Exploration Patterns in Fast Growing Entrepreneurial Firms: A Multiple Case Study in the Internet Technology Industry

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Introduction

Based on the seminal paper of March (1991), numerous scholars (e.g. Ahuja & Lampert, 2001; Elfring & Hulsink, 2003; Tushman & Anderson, 1986) emphasize that realizing technological change requires exploration or activities such as creative search, experimentation, improvisation, and technology probing. At the same time, it has been emphasized that exploration of new technological capabilities is a fragile and time-consuming process that triggers organizational tensions and costs. Academic research on exploration (e.g. Belderbos et al., 2010; Jansen et al., 2006; O'Reilly & Tushman, 2004; Uotila et al., 2009) has therefore substantially increased during the past decade, providing valuable insights into the organizational challenges and performance implications of exploration. At the same time, it needs to be noticed that this research stream is dominated by *cross-sectional* studies which typically focus on how *large established* firms can stimulate exploration within and outside their organizational boundaries.

In this paper, we want to complement previous research on exploration in two important ways. First, we conduct a more *dynamic* analysis, examining how the exploration of new capabilities evolves over time. Second, we focus our research on exploration in gazelle firms, which are defined as *fast growing entrepreneurial* firms (Birch, 1979; Sims & O'Regan, 2006; Van Praag & Versloot, 2008). We choose this particular setting because different scholars seem to provide contradictory predictions regarding the evolution of explorative activities within this particular type of firm. Some scholars suggest that, within fast-growing firms, success traps are likely to emerge, causing exploitation to drive out exploration (Levinthal & March, 1993; Leonard Barton, 1995; Beckman, 2006). Other scholars (Nohria & Gulati, 1996; Damanpour 1992), however, provide indications that fast growth allows for organizational slack, which in-turn stimulates exploration. In sum, whereas some argue that the intensity of exploration is likely to gradually decrease in gazelle firms, others propose an increasing intensity of explorative activity in such fast-growing firms.

The purpose of this paper is therefore to explore how the intensity of exploration within gazelle firms evolves over time. In order to do so, we conduct a multiple case study of five fast growing organizations in the ICT sector. Our findings enrich our understanding of innovation within fast growing firms in several ways. Based on our data, we identify different kinds of exploration patterns that can emerge within fast-growing entrepreneurial firms. In addition, we link these different exploration patterns to different kinds of organizational structures. In particular, we identify structural ambidexterity and collaborative strategies as important facilitators of exploration in fast growing firms. Together, our findings help managers of entrepreneurial firms to optimize their ability to explore new capabilities in order to initiate or respond to technological change.

Theoretical background

Gazelle firms or fast growing entrepreneurial firms have been recognized as crucial for achieving economic and job growth within regions and nations (Birch, 1979; Sims & O'Regan, 2006; Van Praag & Versloot, 2008). At the same time, it is recognized that, in order to achieve long term survival, such fast-growing new firms do not only have to exploit their existing capabilities, but also need to explore new ones (Danneels 2002; Sims & O'Regan, 2006; Eisenhardt & Martin, 2000; Audretsch, 1995). Examining the existing entrepreneurship and innovation literature, different scholars seem to provide contradictory predictions regarding the evolution of explorative activities within gazelle firms. Below, we discuss these alternative perspectives.

Exploration and learning traps

According to Levinthal and March (1993) exploitation can drive out exploration. When management has to choose whether to allocate scarce resources to exploitation or exploration, exploitation has a better outlook. It has relatively certain returns and enables a quick learning cycle, whereas the results of exploration take longer, are uncertain, and often prove ambiguous (March, 1991). Moreover, the choice to focus on exploitation is self-reinforcing. Successful exploitation normally leads to more exploitation. Subsequent adaptive learning cycles gradually refine the organizational knowledge system, comprising technical capabilities, supporting managerial systems, and norms and values, developing core capabilities and strengthening a company's current competitive position (Leonard-Barton, 1995). Success traps occur when all organizational learning is focused on refining the current capabilities – the basis of current success – and investment in really new capabilities, which may prove crucial for long term success, is lacking.

Success traps occur in established firms, when core capabilities develop into core rigidities (Leonard-Barton, 1995), but also in fast growing entrepreneurial firms. Growth is the result of the successful exploitation of a new enterprise's capabilities (Beckman, 2006) and to continue growing, further exploitation is required. Especially in case of fast growth, adaptation to increasing numbers of customers and employees is a huge managerial challenge, requiring rapid learning cycles (Visscher & De Weerd-Nederhof, 2006). As a result, organizational growth leads to an increase in managerial complexities, which are typically solved by introducing more structure, routinization, standardization, and functional specialization (Greiner, 1972; Miller & Friesen, 1984), characteristics which are said to hamper exploration (Miles & Snow, 1978; Benner & Tushman, 2003). In summary, one can expect - on the basis of this literature – that fast growth leads to a decline in exploration.

Exploration and slack resources

Other scholars, in contrast, expect an increase in exploration in growing entrepreneurial firms. Entrepreneurial success does not only lead to growth, but also to a accumulation of slack, i.e. resources that are in excess of the minimum necessary to produce a certain level of output (Nohria & Gulati, 1996). The existence of slack is necessary for exploration, as it provides the resources for experimentation and creates a buffer to cope with the uncertain and possibly disappointing results of explorative efforts (Damanpour, 1992). Besides, it allows entrepreneurs to take their mind of day-to-day survival and to consider long-term development of their firm (Nohria & Gulati, 1996). They can then choose to build an organization that balances their short-term and long-term interests (Miles & Snow, 1978; March, 1991).

More slack does not always lead to more exploration, as it may also diminish the incentives to innovate. Scholars therefore proposed, and tested, a curvilinear relation between slack and innovation (Nohria & Gulati, 1996; Danneels, 2008). Too little slack is bad for exploration, just as too much slack. However, entrepreneurial firms, who are just starting to build up some slack, do not yet run the risk of excessive luxury in resources. This implies that an increase in slack resources should foster exploration in growing entrepreneurial firms.

Methodology

Research design and setting

The goal of this empirical study is to build theory on the evolution of explorative activities at gazelle firms. We conducted multiple case studies as such research design allowed us to (i) investigate exploration patterns in practice (Van de Ven, 2007); (ii) observe how a contemporary set of events over which we have little or no control evolves across different entities (Yin 1984); and (iii) mobilize multiple, non-idiosyncratic observations on complex processes (Eisenhardt and Graebner 2007).. We focused on one industry, internet technology, to minimize the risks of extraneous variations (Eisenhardt, 1989). In the internet industry, many gazelles can be found (Delmar et al, 2003; MacCormack et al, 2001). In addition, because of the high pace of technological developments, exploration is assumed to be of major importance for firms in this industry.

To select gazelle firms, we relied on Deloitte's Technology Fast 50. This is a list of the 50 technology firms with the highest growth rates in the Netherlands, measured on the operating revenues during a five year period (in our case 2002–2006). From the 50 listed organizations, a selection of internet technology firms was made, which resulted in a selection of 30 organizations. Of the 30 organizations that were contacted, 5 finally agreed to participate[1]. Table 1 gives an overview of the participating organizations

Table 1: Overview of cases

Company	Business	Founding year	Number of employees in 2007
'Hotels'	Hotel bookings	2001	37
'Consult'	IT-infrastructure consulting	2002	120
'Dialogue'	Dialogue marketing	1997	47
'AFFIL'	Affiliate marketing	1999	35
'CMS'	Content management systems	1999	35

Data collection

To get detailed information on the evolution of the intensity of exploration and the organization of exploration, semi-structured face-to-face interviews were held with senior managers, in particular the CEO and the CTO or R&D manager of the participating companies. The CEO holds the primary responsibility for setting strategic directions and structures in the organization (Gioia & Chittipeddi, 1991). The CTO or R&D manager is involved with the day to day processes and activities related to product development in general and exploration in particular. In relatively young and small organizations, CEO's and CTO's are often the founders of the organization, or at least they have been present from the beginning. Therefore, these respondents can give a good insight into the evolution of the development of the organizations since their founding.

All interviews were conducted in 2009. A funnel model was used to conduct the interviews, starting from an overall picture of exploration and organizational development, and subsequently focusing on questions related to the internal and external organization of exploration (cf. McCutcheon & Meredith, 1993; Voss et al, 2002). Furthermore, information was obtained from organization websites and in brochures, news communities and industry related magazines, to complement and check the interview data.

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[1] There were several reasons for non-response, including a lack of time of the intended interviewees (14 companies), unwillingness to participate in a study in which potential competitors were involved (3 companies).

Data analysis
The interviews were transcribed, and for each case, a report was made that was sent to the respondents for verification. The data were subsequently coded using a software program (NVivo 8). The descriptive codes were derived from the theoretical framework, as presented above. Further analysis was done by going back-and-forth between the data and the coding framework (Glaser & Strauss, 1967), resulting in four pattern codes (Miles & Huberman, 1994) for the evolution of exploration: 'stable exploration', 'punctuated equilibrium', 'recovery', and 'non-recovery'. With these categories, the cases were recoded and the different ways of organizing exploration internally and externally were categorized accordingly. The final step in our analysis was the identification of the relation between different ways of organizing and the different evolution patterns, and the attempt to explain the differences found in the data by confronting them with relevant literature.

Results
In this section, we discuss the observed similarities and differences between the different cases in terms of the evolution of their explorative activities. We start with a discussion of the evolution of exploration at the initial growth stages, when firms were confronted for the first time with significant growth pressure. Subsequently, we assess to what extent the firms, which experienced a substantial decline in exploration during the initial stages, managed to recover their exploration activities during later stages of the growth trajectory. In particular, we describe how, in two of the four cases, companies managed to recover their exploration activities. However, we also point to substantial differences between these two companies in 1) the exploration recovery pattern and 2) the means by which they achieve this recovery.

Evolution of exploration at the initial stages of the growth trajectory
In four cases (i.e. Hotel, CMS, Consult, AFFIL), we observed that, when the first product or service was launched onto the market, focus of the activities within the company quickly shifted from initial exploration of the product/service to exploitative activities such as refining, standardizing, upscaling and fine-tuning. The following statements are illustrative in this respect:

> *'We were focused on processing the demands of customers and managing bookings. [From a technical perspective], we were only fixing bugs and solving day-to-day issues. On the technological front, we started running behind.' (Hotel interviewee)*

> *'Instead of doing new things, we were focusing on what we already did. Exploration accounted for 10 to 15 % of our time and this was even exploration in details. The business model was no longer questioned.' (AFFIL interviewee)*

> *'Innovation had become a marginal activity.' (Consult interviewee)*

To explain this decline in explorative activities during the initial stages of the growth trajectory, respondents emphasized that they first 'needed to make money [and] reach a state of maturity' (AFFIL interviewee) with their initial product/service before they could start exploring alternative possibilities. In addition, it was stressed that they needed to use all their available resources for the successful commercialization of this product/service, leaving limited time and manpower for explorative activities:

> *'The fact that we could not innovate as much as we wanted was caused by a lack of resources... At the start, we only had one driver: Making billable hours at our customers.' (Consult interviewee)*

In sum, respondents mainly referred to financial and human resource constraints to explain the initial decrease in exploration activities. In one case (i.e. Dialogue Company), however, we observed that, despite the fact that first services were launched into the market,

the company continued exploring. In particular, they continued searching for new market opportunities and continued to experiment with new business opportunities:

> *'Growth did not hamper investments in innovation: No, not at all, that would be fundamentally wrong... You shouldn't stay put. As new media organization you have to continuously focus on new developments.' (Dialogue interviewee)*

> *'We were continuously busy with innovation... We were continuously looking what we could do to be more innovative.' (Dialogue interviewee).*

Interviewees pointed to the particular structure of Dialogue as an important facilitator of such explorative activities. Within Dialogue, each employee was encouraged to continuously come up with new business ideas. When Dialogue's management evaluated an idea as commercially feasible, it created a separate organization within Dialogue where a team could further elaborate on the idea and subsequently start exploiting the idea within this separate entity:

> *'When somebody has an idea, he consults the management. If they like the idea, they allocate people and time to it and frame it as a new project... When it becomes a project, it also becomes a new organization within our company.' (Dialogue interviewee)*

> *'Every new idea gets separated... New projects remain independent. There is no integration. If you integrate it in another organization then the profits of that specific organization are hard to track. It has to survive independently.' (Dialogue interviewee)*

In this way, Dialogue as a whole could continuously explore new opportunities, whereas the subsequent exploitation of the ideas was situated in separate organizational structures. This structural strategy resembles the structure that Edison applied in the nineteenth century to manage his Menlo Park. At Menlo Park, Edison, together with a team of engineers, continuously experimented in order to come up with new applications for the telegraph, electric light, railroad, and mining industries. When an experiment looked promising, 'Edison would not hesitate to incorporate a new company and build a team to pursue it' (Hargadon, 2003: 16). As a result, a collection of companies emerged that were dedicated toward exploiting the innovations that came out of the Menlo Park lab.

In contrast to the other cases, Dialogue interviewees did not refer to resource constraints that hampered their ability to explore. Instead they emphasized that the financial revenues that were created within the separate organizations provided sufficient financial resources to continuously fund new explorative initiatives. In addition, it was stressed that, with respect to their explorative activities, Dialogue heavily relied on external resources such as joint ventures with other firms and trainees from (polytechnic) universities:

> *'We heavily rely on external partners for innovation. For instance, we have collaborated with another organization that focuses on payment consultancy. This collaboration resulted in a joint venture.' (Dialogue interviewee)*

> *'We are continuously working with trainees. They have a fresh look on the organization from outside.' (Dialogue interviewee)*

Evolution of exploration at the more mature stages of the growth trajectory
As already mentioned, we observed that, in four cases, a substantial drop in explorative activities during the initial stages of the growth trajectory was observed. As these companies continued to grow, we observed that two firms (i.e. Hotel and CMS) were able to revitalize explorative activities, whereas exploration remained absent in the two other cases (i.e. AFFIL and Consult). At the same time, we observed important differences between the exploration recovery pattern at Hotel and CMS. Below, we discuss these observations in detail.

Recovery of exploration at Hotel and CMS. As both Hotel and CMS entered the more mature stages of their growth trajectory, managers of these companies realized that, if they wanted to keep up with the developments in their sector, they needed to reinvest in exploration. At Hotel, for instance, managers became aware that, because of their previous focus on exploiting their existing service delivery platform, the technological foundation of this platform was no longer up to date. It therefore was decided to make 'a big step and put a lot of energy in the development of a totally new system.' (Hotel interviewee). This exploration of a new system was not situated within the company itself. Instead, Hotel's management decided to outsource these exploration activities to a team of development engineers, which were situated at Peru:

> *'We have grown so fast that we started to experience problems [with the old platform]. We needed to catch up. We therefore created a separate team of 16 people in Peru.' (Hotel interviewee)*

A similar recovery of exploration was observed in the CMS case. Also in this company, managers started realizing the need to make a next big step in the development of their products and services:

> *'We started thinking about the next big step. We wanted to avoid that we are solely focusing on refurbishing or existing products, without making a major contribution. We therefore started looking at what was missing, what our customers would need in the future and in which directions the world was heading.' (CMS interviewee)*

To organize this new stream of explorative activities, CMS decided to create a separate department within their company, in which the responsible people would only focus on explorative activities:

> *'Radical innovation asks for a lot of time and attention. In such circumstances, you can not ask the responsible people to also deliver services to customers. We therefore have created a separate development team. In this way, they are allowed to do a lot of thinking with a high concentration span.' (CMS interviewee)*

In addition, CMS created an open source platform in order to involve external people in their new exploration activities:

> *'Although we have some capacity to experiment [i.e. separate development department], our capacity is not infinite. We do not have 100 people who can only spend time on trying out new stuff. However, as we chose to adopt an open source approach, we can try to make people outside our company enthusiastic and try to involve them in our [explorative] activities.' (CMS interviewee)*

Whereas we identified a recovery of explorative activities in both the Hotel and CMS case, we observed that their exploration patterns diverged over the longer term. In the Hotel case, after a short peak of exploration in order to develop a new technological platform, focus again completely shifted to exploitation of this new system. Hotel respondents argued that, instead of exploring new opportunities, they chose to again focus on their current services:

> *'We want to focus. We know our competencies. You might argue that we could start doing things such as entering the airline and car renting business, but in the short term we have not the intention to do so.' (Hotel interviewee)*

The decision of not initiating new explorative efforts in the short term also resulted in the decision to gradually phase out the development activities at the team in Peru.

In the CMS case, the exploration recovery pattern was of a more stable nature. In the interviews, CMS respondents expressed their objective to create a continuous flow of new

products and services by means of continued investments in the separate development department and the open source platform.

Non-Recovery of exploration at AFFIL and Consult. In the AFFIL and Consult case, we did not observe a recovery of exploration activities. Instead, respondents indicated that, when these companies entered the mature stages of their growth trajectory, they kept on focusing on exploiting their existing products and services:

> *'The purpose is to get better, rather than developing new stuff. If we would try to develop new creative things, a lot of energy would be spent on it. However, we want to focus on optimizing the product and this can not be seen as really innovative.' (AFFIL interviewee)*

> *'We are driven by making turnover. Commercial interests are a dominant force. These short-term focus hampers to make other, more innovative choices.' (Consult)*

To explain their continued focus on exploitation, respondents of AFFIL and Consult referred to the success of their existing products and services. Given this success, investing in more explorative activities was perceived as very risky and financially unfavorable option:

> *'The main reason [of not investing in exploration] is the risk problem. If you make something new, you have a 90% probability of failure. I therefore prefer to put energy in something that is much less risky and that immediately delivers results.' (AFFIL interviewee).*

> *'Investing in innovation is likely to hurt your financial performance. Each employee normally generates 1000 euro each day. If I would give 10 people a week time [to focus on more explorative activities], this would cost me 50.000 Euros.' (Consult interviewee)*

In contrast to the previous cases, AFFIL and Consult also did not possess a separate structure where employees could fully focus on explorative activities. Interviewees of AFFIL provided indications that the absence of such separate structure further complicated their efforts in exploring interesting ideas or opportunities. In particular, they refer to a quite chaotic working environment in which the ability to explore the feasibility of new ideas and opportunities is hampered by the day-to-day obligations:

> *'There are a lot of ideas that have a lot of potential. However, these ideas to not materialize. At the moment, we can't see the wood for the trees.' (AFFIL interviewee)*

Another difference with the other cases is that AFFIL and Consult did not heavily rely on collaboration with external partners. One Consult interviewee, for instance, emphasized that, because of intellectual property issues, they preferred not to include external partners in their development activities:

> *'If you really want to collaborate for innovation, you need to make a lot of efforts in negotiating IP issues. This is time consuming and not practical.' (Consult interviewee)*

In a similar vein, AFFIL interviewees expressed concerns that collaboration with external processes would have a 'too big impact on their internal business processes.'

Discussion
Whereas some studies (Levinthal & March, 1993; Leonard Barton, 1995; Beckman, 2006) suggest that the intensity of exploration is likely to gradually decrease in gazelle firms because of success traps, others (Nohria & Gulati, 1996; Damanpour 1992) seem to propose an increasing intensity of explorative activity in such fast-growing firms because of increasing slack resources. In this study, however, we observe a wide variety of exploration patterns (see Figure 1). In one case (i.e. Dialogue Company), the level of exploration remained quite stable over time, which we define as a 'steady' exploration pattern. In the four

other cases, a substantial drop in explorative activity was observed at the initial growth stage. However, in two cases, companies managed to achieve a recovery in exploration. In the CMS case, this recovery of exploration turned out to be quite permanent. We therefore refer to this exploration pattern as 'stable recovery.' In the Hotel case, the recovery of exploration was only temporary. We therefore define this evolution as 'punctuated recovery.' In the two remaining cases (i.e. AFFIL and Consult), we did not observe a recovery of exploration, which we refer to as a 'non-recovery' exploration pattern.
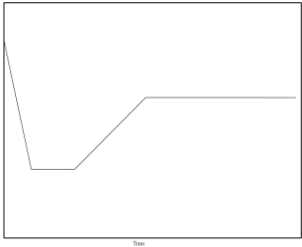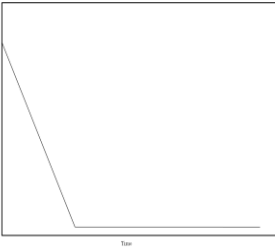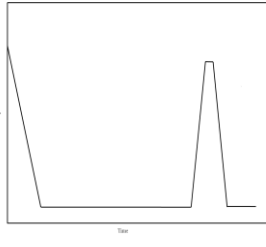
Case(s)	CMS	AFFIL and Consult	Hotel	Dialogue
Exploration Pattern	Stable recovery exploration pattern	Non-Recovery exploration pattern	Punctuated recovery exploration pattern	Steady exploration pattern
Structural ambidexterity	Permanent separate exploration unit	No separate exploration unit	Temporal separate explorative structure	Menlo Park structure
Collaborative structure	Open source platform	No collaborative structure	Outsourcing	Joint Ventures

Figure 1: Identification of different exploration patterns

We also identified two organizational attributes that seem to contribute to the emergence of these different exploration dynamics. The first attribute is the organizational structure of the company. In the innovation literature, numerous scholars (e.g., Benner and Tushman, 2003; Jansen et al., 2006; O'Reilly and Tushman, 2004) point to structural ambidexterity as an effective organizational strategy to address the tension between exploitation and exploration. Structural ambidexterity refers to the separation of exploitative and explorative activities into distinct organizational units (Gibson and Birkinshaw, 2004; Raisch et al., 2009). In this way, each type of activity gets its own organizational space, where it can be managed in its own particular way (Raisch and Birkinshaw, 2008). For instance, O'Reilly and Tushman (2004) emphasize that, whereas a more mechanistic organizational structure can be applied for the exploitation-oriented business units, more organic structures can be implemented in the exploration-oriented business units. In a similar vein, Jansen et al. (2006) provide evidence that exploitative business units perform better with high levels of formalization whereas explorative business units might benefit from low levels of centralization. In our cases, we observed different kinds of structural ambidexterity that were linked to different kinds of exploration patterns. In the Dialogue Company, managers explicitly created separate entities for each new idea with limited integration between them. Such a 'Menlo Park structure' (Hargadon, 2003) allowed for a steady exploration pattern. In the CMS case, we observed that the implementation of a separate department for exploration activities contributed to a stable recovery of exploration activities. In the Hotel case, which was characterized by a punctuated exploration pattern, a much more temporary separate structure was installed for the exploration activities. The cases that were characterized by a

non-recovery exploration pattern (i.e. AFFIL and Consult) did not possess any form of structural ambidexterity.

A second organizational attribute that contributed to the emergence of differences in exploration patterns was the presence of collaborative structures. Relying on an open innovation perspective (Chesbrough, 2003), the benefits of collaborating with external partners for explorative activities have been emphasized. Some scholars (e.g. Faems, Van Looy & Debackere, 2005; Neyens, Faems & Sels, In Press; Rothaermel & Deeds, 2004), for instance, provide evidence that engaging in alliances with universities and research institutes has a positive impact on the development of radically new products. They therefore refer to collaboration with such partners as explorative collaboration. Von Hippel (1988) points to the relevance of collaborating with lead users to generate breakthrough ideas. In a similar vein, Brown (2004) stresses the importance of various collaborative initiatives (i.e. open source initiatives, investing in high-tech startups) to stimulate explorative activity. In line with these previous studies, we observed that, in our cases, companies heavily relied on collaborative structures to continue and/or revitalize exploration. In the Dialogue company, joint ventures were created with external partners to reassemble the necessary resources for new explorative endeavors. In the CMS case, the internal exploration efforts, which were situated in a separate department, were complemented by an open source platform. In the Hotel case, the temporary team, which was responsible for the development of the new technological platform, was not situated within the company, but was outsourced to a development team in Peru. In contrast, in the cases that were characterized by a non-recovery exploration pattern, such collaborative structures remained absent.

Conclusion

In this section we first discuss the main theoretical contributions of our findings. Subsequently, we point to the main managerial implications. In particular, we provide specific guidelines to managers of entrepreneurial firms in general and gazelle firms in specific on how to realize sustainable exploration. Finally, we discuss the main limitations of this study and point to interesting avenues for future research.

Theoretical contributions

Toward a dynamic perspective on exploitation-exploration dichotomy. In the innovation literature, numerous scholars (e.g. Belderbos et al., 2010, He & Wong, 2004; Jansen et al., 2006; Uotila et al., 2009) have provided evidence that firms, which manage to achieve a healthy balance between exploration and exploitation, are likely to outperform organizations that only focus on exploitation or exploration. In addition, scholars (e.g. De Visser et al., 2010, Gibson & Birkinshaw, 2004, O'Reilly & Tushman, 2004) have provided managerial advice on how firms can manage to simultaneously combine exploitation and exploration. However, these studies have remained relatively silent on how the intensity of exploitative and explorative activities within firms evolves over time. In this paper, we assessed how exploration evolves in one specific type of firm (i.e. gazelle firms). Based on a multiple case study of 5 fast growing firms, we conclude that exploration can evolve in a wide variety of patterns, ranging from steady exploration, stable recovery of exploration, punctuated recovery of exploration to non-recovery of exploration. Moreover, we provide first indications that the presence or absence of 1) structural ambidexterity and 2) collaborative strategies has a huge impact on which kind of exploration pattern is likely to manifest itself in gazelle firms. In this way, our study contributes to a more dynamic perspective on the exploitation-exploration research in the context of innovation.

Toward a heterogeneous perspective of gazelle firms. Our research also contributes to the literature on fast-growing firms. Previous research on gazelle firms has mainly focused on the economic implications of gazelle firms (e.g. Birch, 1979; Henrekson & Johansson, 2010) and the characteristics that distinguish gazelle firms from other firms (Sims & O'Regan, 2006). This research stream mainly refers to gazelle firms as a quite homogenous group that can be differentiated from other firm types. The research of Delmar, Davidsson & Gartner (2003) can be seen as an exception in this respect. These scholars made a distinction between

different kinds of high-growth firms by looking at different kinds of growth patterns. Our research complements the research of Delmar et al. (2003) by identifying different kinds of exploration patterns within gazelle firms. Moreover, we observed that these different exploration patterns were linked to different choices with respect to 1) the willingness to invest slack resources in exploration; 2) the structuring of innovation activities within the firm; 3) the degree of collaboration with external partners.

  Evolutionary patterns and organizational configurations. The evolutionary patterns of gazelle firms identified in this study fit with the classic organizational configurations of Miles and Snow (1978). The steady exploration pattern fits the prospector firm, which is primarily concerned with exploration and finding new technological and market opportunities (Shortell & Zajac, 1990; Auh & Menguc, 2005). The punctuated equilibrium pattern fits the defender firm, which is mainly focused on exploitation, although it needs temporary exploration to maintain a defendable position (Auh & Menguc, 2005). The recovery pattern fits the analyzer, which combines exploitation with exploration. And finally, the non-recovery pattern resembles the reactor, characterized by a half-hearted strategy and the inability to adapt the organizational structures to the changing circumstances.

  This alignment with Miles and Snow (1978) brings us to two speculations, which require further research. First, we can cautiously assert that, although we studied a limited number of cases, the identified patterns cover the existing variety in exploration strategies among gazelle firms. However, different organizational arrangements may exist that are also consistent with the identified exploration strategies. Further research is required to uncover these structures. Secondly, we can state that, with exception of the non-recovery pattern, all other three patterns may be viable for quickly growing firms. It depends on the strategic choice of the entrepreneurs and the contingencies of the situation which exploration strategy is followed. We can hypothesize that a relatively stable competitive environment and the possession of defendable complementary assets, combined with a modest growth ambition, allow a punctuated equilibrium, while more environmental turbulence and the absence of strong complementary assets ask for instant recovery. Whether this is the case, and which other factors play a role is subject of further research.

Managerial implications

In order to keep up with technological change, firms in general and entrepreneurial firms in particular need to engage in explorative activities (Alvarez & Busenitz, 2001; Eckhardt & Shane, 2003). Exploring new opportunities is not always a straightforward exercise. For instance, when entrepreneurial firms face substantial growth, they might be inclined to focus on exploitation of their existing capabilities instead of exploring new ones. Our findings provide specific guidelines that might help entrepreneurs to overcome potential obstacles to exploration.

  Our data suggest that fast growing entrepreneurial firms can create separate structures within or outside their organization where exploration can be fostered. This guideline is in line with previous research in established firms (e.g. De Visser et al., 2010; Jansen et al., 2006; O'Reilly & Tushman, 2004), emphasizing the relevance of structural ambidexterity to overcome success traps and stimulate exploration..

  Entrepreneurs increasingly embrace the concepts of open innovation (Chesbrough, 2003), co-creation (Prahalad & Ramaswamy, 2004), and networked innovation (Powell et al., 1996). These new innovation paradigms suggest that entrepreneurial firms might stimulate their innovation performance by crossing their organizational boundaries. In line with these arguments, our data point to the relevance of engaging in collaboration with external partners to stimulate exploration and realize technological change.

Limitations and future research

Next to its merits, this study has several limitations. First, we focused on one particular sector (i.e. internet technology firms). Although such a research design minimizes the confounding effects of extraneous variation, it remains unclear whether our findings can be generalized to other settings.

Furthermore, we collected our data retrospectively, restricting our ability to disentangle exploration patterns in more fine-grained ways. Due to this approach, we have probably been more sensitive to highly visible and influential changes in explorative activities. Emergent, incremental or gradual changes, instead, may be underrepresented in our study. Moreover, our data did not allow us to reveal the dynamics amongst individual stakeholders, which may have affected their awareness and understanding and their role in the emergence of shifts in explorative activities beyond those described in this paper. We therefore call for future research in which explorative developments are tracked in real-time.

Finally, we relied on the information from the respondents to assess the evolution of exploration over time. Some scholars have recently pointed to patents (Belderbos et al., 2010) or internal project documents (Uotila et al., 2009) as alternative sources that might provide a more 'objective' perspective on the intensity of exploration within firms and how it evolves over time. We therefore encourage future research on exploration patterns that complements respondents' impression of the evolution of exploration with more objective indicators of explorative activities.

References

Alvarez, S.A. and L.W. Busenitz (2001), 'The entrepreneurship of resource-based theory', *Journal of Management,* 27, 755-775.

Audretsch, D.B. (1995), *Innovation and industry evolution,* Cambridge, MA: MIT Press.

Auh, S. and B. Menguc (2005), 'Balancing exploration and exploitation: The moderating effect of competitive intensity', *Journal of Business Research*, 58, 1652-1661.

Beckman, C.M. (2006), 'The influence of founding team company affiliations on firm behavior', *Academy of Management Journal*, 49, 741-758.

Belderbos, R., D. Faems, B. Leten and B. Van Looy (2010), 'Technological activities and their impact on the financial performance of the firm: Exploitation and exploration within and between firms', *Journal of Product Innovation Management*.

Benner, M.J. and M.L. Tushman (2003), 'Exploitation, exploration, and process management: The productivity dilemma revisited', *Academy of Management Journal*, 28, 238-256.

Birch, D.L. (1979), *The job generation process*, Cambridge, MA: MIT Press.

Chesbrough, H. (2003), *Open innovation*, Cambridge: Harvard University Press.

Damanpour, F. (1992), 'Organizational size and innovation', *Organization Studies*, 13, 375-402.

Danneels, E. (2002), 'The dynamics of product innovation and firm competences', *Strategic Management Journal*, 23, 1095-1121.

Danneels, E. (2008), 'Orgaizational antecedents of second-order competences', *Strategic Management Journal*, 29, 519-543.

Delmar, F., P. Davidsson and W.B. Gartner (2003), 'Arriving at the high-growth firm', *Journal of Business Venturing*, 18, 189-216.

De Visser, M., P. De Weerd-Nederhof, D. Faems, M. Song, B. Van Looy, B. and K. Visscher. (2010), 'Structural ambidexterity in NPD processes; A firm-level assessment of the impact of differentiated structures on innovation performance', *Technovation*, 30, 291-299.

Eckhardt, J.T. and S.A. Shane (2003), 'Opportunities and entrepreneurship', *Journal of Management,* 29, 333-349.

Eisenhardt, K. M. (1989), 'Building theories from case study research', *Academy of Management Review*, 14, 532-550.

Eisenhardt, K.M. and M.E. Graebner (2007), 'Theory building from cases: opportunities and challenges', *Academy of Management Journal*, 50, 25-32.

Eisenhardt, K.M. and J.A. Martin (2000), 'Dynamic capabilities: What are they?', *Strategic Management Journal*, 21, 1105-1121.

Elfring, T. and W. Hulsink (2003), 'Networks in entrepreneurship: The case of high-technology firms', *Small Business Economics*, 21, 409-422.

Faems, D., B. Van Looy and K. Debackere (2005), 'Interorganizational collaboration and innovation: Toward a portfolio approach', *Journal of Product Innovation Management,* 22, 238–250.

Gibson, C.B. and J. Birkinshaw (2004), 'The antecedents, consequences, and mediating role of organizational ambidexterity', *Academy of Management Journal,* 47, 209-226.

Gioia, D. A. and K. Chittipeddi (1991), 'Sensemaking and sensegiving in strategic change initiation', *Strategic Management Journal,* 12, 433-448.

Glaser, B.G. and A.L. Strauss (1967), *The discovery of grounded theory: strategies of qualitative research,* London: Wiendfeld and Nicholson.

Greiner, L.E. (1972), 'Evolution and revolution as organization grow: A company's past has clues for management that are critical to the future', *Family Business Review*, 10, 397-410.

Hargadon, A., (2003), *How breakthroughs happen: The surprising truth about how companies innovate,* Boston MA: Harvard Business School Press.

He, Z.L. and P.K. Wong (2004), 'Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis', *Organization Science*, 15, 481-494.

Henrekson, M. and D. Johansson (2010), 'Gazelles as job creators: A survey and interpretation of the evidence', *Small Business Economics, 35,* 227-244.

Jansen, J.J.P., F.A.J. Van den Bosch and H.W. Volberda (2006), 'Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators', *Management Science*, 52, 1661-1674.

Leonard-Barton, D. (1995), 'Core capabilities and core rigidities: A paradox in managing new product development', *Strategic Management Journal*, 13, 111-125.

Levinthal, D.A. and J.G. March (1993), 'The myopia of learning', *Strategic Management Journal*, 14, 95-112.

MacCormack, A., R. Verganti and M. Iansiti (2001), 'Developing products on internet time: The anatomy of a flexible development process', *Management Science*, 47, 133-150.

March, J.G. (1991), 'Exploration and exploitation in organizational learning', *Organization Science*, 2, 71-87.

Miles, M. B. and M. Huberman (1984), '*Qualitative data analysis',.* Beverly Hills: Sage Publications.

Miles, R.E. and C.C. Snow (1978), 'Organizational strategy, structure and process', McGraw-Hill.

Miller, D. and P.H. Friesen (1984), 'A longitudinal study of the corporate life cycle', *Management Science*, 30, 1161-1183.

Neyens, I., D. Faems and L. Sels (In Press) The impact of continuous and discontinuous alliance strategies on startup innovation performance. *International Journal of Technology Management.*

Nohria, N. and R. Gulati (1996), 'Is slack good or bad for innovation?' *Academy of Management Journal,* 39, 1245-1264.

O'Reilly, C.A. and M.L. Tushman (2004), 'The ambidextrous organization', *Harvard Business Review,* 82, 74–82.

Powell, W.W., K.W. Koput and L. Smith-Doerr (1996), 'Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology', *Administrative Science Quarterly*, 41, 116-145.

Prahalad, C. K. and V. Ramaswamy (2004), *The Future of Competition: Co-creating Unique Value with Customers,* Boston, MA: Harvard Business School Press.

Raisch, S. and J. Birkinshaw (2008), 'Organizational ambidexterity: Antecedents, outcomes, and moderators', *Journal of Management*, 34, 375-409.

Raisch, S., J. Birkinshaw, G. Probst and M.L. Tushman (2009), 'Organizational ambidexterity: Balancing exploitation and exploration for sustained performance', *Organization Science*, 20, 685-695.

Rothaermel, F. T. and D.L. Deeds (2004), 'Exploration and exploitation alliances in biotechnology: a system of new product development' *Strategic Management Journal*, 25, 201-221.

Sims, M.A. and N. O'Regan (2006), 'In search of gazelles using a research DNA model', *Technovation*, 26, 943-954.

Shortell, S.M. and E.J. Zajac (1990), 'Perceptual and archival measures of Miles and Snow's strategic types: A comprehensive assessment of reliability and validity', *Academy of Management Journal*, 33, 817-832.

Uotila, J., M. Maula, T. Keil and S. Zahra (2009), 'Exploration, exploitation, and financial performance: Analysis of S&P 500 corporations', *Strategic Management Journal*, 30, 221-231.

Van de Ven, A.H. (2007), *Engaged scholarship: A guide for organizational and social research,* Oxford: Oxford University Press.

Van Praag, M.C. and P.H. Versloot (2008), 'The economic benefits and costs of entrepreneurship: A review of the research', *Foundations and Trends in Entrepreneurship Research*, 4, 65-154.

Visscher, K. and P.C. De Weerd-Nederhof (2006), 'Rise and fall of an innovative organization; the innovation journey of Ericsson Enschede', *International Journal of Innovation Management*, 10, 217-235.

Von Hippel, E. (1988), *The sources of innovation,* New York: Oxford University Press.

Voss, V., N. Tsikriktis and M. Frohlich (2002), 'Case research in operations management', *International Journal of Operations & Production Management*, 22, 195-219.