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The building blocks of a resource-based theory of business start-ups
A mixed methods approach to investigate the interaction between markets, institutions, and entrepreneurial learning

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Table of Contents

Abstract

Firm dynamics are commonly explained through learning processes by evolutionary economics and resource-based theories of the firm. The literature, however, also highlights the methodological difficulty to unpack learning. With the support of cognitive-behavioural theories of learning and the use of a multi-method approach, this study investigates the evolution of business start-ups and interactions between markets, institutions and learning strategies. In retrospective interviews, entrepreneurs-founders of 43 Brazilian start-ups reconstructed the storyline of the first three to five years of their firms, focussing on critical learning episodes. Analyses of the narratives resulted in 207 critical learning episodes, based on the analytical framework, empirical content, expert evaluation and the literature. These episodes were clustered in five categories. Quantitative descriptive analysis showed the cross-cutting dynamics of these episodes. Then, relationships between episodes were investigated through grounded theory principles. Results showed that the key linking factor between episodes is the resource-base of each episode, which generated five typical pathways. The final step identified the properties of these pathways. It is argued that the iteration between qualitative and quantitative methods was crucial to unpack the relationships described. This study provides a viable methodology and a comprehensive framework to investigate the evolution of business start-ups, contributing to the literature on organizational learning, entrepreneurship, and theory of the firm.

Keywords

Mixed methods, resource-based theory of the firm, evolution of business start-ups, theory building.

The building blocks of a resource-based theory of business start-ups [1]

A mixed methods approach to investigate the interaction between markets, institutions, and entrepreneurial learning

1 Introduction

Evolutionary economics and the resource-based theory of the firm claim the critical, if not central, role of learning processes in firm dynamics (e.g., Kraaijenbrink et al., 2010). Learning is a necessary process for innovation (Best, 1990; Lundvall, 2007), growth (Penrose, 1980 [1959]) and evolution (Nelson and Winter, 1982). However, these theories lack empirical evidence of how learning plays this role.

On the other hand, the psychology literature has extensively theorised about learning processes applied to organizations (Bastos et al., 2004; Warr and Downing, 2000). This literature, in turn, lacks empirical studies, in relation to the effects of natural learning, in which the learner controls the learning process, on individual performance and organizational effectiveness (Rousseau, 1997).

Interestingly, despite claims that "economic evolution is a growth of knowledge process" (Dopfer et al., 2004: 265), there is consensus in the literature that the emergence of learning outcomes at the organizational level is a 'black box'. Opening this box is the main objective of this study. This paper is based on a PhD thesis developed within a research group on markets and civil society at the International Institute of Social Studies (ISS), out of which the current Civic Innovation Research Initiative emerged. The thesis focussed on learning processes of entrepreneurs in the first years of their business start-ups.

Two central principles underlie this study. First, learning processes can be either inducted or natural, that is, structured in training settings or controlled by the individual, without deliberate external efforts (Rousseau, 1997). Second, much of what the individual learns does not translate into job performance or organizational change (e.g., Cope, 2003; Rousseau, 1997; Weick and Quinn, 1999), since other factors account for the transfer of knowledge to the job (e.g., Abbad and Borges-Andrade, 2004).

Structured training events have been largely studied in organizations (e.g., Klein and Kozlowski, 2000, Salas and Cannon-Bowers, 2001). Natural learning, however, is methodologically more difficult to investigate, since individuals – entrepreneurs in this case – are, in principle, always subject to learning. Despite theoretical and methodological efforts to develop taxonomies of learning in organizations (e.g., Cope, 2003 and the concepts of continuous and

[1] This study was supported by a Doctoral Fellowship of the Brazilian Ministry of Education, through CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), Process n. 3957-06-3; Nov/2007-Oct/2011.

discontinuous learning events; Klein and Kozlowski, 2000 and the multilevel concepts of learning per composition and per compilation; Argyris and Schon, 1978 and the single and double loop learning), identifying the boundaries of a natural learning event and demonstrating how different types of learning interact in the organizational context is yet an area of more questions than answers (e.g., Siqueira, 2002).

Furthermore, the literature about evolution and learning in organizations has focussed on well-established and hierarchical organizations, in which routines are in place, clear divisions exist between functional teams, and the organizational impacts of micro-processes are difficult to measure. This leaves a gap in understanding firms of small scope, characterized by uncertain initial stages, relatively more horizontal structures, small number of members, embryonic routines, and other aspects related to the 'liability of smallness' (e.g., Baum et al., 2000).

Exploring learning dynamics in business start-ups provides empirical evidence on the evolution of this type of firm, contributing to resource-based theories of the firm and to the literature on entrepreneurship. Despite developments in the entrepreneurship literature (Casson et al., 2006), there is not yet a comprehensive theory of the evolution of business start-ups (e.g., Aldrich and Martinez, 2005). Methodologically, it is assumed here that the smaller scope of business start-ups facilitates the measurement of multilevel learning dynamics. In practical terms, understanding natural learning processes in business start-ups might help explain why their first three to five years are reportedly the most critical for survival (e.g., Kelley et al., 2010; Nichter and Goldmark, 2005; SEBRAE, 2007; Naudé, 2008).

The main research question here is *How do critical learning episodes explain the evolution of business start-ups?* Briefly, critical learning episodes (CLEs) are turning points in the evolution of businesses start-ups, since they result in major changes in organizational routines (Corradi, 2013). CLEs are a process indicator of the impact of learning on the evolution of these firms.

The following section presents the conceptual framework. It is followed by sections about the methods of data collection and analysis, and the results of critical learning episodes and evolutionary pathways. The discussion section claims that the interaction between different methods enriched findings in organizational studies. The conclusion highlights the contributions of this study to explain the evolution of business start-ups and other organizational processes.

2 Conceptual framework

The conceptual framework is composed by the concepts of learning, critical learning episodes, learning strategies, and organizational routines.

2.1 Definition of learning

Learning is an individual process of knowledge acquisition, storage, transformation and use that is embedded in the social and institutional context of the learner (Pantoja and Borges-Andrade, 2004). The environment (i.e., social, institutional, physical etc.) impacts on what is learnt and, in turn, learning outcomes impact on the environment. Those environmental and individual factors applied to the firm functioning are referred to, here, as *resources*. Hence, the aim of entrepreneurial learning is to acquire or create resources to the firm.

This definition differs from other developments of the resource-based theory of the firm, which assume a reified notion of resources. Critiques to this notion are found, for instance, in Kraaijenbrink (2010), Eisenhardt and Martin (2000), and Nienhüser (2008). Here, the concept of resources is contingent to their use within the firm. Thus, a taken for granted (potential) resource such as a bank loan is not considered a resource to a business start-up that does not fulfil the bank criteria to access this loan.

2.2 Critical learning episodes

Critical learning episodes (CLEs) are discontinuous events (e.g., Cope, 2003) in the start-up's evolution that may change the course of the business ('change over stability', cf. Knight and Pye, 2007) through the aggregation of new knowledge and changes in organizational routines (Nelson and Winter, 1982). The key elements of a CLE are triggers, learning strategies, learning outcomes and organizational routines. The boundaries of a CLE are defined by triggers to the learning process and the resulting organizational routines. CLEs can vary in duration, from weeks to years, and context (the institutional setting of each episode).

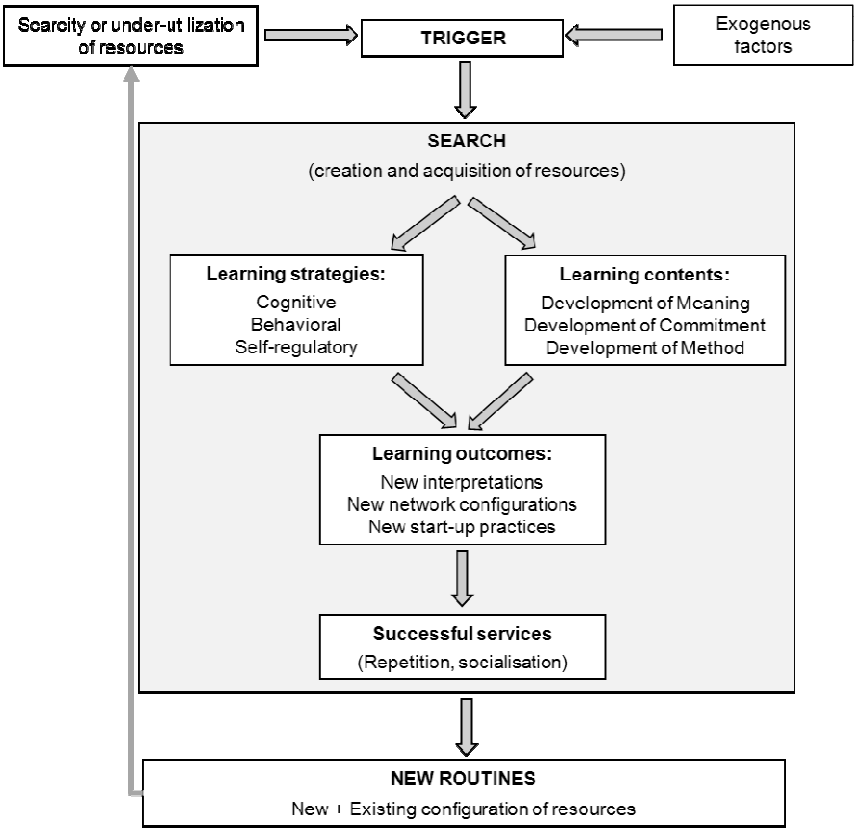
The content of these episodes are unfolded in three dimensions: cognitive, social, and practical (Knight and Pye, 2007). These dimensions correspond to recent developments in the micro-foundations of evolutionary economic theory, which link the subjective cognitive dimension to the objective blueprint dimension (Dopfer, 2004). In relation to outcomes, these dimensions are reflected in the identity of the firm, the relative importance of different actors in the firm's network, and the firm's working methods.The conceptual framework of CLEs is shown in Figure 1.

A CLE starts with an endogenous or exogenous trigger. Endogenous triggers refer to scarcity or under-utilization of resources inside the firm (Penrose, 1980 [1959]), such as needing to increase the production volume to expand the firm. Exogenous triggers (Nelson and Winter, 1982), in turn, stem from the external environment, such as market actors, support institutions (i.e., business incubator), regulatory frameworks, etc.

These triggers start a process of search for the needed resources. This search ends when the newly acquired or created resources solve that trigger. If these resources prove to be useful to the regular functioning of the firm, they will be incorporated to the working routines through processes of repetition,

legitimization and adjustment (e.g., Feldman, 2000; Lazaric, 2008). This means that resources resulting from learning processes (i.e., a technological development) can only impact on the functioning of the firm through changes in the organizational routines (i.e., transformation of the technology into a product). This is the condition for the individual level to impact on the organizational level.

Figure 1
Conceptual framework – Critical learning episodes



The main distinction between learning outcomes and organizational routines is that the former is individual and CLE-specific; whereas the latter belongs to the firm level and is coordinated with other routines. Organizational routines, therefore, are more complex than learning outcomes and more stable over time. As systems of organizational routines become more complex, it is expected that they will become less subject to change by new individual learning outcomes. This distinction helps to explain differences in the change dynamics of small versus bigger firms.

2.3 Learning strategies

Learning strategies are individual activities of information processing used by entrepreneurs to codify information and generate new meanings, expand business networks, and develop new methods of work. They are adaptable to contextual and individual characteristics and will vary according to the task to be performed (Riding and Rayner, 1998). Strategies can be cognitive, behavioural or self-regulatory.

Cognitive learning strategies refer to the mental processing of information gathered from the environment by the learner (Warr and Downing, 2000). They are strategies of intrinsic reflection when the entrepreneur acquires specific knowledge (i.e., definition of cash flow); of extrinsic reflection when the entrepreneur connects more than one type of information (i.e., the balance between volume of sales and production capacity); or of reproduction (i.e., following the steps of a manual to assemble a machine) (e.g., Pantoja, 2004).

Behavioural learning strategies refer to help seeking in written material such as manuals and legislation; to interpersonal and inter-organizational help seeking through networking with resourceful actors; or to learning by doing through experiments and trial-and-error efforts (e.g., Abbad and Borges-Andrade, 2004).

Self-regulatory strategies are metacognitions that monitor and control the entrepreneur's own learning process. They are reflected in emotion control, motivation control and comprehension monitoring of learning activities (e.g., Abbad and Borges-Andrade, 2004). Despite the difficulty to self-report these strategies, they appear in CLEs related to the imminent risk of closing down the business, in which the intrinsic entrepreneurial motivation is threatened and there is a high emotional burden of losing one's investments.

2.4 Organizational routines

Routines are relatively stable configurations of resources applied to the regular functioning of the firm. Individual routines are coordinated in systems framed in general organizational rules of action. They are the way start-ups systematically do things internally and in interaction with the environment.

This definition builds on recent developments of the concept originally coined by Nelson and Winter (1982), as found, for instance, in Feldman and Pentland (2003), and in the special issue of the Journal of Institutional Economics (Hodgson et al., 2011).

3 Method

The business start-ups studied here were linked to business incubators in the Brazilian States of Sao Paulo and Minas Gerais. These two states were intentionally chosen for the availability of resources to business start-ups (IBGE, Directory of Research, Coordination of Industry, 2010; IBGE, Directory of Research, Coordination of Services and Commerce, 2003). Business incubators provide business development services to small enterprises

and entrepreneurs (Altenburg and Stamm, 2004; DCED, 2001), representing a particular learning environment for their strategic services. These services include, for instance, training, consultancy in managerial and financial issues, and technology development (Altenburg and Stamm, 2004; ANPROTEC, 2005).

3.1 Sampling

Mapping the business incubators in the selected region was the first step to identify potential participants. Online databases and business incubators' websites provided information for a general database. The criteria to select the incubators were a) at least four years in operation and b) dedicated to assist start-ups in traditional or technological sectors. The minimum operation time of the incubator was a proxy indicator to find firms operating for at least three years. Contacts with the 15 selected incubators produced a list of start-ups from which 43 entrepreneurs were interviewed. Table 1 summarizes the main characteristics of this sample.

Table 1
Characteristics of the sample

Entrepreneurs characteristics	Values (%)	Start-up characteristics	Values (%)
Entrepreneurs driven by business opportunity	86,1	Manufacturing	55,6
No entrepreneurial experience	80,6	Information and communication	27,8
Work experience in the same field	47,2	Scientific and technical activities	16,7
No work experience	22,2	Capital goods	27,8
Work experience in a different field	16,7	Consumption goods	25,0
Academic career	13,9	Intermediate goods	22,2
Education not mentioned and secondary level	19,5	Business services	22,2
Tertiary education	47,2	Final consumer services	2,8
PhD degree	19,4	Years in operation (mean, SD)	4 (2)
MA degree	13,9		

3.2 Data collection

Retrospective interviews (Flick, 2000) reconstructed the storyline of the start-up based on critical episodes. The criticality of an episode is attributed by the entrepreneur, based on how that episode is perceived as a milestone to the firm. This data collection strategy was useful a) to distinguish between discontinuous and continuous learning episodes, and b) to give central relevance to the entrepreneurs' perceptions. Contextual and overarching issues

narrated by the entrepreneur were crucial to weave CLEs within the trajectory of the business and to picture the start-up in its institutional environment.

Interviews started by the following question: "Please, tell me the story of your firm based on those episodes that marked its trajectory; think of episodes that show critical changes in the way of doing things in the firm". This question is purposefully leading to collect information about these critical events. It was made clear to the interviewees that criticality relates to change, rather than to successful ends.

In addition to this open question, there were complementary questions to detail each CLE. They included the episode's time frame, how it started, who was involved and what their role was, how the entrepreneurs searched for or found a solution, what the outcomes were, and how these outcomes affected the operation of the business. For most cases these details were spontaneously narrated. For others, these complementary questions helped entrepreneurs remember previous and posterior events to that episode, providing information about links between episodes, and a complete and coherent description of the evolution of the start-up. This type of interview, based on critical events that are perceived to have strongly impacted on work routines and practices, and which require more knowledge or skills than before, are a common research technique to investigate informal learning processes (e.g., Eraut, 2004).

The dialogical format of the interview favoured the salience[2] of each episode in the flow of the narrative, which is an advantage for this study, since unusual events are more easily remembered (Eraut, 2004). Later, it was an analytical task of the researcher to sequence the narratives based on time frames and linkages between episodes.

3.3 The coding process

Narratives were initially open coded per paragraph, according to grounded theory principles (Strauss and Corbin, 1998). Coding started by general topics from the research question and the conceptual framework[3]. Examples of these codes are: *background, beginning of the idea, critical learning episode* (at this stage, it included anything related to a CLE), *networks, sector-specific issues,* and *business incubator*.

The most complex category, critical learning episode, was coded in more detail in the second round of coding. The anchor-question was '*What is the new routine?'* By identifying a new routine, the elements of that learning episode could be traced back. Examples of the resulting categories are: *triggers, learning strategies, learning content, learning outcomes, and routines*, following the conceptual framework. The aggregation of detailed information about each episode was a

[2] Salience: "the property of a stimulus that makes it stands out relative to other stimuli in a particular context" (Hogg and Vaughan, 2010).

[3] Atlas.Ti (1993) provided the technological support for codes, memos and retrieval of information from the interviews.

cumbersome process, due to the scattered character of some narratives, in which parts of the same episode would be reported at different moments of the interview.

Successive rounds resulted in more specific categories derived from the first and second rounds. Some of these categories were independent from the conceptual framework (i.e., *identity of the firm, explanatory style*), and others were refinements of the initial codes. At an advanced stage, each storyline was reconstructed based on the following elements: the beginning of the idea, the setup of the business, the sequence of CLEs and new routines, the current status of the business, and perspectives for the future. This paper focusses on the results for the supra-category of critical learning episodes.

3.4 Identifying critical learning episodes

The identification of a critical learning episode started by its boundaries: triggers and routines. Potential episodes often began with expressions that signalled the importance of an event. For instance, "***What indeed pushed us ahead*** *was, in the next year, when we went to a [business] fair*", "*But as things evolved, in eight months' time,* **there was a disagreement between me and my associate**", "*I came from an enterprise that had nothing to do with entrepreneurship*", "***Our critique was accepting that*** *in a given time we would have to accept the entry of an investor*".

Following those expressions, triggers to episodes were addressed by the entrepreneurs. For instance, *"We had the* ***follow up of the people who provide consultancy****, who started passing information on", "Then you enter a market, a huge market.* ***It's a shock****", "****Until the end of 2006 we earned nothing.*** *We were working 12 hours a day and earning nothing", "To be honest, when I started,* ***I didn't even know that commercial area, financial area existed***".

Then, the end of an episode could have two possible sets of expressions. Completed episodes were signalled by the description of new routines. Examples include: *"Where did we aggregate more? I think it was in the* ***entrepreneurial culture****", "****Now we create our own documents****, our own registers* [reference to quality procedures]*", "****First we established the*** **[business]** ***model, then the strategies to fulfil that model.*** *In fact it was a gradual thing", "****We already have a whole system of project management.*** *We have focus on development. We have partnerships with many universities".*

Episodes in progress were indicated by expressions such as *"****It's in the very beginning*** *and all, we're in the first steps in this part", "****Currently the biggest barrier*** *is the associate having to work in something else to be able to survive", "****We have a problem here… of demand management.*** *We haven't been able to attend the demand".* It is important to note that some of these expressions, if out of context, could also signal a trigger. However, they are considered "routines in the making" because of their place in the narratives as ongoing consequences of an episode. Nevertheless, later, these routines could indeed become triggers, playing a different role in the start-up's storyline.

At this stage, each of the 207 found CLEs was treated as a discrete event. The next step was clustering these CLEs in categories. The first challenge to this categorization process was to identify what, amongst the many elements of

a CLE, would be the best clustering factor. After some tentative categorizations, the element that worked best was the triggers. Therefore, episodes are classified according to the key challenges that start a CLE. It is noteworthy that triggers and, therefore, the categories based on them, often do not necessarily reflect the main content of the episode nor relate directly to the resulting routines.

A preliminary trigger-based categorization, complemented by the empirical properties of the clustered episodes, was revised and adjusted according to the literature (e.g., Stretton, 1999). This first categorization was double-blind checked by two experts. Each of them received an evaluation sheet with the definitions of each category and a short description of a sample of 56 episodes. Mismatches between their categorizations led to reviews and the refinement of specific categories. A resulted set of 10 categories was then investigated for all 207 episodes. This is the final definition of triggers-based categories of CLEs:

- ***Access to and relationship with suppliers:*** refers to finding a workable combination of quality and price from suppliers and buying from them; it includes establishing trust relationships that facilitate negotiation and trade.
- ***Access to technology:*** refers to producing new technology by deploying endogenous resources (i.e., the entrepreneur's expertise) or through partnerships. It includes low and high R&D-intensive products and services, and the development of prototypes.
- ***Access to investment capital:*** refers to needing to cover high costs of product development. The two main sources of investments are public subsidy for R&D and venture capital. Each source of investment capital has its own requirements and poses different demands upon entrepreneurs.
- ***Entrepreneur-specific:*** decisions by entrepreneurs that trigger critical learning episodes (i.e., decisions to expand the business). This category relates to the literature on learner-induced learning, in which the learner has agency to trigger a critical learning event (e.g., Moraes and Borges-Andrade 2010), and to the innovation literature, in which the agent is proactive to change his or her own knowledge and to change the firm (e.g., Xu 2011).
- ***Entry and survival in the market:*** this category has three dimensions: entering a well-established market, entering or creating a new market niche and surviving threats. Established markets rely on working institutions and supply and demand structures; but they also call on the competitive differential of new entrants to attract buyers. New markets lack market structures from both supply and demand sides, and institutions, if existent, are incipient. In this case, the critical event is accessing potential buyers who are unaware of that innovative product or service. Once in the market, businesses are subject to threats to survival such as the case of episodes triggered by unfair competition.

- ***Joint venture breakdowns****:* refers to the dissolution of the association between founders, triggering a reorganization of the business and the distribution of its assets. It implies financial and expertise losses.
- ***Labour force issues****:* refers to lack of skilled or specialized workers, high turnover rates, and poor human resources management.
- ***Lack of working capital****:* working capital is the difference between current assets and current liabilities. For nascent enterprises, it is common that there are no current assets other than the entrepreneur's savings, triggering critical episodes to raise the needed financial resources.
- ***Regulation issues****:* compliance costs, registration costs and managing the length of regulatory procedures that impact on the sovereignty of the business. Regulatory agents may be governmental or sector-specific institutions that set up standards, rules and sanctions on economic activities.
- ***Other triggers****:* this category clusters a few other triggers not covered by the above categories, i.e., one case of gender prejudice.

The distribution of these CLEs is presented in Table 2. The 207 episodes are distributed, on average, in 3,3 different types of CLEs per start-up. The frequencies are ordered by descendent values of the first two columns. The most common episode, reported by 82 per cent of the start-ups, is entry and survival in the market. When multiple occurrences are counted, in the last two columns of Table 2, this category accounts for 35 per cent of all CLEs.

Table 2
Distribution of CLEs in 10 categories of triggers

Types of triggers	Cases		Occurrences	
	N	%	N	%
Entry and survival in the market	35	24,65	73	35,27
Entrepreneurial specific triggers	29	20,42	43	20,77
Other triggers	15	10,56	18	8,70
Labour force issues	13	9,15	17	8,21
Lack of working capital	10	7,04	10	4,83
Access to and relationship with suppliers	9	6,34	10	4,83
Access to investment capital	10	7,04	14	6,76
Joint venture breakdowns	8	5,63	8	3,86
Regulation issues	8	5,63	9	4,35
Access to technology	5	3,52	5	2,42
Total	142	100,00	207	100,00

Note: The first two columns of values consider one occurrence of each episode per start-up. The other two count multiple occurrences

These categories were further clustered into five broader categories:

- Entry and survival in the market: defined as above.
- Production-related issues: cluster of access and relationship with suppliers, access to technology, access to investment capital, labour force issues, and regulation issues.
- Entrepreneur-specific issues: defined as above.
- Managerial issues: cluster of joint venture breakdowns, lack of working capital and some episodes from 'others' that reflected managerial issues.
- Others: the rest of the episodes in 'others'.

This higher level clustering reflects the key functions of a business: production, management, market relations, and entrepreneur-specific issues. These categories are similar to those recognized in SEBRAE (2007) as being the most important for the survival of business start-ups.

This more parsimonious clustering facilitated comparisons between CLEs and the investigation of firms' pathways. Table 3 shows the distribution of episodes in these five categories, counting re-occurrences. Entry and survival in the market continues to be the most frequent trigger, followed by production-related issues, entrepreneur-specific issues and managerial issues. The percentage of other triggers is marginal.

Table 3
Distribution of CLEs in five categories of triggers

Types	n	%
Entry and survival in the market	73	35,27
Production issues	55	26,57
Entrepreneur-specific issues	43	20,77
Managerial issues	26	12, 56
Others	10	4,83
Total	207	100,00

A detailed codification of all these CLEs, their constituent elements, the characteristics of business incubators, start-ups, and entrepreneurs composed a SPSS (2007) database to input quantitative analyses. The next section illustrates one example of each category of CLE.

3.5 The theory in practice: examples of CLEs

This section shows how each CLE was organized. These episodes follow the pathway of Firm30, a start-up in the information and communication sector. This example demonstrates that CLEs are often intertwined. In fact, only a few CLEs were reported as independent. The conceptual elements are indicated in the first column of Boxes 1-4 and the corresponding empirical content is in the second column.

Box 1
Entrepreneur-specific issues

Seq01	Duration: 2006-2008, *focus on the core product*
Topic of the episode	Development of managerial competences
Trigger and initial actor	All associates in the area of IT; need of managerial competences. Actors: associates, start-up.
Resource use	Access to managerial knowledge
Learning strategies	Courses and seminars on managerial competences (costs, finance, marketing, human resources management, etc.); consultancies (marketing and finance); and trimestral monitoring (business incubator indicators).
	Interpersonal/Inter-organizational help seeking + Practical application + Intrinsic reflection + Extrinsic reflection.
Learning contents	Development of meaning and method.
Learning outcomes	*Interpretation:* One associate did a master programme in production and management of projects, and the other in knowledge management.
	Network: Introductions to potential buyers by the business incubator; formal and informal exchanges with other incubatees, and partnerships in projects.
	Practices: Techniques of knowledge management to cope with the loss of knowledge because of high turnover of employees and interns.
Routine	Technological strategies to make tacit knowledge explicit (i.e., CRN, Twik)
Source of resources	Business incubator, courses, seminars, incubator consultants, university master courses, other incubatees

Box 2
Entry and survival in the market

Seq02	2006, *focus on the core product*
Topic of the episode	First sales
Link in the sequence	CLE complementary to Seq01, since it coincides with the development of managerial competences.
Trigger and initial actor	Two very big sales right from the start. Actors: buyers, start-up.
Resource use	Creation of production conditions to cope with big sales
Learning strategies	Hiring workers, full dedication of the associates to programming to cope with delays; (later) half of the associates dedicated to revising the business model. Interpersonal/Inter-organizational help seeking + Practical application + Extrinsic reflection.
Learning contents	Development of meaning and method.
Learning outcomes	*Interpretation:* "[W]e saw that the project was much bigger than we had foreseen. We had taken much too big a step and the value was too low for the size of it." (§029). Then half of the team stopped programming to develop an alternative strategy.
	Network: Loss of one buyer; trust-based relationship with the other.
	Practices: Income enough to cover expenses; modules delivered every 6 months; creation of a web portal for buyers to manage their own content.
Routine	(end of 2006) Modularization of the system; easier sales and less workload with the web portal; partnerships for product development
Source of resources	Buyers, associates

Box 3
Production-related issues

Seq03	Since 2006 (in progress), *focus on the core product*
Topic of the episode	Workers' training and turnover
Link in the sequence	CLE complementary to Seq01 and Seq02 for the establishment of the first managerial routines and the need of skilled labour.
Trigger and initial actor	Lack of skilled labour and high turnover of trained workers. Actors: workers, big companies. CLE initially classified as Labour issues.
Resource use	Loss of resources due to losing trained workers to big companies
Learning strategies	Training of undergraduate students to become skilled programmers. Interpersonal/Inter-organizational help seeking + Extrinsic reflection.
Learning contents	Development of method.
Learning outcomes	*Interpretation:* Time-consuming training of workers was actually favouring big companies (turnover); creation of a career plan to retain the best workers.
	Practices: Development of their own "corporate university" with web courses in modules with training, testing, grading and gradual advance in competence level.
Routine	Reduced workload on training through the web training system followed by on-the-job training and effective work in gradual degrees of difficulty; high number of interns to cope with estimated turnover.
Source of resources	Workers, big companies, the training system developed by them, entrepreneurs

Box 4
Managerial issues

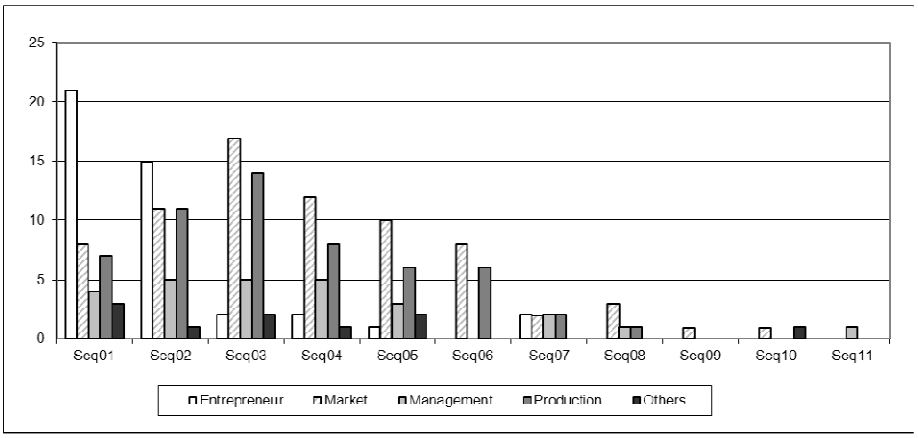
Seq04	2006, *focus on the core product*
Topic of the episode	Joint venture maintenance.
Link in the sequence	CLE caused by Seq02, the consumption of the entrepreneurs' time in developing the first product.
Trigger and initial actor	No income for the entrepreneurs until the end of 2006 and difficulties in keeping the joint venture. Actors: associates. CLE initially classified as Lack of working capital
Resource use	Creation of internal organization to generate income
Learning strategies	Management of each situation to maintain the team of associates; financial inputs by one associate who worked at a multinational for a while. Interpersonal/Inter-organizational help-seeking + Practical application + Extrinsic reflection.
Learning contents	Development of commitment and method.
Learning outcomes	*Interpretation:* Revision of sales goals to increase the entrepreneurs' income and keep them exclusively dedicated to the start-up.
	Practices: Maintenance of the structure of five associates.
Routine	Clear administrative structure focused on results to generate income; (in 2008) stable income for all associates.
Source of resources	Associates, high potential employee in the marketing area

4 Quantitative results

Descriptive statistical analyses examined the distribution patterns of the 207 CLEs. Figure 2 shows that episodes triggered by entrepreneur-specific issues predominate in the first two sequences (Seq01 and Seq02), after which this frequency drops considerably. Then, after sequence 2, market and production issues gain importance, until sequence 6 (Seq06). Episodes triggered by the need to entering and surviving in the market become the most frequent from sequence 3 and are quite steady across all sequences. Most of the episodes (85 per cent) occur between until sequence 5.

Next, the distribution of learning strategies across these CLEs is examined. These strategies indicate what types of resources entrepreneurs search for when they need to cope with a CLE. Figure 3 highlights the most frequently used strategies: intrinsic reflection, extrinsic reflection, interpersonal/inter-organizational help seeking, and practical application. There are significant differences in relation to intrinsic reflection (X^2 (4, n=207) = 14,58, p< 0,01), extrinsic reflection (X^2 (4, n=207) = 38,67, p<0,01), and practical application (X^2 (4, n=207) = 36,22, p<0,01). The interpretation of these results focusses on patterns of combinations of strategies.

Figure 2
Distribution of CLEs per type and sequence of occurrence

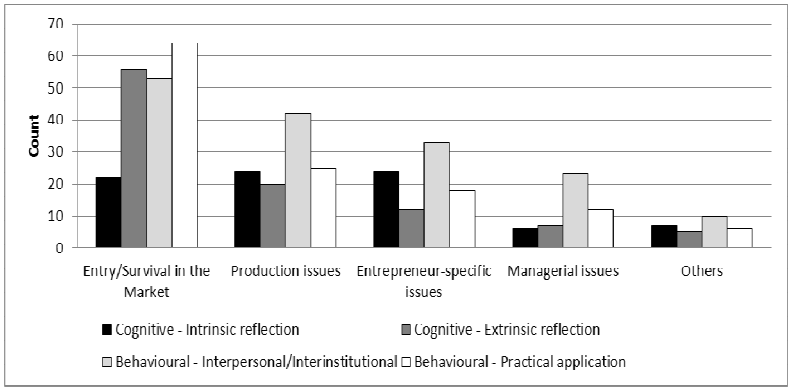


The most common pattern is observed in the categories Production issues, Entrepreneur-specific and Others. This pattern is characterized by networking with resourceful actors, followed by intrinsic reflection and practical application. This result suggests that information is gathered from other actors and processed by the entrepreneur both cognitively and in practical activities to achieve solutions to these triggers.

Another pattern is observed in the category Entry and survival in the market. Here, the most common strategy is practical application of new

knowledge to the current routines, followed by extrinsic reflection and interpersonal or inter-organizational help-seeking. Therefore, this type of CLE seems to be resolved through learning by doing. It includes the deployment of internal resources, combined with reflections on the interaction between these internal activities and information from the outer environment (i.e., with competitors).

Figure 3
Distribution of the most common learning strategies per type of CLE



A third pattern appears in management-related triggers, which are sorted out mainly through interpersonal and inter-organizational exchanges, mostly with incubators' consultants and other incubatees. This result provides a dynamic social and episode-driven perspective to the acquisition of managerial competences, since the content of these episodes relates to joint venture breakdowns and lack of working capital. This perspective can be complementary to traditional views on the acquisition of managerial knowledge, which tend to look at the acquisition of general managerial competences.

Other distributions of critical learning episodes considered firm, institutional, social and entrepreneurial characteristics, such as R&D-intensity, region, initial financial resources, type of entrepreneur, and type of business incubator. Statistical tests showed differences in the number of CLEs only by type of entrepreneur, with opportunity-driven entrepreneurs experiencing a significantly higher number of CLEs ($t(4, n=207)=2{,}17$, $p<0{,}05$).

Another interesting result shows that experienced entrepreneurs report few CLEs triggered by managerial issues or entrepreneur-specific issues ($t(4, n=207)=9{,}70$, $p<0{,}05$). This result suggests that previous managerial and general entrepreneurial knowledge are an asset when starting a new business. This previous knowledge brings in resources that are useful when dealing with episodes that would otherwise be perceived as critical. Moreover, none of their previous experiences were in the same type of business, which explains their reporting of CLEs triggered by production and market issues.

This section dealt with CLEs as discrete events. However, these episodes can only configure theoretical building blocks to explain the evolution of business start-ups if they are systematically related. The methodology to investigate these relationships is presented next.

5 CLEs and the evolution of business start-ups

The driving question of this section is '*Would there be grouping patterns in the learning-based pathways of these start-ups?*' The methodological steps taken to answer it were:

- Analyses based on the sequence of types of CLEs in each firm's pathway: relationships between CLEs and characteristics of the entrepreneurs, the start-ups, and the market;
- Correlational analysis: correlations between variables that could be associated with types of CLEs, their duration and diversity. If the number of observations had allowed it, this would have been a first step to investigate predictors of types of CLEs and to explain their duration and diversity;
- Analysis based on the resource-base (linking factor): this more complex method considered the resource-base tackled in the episode. Resource-base is the arrangement of interconnected resources that provides an array of specific services to the firm and shapes the firm's interaction with the environment. The resource-base of a firm can be dedicated to the core product or service (i.e., development of medicines), or to secondary products or services (i.e., consultancy in biotechnology).

  The main results of each of these methodological steps are presented next.

5.1 Results of the sequential analysis

The sequential analysis showed that entrepreneur-specific issues are the most common trigger initiating individual firms' pathways, which were followed by CLEs of production or, otherwise, market. Arrangements in these sequences resulted in a first clustering of cases, as follows:

- Pathway A: ENTREPRENEUR–PRODUCTION–MARKET;
- Pathway B: MARKET–PRODUCTION–ENTREPRENEUR;
- Pathway C: ENTREPRENEUR–MARKET–PRODUCTION–MARKET;
- Pathway D: ENTREPRENEUR–MARKET–ENTREPRENEUR.

It is noteworthy that CLEs triggered by managerial issues do not appear in this first categorization. This is because management-related episodes do not show a pattern within sequences of CLEs, challenging widespread assumptions about the leading role of managerial issues (e.g., Nichter and Goldmark, 2005; Praag, 1999; SEBRAE, 2007). One possible explanation is that the low

frequency of this type of CLE does not allow for the identification of patterns. Another is that the low frequency of managerial competences indicates their relevance as resources to deal with CLEs rather than as triggers.

This clustering was analysed in light of characteristics of the start-up and the entrepreneur associated to firm performance and change (e.g., Michor et al., 2010). Characteristics of the start-up are type of industrial activity (manufacturing, information and communication, and professional, scientific and technical activities) (United Nations, 2008), type of market (capital goods, intermediate goods, consumption goods, business services, and final consumer services) (EC, IMF, OECD, UN, World Bank, 2009), status of the start-up (incubated and graduated), region (São Paulo and Minas Gerais), and time in operation (up to 2 years; 2,1 to 3 years; 3,1 to 4 years; 4,1 to 5 years; 5,1 to 6 years; and over 6 years). Characteristics of the entrepreneur are the professional background (no work experience, experience in the same field as the business, experience in a different field, and academic career), educational background (secondary education, tertiary education, master degree, and PhD degree), entrepreneurial experience (non-experienced and experienced).

Despite some interesting insights, the empirical test of this classification did not show significant results. Only few actual cases fitted into the firm and entrepreneurial attributes of Pathways A-D. Therefore, this was a weak strategy to find empirical patterns. It also indicated that typical pathways were neither sector-specific nor driven by only one main variable. Consequently, combinations of variables across time were investigated.

5.2 Results of the correlational analysis

This strategy embedded the concept of pathways in temporal dynamics for adding process variables to those static ones described in the previous section. These variables are: learning strategies (cognitive, behavioural and self-regulatory, and their sub-categories), initial networks (with family experts, friends, support institutions, research centres, etc.), structural factors (established market, new market, and others), temporal factors (duration of the episode, year of the start-up when the episode started, length of the sequence of CLEs), and type of resource dynamic in the trigger (acquisition, under-utilization, creation, and loss). These variables were gradually inserted in the analysis, in successive rounds.

This method resulted in interesting associations between variables of the learning process and these factors. For instance, it showed that entry and survival in the market is associated with a higher complexity of factors in comparison to the other types of CLEs. It correlates positively ($r>0,30$) with combinations of several learning strategies, CLEs started in later stages of the pathway, the need to survive in the market, and loss of resources. Production-related issues correlate positively only with start-ups that could count on initial sources of resources. Entrepreneur-specific issues correlate with the learning strategy of intrinsic reflection, access to resources, development of new meanings and methods, and with entering a new market. This set of correlations confirms the description of this type of CLE as acquisition of

knowledge about specific parts and routines that are linked to innovative products. Finally, CLEs triggered by managerial issues correlate positively with learning outcomes for the development of new interpretations, indicating the formation of new resources at the cognitive level, possibly about the firm functioning.

These results, based on an assumption of linearity given by the sequence of triggers, failed to disclose patterns across cases, being of little help to describe evolutionary dynamics. Thus, links between CLEs had to be searched inside the complex dynamics of resources within and between CLEs. This strategy is described next.

5.3 Results of the resource-base as the linking factor between CLEs

This analysis was delimited by the chronological position of CLEs and their duration. Grounded theory principles of conceptual ordering oriented the ordering of data in steps (Strauss and Corbin, 1998). The ordering factor was the relationships between CLEs, given by the narratives. This re-analysis of the narratives aimed at identifying categories (resources) linking different CLEs to explain the relationships between these episodes, their properties and dimensions. This higher level of abstract conceptual analysis advances the deduction-driven identification of CLEs following the conceptual framework. Here, the inductive emergence of categories and properties becomes more relevant.

The new set of tentative aggregating categories included: relationships between CLEs (cause, complementarity, independence), business start-up's guiding principles, entrepreneurial formation and attitude, entrepreneurial experience and experience in the field, scope of the target market, value chain insertion, use of resources, sources of resources, initial and 'current' networks, sector specific issues, growth perspective, and degree of innovation.

None of these variables seemed to differentiate groups of start-ups, but, from this systematic investigation, another category emerged: the raison d'être of the business. The 'raison d'être' corresponds to the product or service the business aimed at when it started. It was observed that the use of resources was, at times, directed to the needs of this core product or service, pointing out that the initial idea continued to be central. However, at times, the use of resources was directed to secondary activities which were developed to secure the survival of the business, but which affected the development of the core product or service in different ways.

To investigate this, each CLE was attributed a code to reflect the dynamics between core and secondary product or service:

- Secondary product that complements the core;
- Secondary product developed independently from the core;
- Secondary product that competes with the core in the use of resources.

Within the core product group, there were two sub-groups: one of start-ups immediately entering the market, and another of those that would take much longer or never engage in market relations. As a result, business start-ups could be aggregated in five pathways that reflect these sets of resource-bases arrangements.

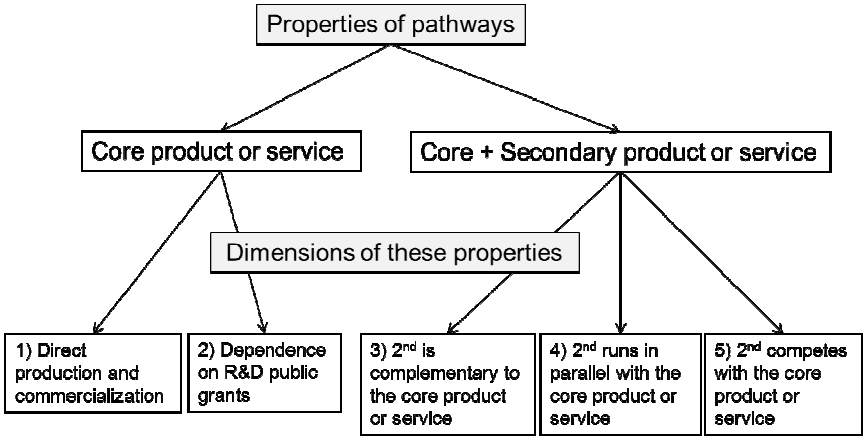
The final step was identifying the emergent properties of these five dimensions. This resulted in two main properties of these pathways: full dedication of the resource-base to the core product or service (65 per cent of the cases), and shared dedication of the resource-base to a combination of core and secondary products or services (35 per cent of the cases). It is noteworthy that these properties were not obvious at the beginning, especially because the property of exclusive dedication to the core product or service would, counter-intuitively, aggregate low and high R&D-intensive firms. The resulting structure of pathways is shown in Figure 4.

5.4 Pathways

This section demonstrates how this methodology resulted in a coherent framework that might support further studies about the evolution of business start-ups. It summarizes key characteristics of each pathway, and leaves out details of their internal dynamics.

- ***Pathway 1 -*** Direct ***production of the core product or service***: this is a linear model of start-up development and aggregates 53 per cent of the cases. Most of the business start-ups included here develop low R&D-intensive products or services (n=20). The two key variables to facilitate this evolutionary path are the possession of technology for production and the embeddedness in specific market and institutional networks.
- ***Pathway 2 – Dependence*** **on** ***investment capital to develop the core product, without secondary products*****:** this pathway is the only formed exclusively by high R&D-intensive start-ups (14% of cases), which fully depend on investment capital, mainly public R&D grants, to develop highly technological products. Firms in Pathway 2 have the most homogeneous and less changing networks, formed mostly by universities and research institutes.
- ***Pathway 3 – Secondary product as means to enter the market while the core is developed***: the resource-base of the secondary product or service is similar to the core one (i.e., type of technology, production inputs etc.), so that entering the market with this secondary product corresponds with establishing business networks with those who will be the suppliers, buyers, etc. of the core product too. This is an interesting strategy for quicker income generation and network building that paves the way to the core product. The move towards a secondary product is driven by three factors: the need to use up working and investment capital, business opportunity, and guidance by business incubator consultants about alternative strategies. Fourteen per cent of the cases are in this pathway.

Figure 4
Structure of pathways

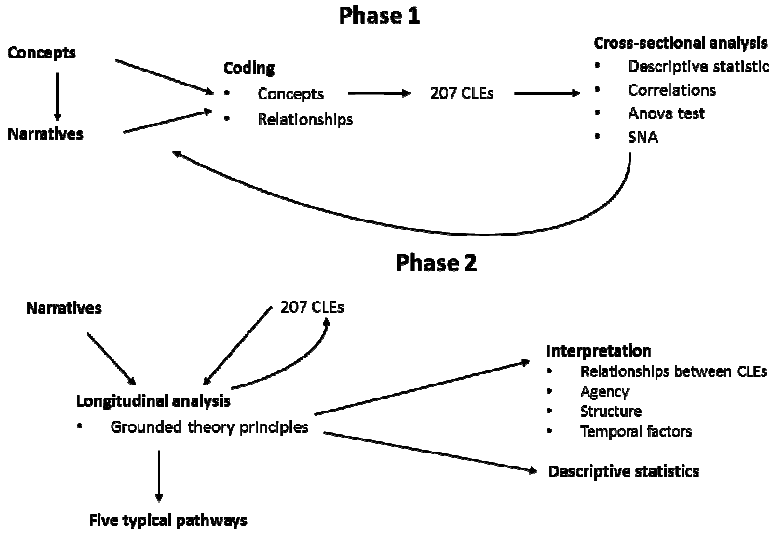


- ***Pathway 4 – Independent or complementary products or services that become spin-offs with parallel administrative structures***: core and spin-off businesses have distinct resource-bases, running parallel structures that create a situation of relative independence between businesses, almost as if there were two core products or services (14% of the cases). These parallel administrative structures are based on partnerships with other enterprises or on the internal reorganization of tasks between associates. These spin-offs stem from the identification of a business opportunity beyond the scope of the first business, or to the need of generating working capital while the core product is developed. It is noteworthy that the secondary product is not meant to be discontinued once the core is introduced in the market.
- ***Pathway 5 – Secondary product becomes the core business or competes with its development***: the resource-base of the secondary product or service is so different to the core that the former becomes the core, or competes with its development (7% of the cases). This pathway is characterized by paralleled efforts to develop two incompatible resource-bases, at the expense of the most value-adding product or service.

6 On mixed methods and theory building

It is common in mixed methods studies that the research is fractioned in quantitative and qualitative parts which have little connection between them. Here, instead, the iterative process of one method systematically inputting the other proved to be a useful research strategy to investigate complex phenomena such as the evolution of business start-ups (Figure 5).

Figure 5
Diagram of the mixed methods



The use of retrospective interviews successfully served the purpose of collecting process data through entrepreneurs' narratives of critical events in the start-ups' storyline. These interviews placed the key agents (entrepreneurs) at the centre of processes of routine formation and change (Feldman, 2000). The coverage of the start-ups' first three to five years provided enough data for quantification and some statistical clustering of results. Therefore, there was rich material to combine deductive and inductive strategies (e.g., Creswell, 2009).

This methodological design was challenging but efficacious to answer questions that appeared along the way. It developed and tested a methodology to describe context-dependent processes of change in organizations (e.g., Glick et al., 1990), specifically in relation to the measurement of learning outcomes at the organizational level (Moraes and Borges-Andrade, 2010; Siqueira, 2002). Furthermore, it contributed to building organizational theory by linking three main units of analysis: individual learning, critical learning episodes, and firms' pathways.

The analytical framework defined the key concepts and provided the deductive input to conceptualize evolutionary processes of business start-ups. At that stage, the concept, properties and dynamics of critical learning episodes were empirically unknown, and the idea of pathways was not yet a concept. Anchoring the entrepreneurs' narratives in theoretical landmarks provided the boundaries within which to investigate learning episodes and their impacts on organizational routines. Successive analysis of the interviews revealed types and properties of CLEs, which led to refinements of the original conceptual framework.

In addition to this, variations in CLEs provided inputs to descriptive quantitative analyses, and disclosed relevant relationships between variables. These quantitative results, in turn, generated further questions that were investigated through a qualitative examination of relationships between those episodes. As a result of this inductive approach, the concept of typical pathways emerged. Therefore, this methodological path supported the investigation of "questions about what the causes or consequences are of the events within the process pattern" (Ven and Huber, 1990: 214).

Results also produced innovative findings by clustering, for instance, high with low R&D-intensive start-ups in Pathway 1. This challenges widespread perspectives that 'box' firms according to type of industrial activity or economic sector. It shows that the context and dynamics of business start-ups matter to explain alternative evolutionary paths.

7 Conclusion

This paper described the methodology developed to investigate how critical learning episodes can explain evolutionary processes of business start-ups. This methodology, based on an iterative process of qualitative and quantitative research techniques, demonstrated that mixed methods are a useful research strategy to develop the building blocks of a theory that combines markets, institutions, and entrepreneurial learning in the study of start-ups. This represents one step ahead in understanding the functioning of these firms, which are claimed to be crucial for local economic development (Helmsing, 2010; Naudé, 2008; Mead and Liedholm, 1998).

It is noteworthy that the elaboration of such theory is beyond the scope of this study. The aim here was to describe a methodological path that might support further theorization. For instance, the use of grounded theory to guide the elaboration of theoretical questions about process, variation and connections between concepts, combined with the quantitative results, helped tackling the difficulties of studying process data in organizations, as pointed out by Langley (1999):

First, [process data in organizations] deal mainly with sequences of 'events': conceptual entities that researchers are less familiar with. Second, they often involve multiple levels and units of analysis whose boundaries are ambiguous. Third, their temporal embeddedness often varies in terms of precision, duration, and relevance. Finally, despite the primary focus on events, process data tend to be eclectic, drawing in phenomena such as changing relationships, thoughts, feelings, and interpretations (691-2).

This study also corroborates the use of narratives in process studies (Langley, 1999) and the relevance of investigating multiple cases to develop organizational theory (Eisenhardt and Graebner, 2007). This particular methodological trajectory was suitable to the exploratory nature of this study, for which little methodological benchmarking could be found.

A research agenda could include typical longitudinal designs, with data collection at different points in time. Such design would allow testing the

arguments elaborated here by a) including more complex resource-bases and configurations of organizational routines; b) including firms of increasingly larger scopes; and c) examining the impacts of these dynamics on the financial performance of these start-ups.

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