and the key resources involved.
Electronic communications and public documents	Annual reports, websites, articles in the media, newsletters, invitations, etc.	From July 2016 to December 2017	Important for building the history of the startup development

Table 1 - Summary of data collection

In analyzing our qualitative data, we will combine visual mapping and grounded theory strategies (Langley, 1999) to identify relevant concepts and inductively theorize on the transformation paths performed by startups in the VCC ecosystem. Firstly, we will identify relevant activities and resources mobilized in the development process of each startup. The processual data collected in the field will provide detailed accounts of many activities carried out within the ecosystem as well as strategies employed by social actors to involve and mobilize resources. With these data, we will draw visual maps describing the transformation process of

startup ventures as the emerging outcome of their transformative paths. Secondly, in analyzing our qualitative data, we will follow the guidelines provided by Strauss and Corbin, (1998) to build a grounded model of transformative practices and adopt an iterative approach of constant comparison, where data collection, coding and analysis are intertwined. We will move back and forth between our field notes, the theoretical model that we will build and new pieces of data, to find support or to detect inconsistencies between new ideas and our data. Therefore, the theory emerging from the analysis of our initial field notes will guide further data collection. For instance, whenever we will identify some unintended consequences of social practices that constrain one or more social actors, we will collect additional data on the actions put in place to react.

Following Strauss and Corbin, (1998), we will identify recurrent actions and activities in our data and we will group them to form categories of practices (open coding), we will make connections between the categories identifying possible relationships to each other (axial coding) and we will select a core category relating major categories of practices to it (selective coding). For the selection of core categories, we will focus on those practices that combine different capabilities such as exploration and exploitation, reliability and flexibility, etc. The final outcome of the coding process will be a set of transformative practices as a result of the imbrication of ambidextrous practices seen as the interactions among social actors and infrastructural resources.

Provisional results

Although the main goal of this work-in-progress paper is to illustrate our research design, in this section we present some initial insights emerged from the first interviews with representatives of the VCC. Our preliminary findings help us in getting a deeper understanding of the empirical context and support our choice to adopt a process view in order to explore how startups grow in digital ecosystems.

With the rise of technology and the internet, the emergence of new types of business has had an impact on the traditional companies of the old economy. Nowadays, startups are able to grow at a much faster pace than before. Examples are Airbnb, which startled the hotel industry within months, Uber which shook up the taxi industry and LinkedIn which has transformed the recruitment industry.

There is not a single undisputed and unanimous definition of startup; generally, a startup is an entrepreneurial venture typically describing newly emerged, fast-growing business. It refers to an organization designed to rapidly develop scalable business model. Often, startup companies

deploy advanced technologies, such as the wearable devices, machine learning, robotics, etc. These companies are generally involved in the design and implementation of innovative services and in their delivery in specific markets. The term became internationally widespread during the dot-com bubble when a great number of dot-com companies were founded. In the last three decades we have seen an explosion of high-tech startups around the world but recently they differ from the dot-com bubble whose main traits are the flurry of IPOs and acquisitions. Rather than a financial game, by virtue of the ongoing era of mobile technologies and the spread of internet access, new digital services are infiltrating into people's practices, transforming every aspect of our daily life: we can do shopping beyond border with a click of mouse; we can connect to the idle resources in the corner of the city; we can reach the best courses provided by prestigious universities on cloud, etc.

Therefore, startups ventures are dramatically changing users' expectations and shaping the world. Moreover, the regional distribution pattern has changed as well. Twenty years ago, almost all tech startups were created in startup ecosystems located in Silicon Valley and Boston. Today, technology entrepreneurship is a global phenomenon, with startup ecosystems rapidly emerging all around the world. Most big cities, no matter belongs to developed countries like US or developing country like China, now have sizable startup colonies or ecosystems that fuel this prosperity. The ease of having global access to users and customers all around the world and the increasing speed of technological adoption by consumers and businesses has enabled startups to grow at a significantly faster rate.

The main driving force for this explosion is that basic building blocks for digital services and products have become so flexible, cheap and ubiquitous that they can be easily combined and recombined: snippets of codes, cloud-computing and the internet itself, which is now fast, universal and wireless. Unrelenting tide of devices and the low cost of internet access enable individuals and organizations to operate online and to perform activities in the cloud. Meanwhile, entrepreneurs are embracing lean principles: they no longer need to operate their own servers and infrastructures, they outsource what they do not excel and focus on the core business. Moreover, they constantly iterate to improve their products or services without updating or repurchasing the equipment. This results in a comparatively low threshold for entrepreneurs to transfer their ideas into practice. Startups can now be built for thousands, rather than millions of Euros. Developing a new product nowadays is much cheaper than in the past due to the free availability of coding knowledge, freelancers with specific plug & play tools and pay-as-you-go services in contrast with the traditional model where relevant capitals are needed in the early stage of a business.

Nevertheless, there is a harsh reality hiding behind the explosion: observation finds that while, on the one hand, there are a handful of new startups that are indeed growing very quickly and for a long period of time, on the other, the vast majority of high-tech startups still show very low rates of growth, if any at all. More specifically, empirical evidence shows that most startups never achieve sustaining growth dynamics and therefore die within the five years of their existence (Shane, 2009). The Startup Genome Report analyzed about 3200 high growth internet startups and found that approximately 92% of the startups failed within three years. It also concluded that more than 90% of startups, due primarily self-destruction rather than competition. Furthermore, we have to recognize that because of the inaccessibility of the venture-backed startups' data, we cannot gather information from another huge amount of startups. But we also see many startups that only survive until some external support is granted. Instinctively, without a sustainable growth and appropriate scaling transformation, startups can hardly survive even operate in favorable circumstance. Therefore, we argue that the growth and scaling problem is the matter of paramount importance in the lifetime of a startup.

As we mentioned before, growth and scaling push startups forward and make them survive. But this is not the end of the story, sustainable growth also provides startups with better access to venture capital funding and human talent, allows them to get into virtuous cycles in fortifying presence in the market in the forms of developing new markets, creating barriers to entry and even developing a competitive advantage in existing markets by creating economies of scale. By growing their business, startups encounter new challenges in both their environment and internal constituencies. New social actors may react to the presence of new digital services by constraining and enabling startup activities. These reactions can be beneficial to the startups since big companies may become interested in embedding the new services in their infrastructure. However, sometimes a resistance to change can contrast the digital transformation in the attempt to preserve the status quo. Internally startups deal with a continuous adaptation of their governance model and technical infrastructure, by taking into account digital trends and the learning processes in place.

Other than growth, scaling represents an important part of a transformation process. In practical management, scaling is presented in the form of a series of implementations took upon the organization. Two types of scaling are generally executed in startup: i) premature scaling, step up to the next round of growth in anticipation of the market instead of demand driven growth; ii) mature scaling, carry out the scaling at the right time, ideally, the time when the slack of the prior growth round has exhausted. Theoretically, from one level to the following one, the transformation has to be realized through redesign of the system. We put the relationship

between growth and scaling in this way: sustainable growth paves the way for scaling and scaling lays a milestone for sustainable growth, they are continuous not discrete. In the real word, entrepreneurs and investors strongly focus on building and identifying startups with the sustainable growth and scaling techniques.

As the world of startup is characterized by uncertainty and because startups are completely new business without a long and stable operating history, startups face a high risk of mortality in the first years of operation. The literature on startups propose some actionable frameworks, tools, and techniques to support entrepreneurs in building and testing business models and strategies for growth and scaling. The great challenge is to remain essentially creative not only in innovating products and services, but also in the company's management mechanisms. Market appreciation and technology trends account more for the former issue, in a way, out of the control of the operator. Nevertheless, the redesign of the management mechanisms is also challenging and contingent to the dynamics of the external environment. In order to mitigate or avoid the influence from the external environment, some researchers attempted to look for the sources of growth and scaling without being obsessed with the details: they tend to place their attention on the subject regarding the entrepreneurship or traits of successful startups. No matter what forms it takes, one conception is easy to get to grips with: the momentum of the growth and scaling comes from external stimuli and internal manipulation.

In fact, to identify the momentum of growth is elusive. All the events take place during the existence may exert influence on growth or scaling. As a report newly released by CBinsights.com, it concluded several keywords to describe the failure based on the survey or the interview of 101 failed startups. According to the report, insufficient fund (25%) tops the list and business model (12.1%) follows. At the same time is worth noting that there is one inevitable flaw in the statistics: the interviews in question are related to their startups and they tend to harbor confidence and shift the responsibility to others. We do admit that these reasons have potential in damaging a startup but there is also another perspective can be taken: these so-called reasons can be regarded as challenges startups are confronting during their growth while the failures failed to handle them.

Since our aim is to course a growth path of digital startups in relation to existing infrastructures, it is worth to mention some of the principles that inform innovation practices. Over the last years, the "lean startup" approach has seen an increased adoption by entrepreneurs. The lean startup describes an approach for building and growing startups, based on the assumption that a startup is an organization in search for a scalable business model. However, this concept is

not comprehensive enough for us to take into account the rich picture of the startup environment. Principles such as openness, purposefulness, multidimensionality, emergent property, and counterintuitive behavior, acting together as an interactive whole, define the essential characteristics and assumptions about the behavior of a successful startup. This point of view not only includes the organizational mechanism but also factors in the interactive feature.

Attempts have been made to generalize the startup transitioning into mature companies. In this sense, some critical activities are: hiring functional experts to take the enterprise to the next level, adding management structures to accommodate increased head count while maintaining informal ties across the organization, building planning and forecasting capabilities, and reinforcing the cultural values. Hiring the functional expert, refers to seeking specialization in select functions, such as sales, human resources, marketing, R&D, and financing. This benefits them in three ways. First, the specialists use their knowledge to tackle their functions' work more efficiently. Second, as they introduce and implement best practices within their domains, they catalyze future growth by creating slack for the commencement of the next phase. Third, human resource is reallocated to positions that are more suitable and the configuration of the business system is optimized, people who are not good at the business development or marketing no longer have to worry about them, for example, are free to explore other activities.

Adding management structure, when launching their startups, many founders avoid hierarchy because of their egalitarian ideals. However, as their startups scale up, a growing number of people report to a handful of leaders. Founders may think this allows them to remain in command, because all decisions pass through them. But ironically, their organizations spin out of control as centralized authority becomes a bottleneck that hinders information flow, decision-making, and execution. A couple of people at the top cannot effectively supervise everyone's increasingly specialized day-to-day work; in such a system, accountability for organizational goals gets lost. In addition, employees find it hard to remain focused and engaged when they do not have managerial guidance and processes. They may become frustrated as they struggle for access to decision makers who are juggling many other projects and people.

The development of detailed business plans during the inception phase of the startup, allows startup to grow in a flexible way with their limited resources; this is how the business makes progress and strives for surviving. However, as the company grows the attention is given to the emerging obsessions of daily details without a clear framework of plans and goals to guide decisions. Therefore, the recommendation is to setup a vision so that the priority goes beyond

the experimentation of new solutions and the reaction to dynamic markets. An eye toward larger objectives and sustaining the business is also needed in order to avoid wasting the momentum.

Also cultural values play an important role in startup development. From the beginning, as the founders work together and turn a fledging business into a viable company, they are keen to pursue their business idea and they feel a sense of belonging to something important. Founders recognize how powerful this is and rely on nostalgic, almost mythic, stories about the organization's first days to get everyone to embrace the culture. This can work until the startup remains small and team members can personally interact. However, as more people come aboard, leaders may struggle to nurture an organizational culture. This may create obstacles to the growth of a startup. As a venture starts to formalize its functions and reporting chains, identifying with the larger organization helps employees work across boundaries and engage in the spontaneous collaboration and exchange of ideas the company needs to innovate.

Intended contributions

With this study, we offer two main contributions. First, we develop a theory of infrastructural ambidexterity, which extends our understanding on the dynamics of digital innovation. Second, we provide practical guidance to managers and policy makers on the intended and unintended consequences of generated by digital innovation.

Our theorizing contributes to the knowledge base on entrepreneurship and innovation management by complementing studies focused on startups as source of financial revenues. By focusing on the process through which startups integrate their services into large scale IT infrastructures, we offer insights on the transformative paths for managing tensions in digital business ecosystems.

The analysis of mutual needs, complementarities and tensions emerging from the interactions among different actors dealing with digital innovation offers insights on the process to combine the distinctive capabilities of big organizations and startups.

By focusing on digital innovation practices, this study has a potential impact on the level of competitiveness and equality of national socioeconomic systems that may be solved with a balanced approach between highly reliable infrastructures and agile experimentation of customer driven innovations. Therefore, by analyzing the infrastructural integration of organizations operating at different levels of the value chain, we provide a contribution on which solutions should be undertaken to implement ambidexterity and, in turn, to pursue economic and market success.

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APPENDIX 1

Interview guide for startup team members

Describe your role in the team since the beginning of the startup venture

a. Tasks and responsibilities
b. Vision on the new services

How and to what extent, digitally enabled services provided by the startup have been/will be integrated into large infrastructures provided by large firms?

a. Describe how do the integration occurs. Which characteristics?
b. Could this integration be seen as a success? Why?
c. Describe some examples

Could you help us to identify all the firms and groups involved with your business?

a. In addition to the startup itself, who else is involved? Investors? Large firms? Suppliers? Customers?
b. What are the teams inside the start up?

What are the main resources involved in the business?

a. IT infrastructure, IT applications, collaborative spaces, business models templates, particular methodologies, etc.

Identify the main activities carried out by the startup to be in the market and to be able to integrate its applications into large infrastructures

a. Examples of activities are: pitching, prototyping, designing, communicating, meeting, brainstorming, creating events, etc.
b. Which from those activities are recurrent (somehow institutionalized)? What are the distinctive features of those activities?

Comment on the service reliability and flexibility

a. Which are the activities that can improve the reliability of your service?
b. Which are the activities that can improve the flexibility of your service?
c. How these activities are related to each other?