

RESEARCH REPORT

ENTREPRENEURIAL ADAPTATION: INSIGHTS FROM EXISTING
LITERATURE AND POSSIBILITIES FOR NEW RESEARCH

PETRA ANDRIES • KOENRAAD DEBACKERE

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Entrepreneurial adaptation: Insights from existing literature and possibilities for new research

Petra Andries and Koenraad Debackere
K.U. Leuven, Faculty ETEW, Research Division Incentim
Naamsestraat 69, B-3000 Leuven, BELGIUM
petra.andries@econ.kuleuven.ac.be
Tel: +32 16 32 69 01

ABSTRACT

Recent research shows that new ventures have great difficulties in defining a viable business model from the outset and that minor or major adaptations to this initial business model are needed as the venture evolves. Entrepreneurial adaptation or the entrepreneur's willingness and ability to make appropriate adjustments to the business concept become critical. If adaptation is so important for entrepreneurial companies, we need to ask ourselves a number of questions. (1) What causes this need for adaptation? (2a) What is the precise effect of adaptation on a start-up's performance or survival and (2b) is this effect similar for all start-ups? Also, (3) what do we know about the process of adaptation? And (4) what are factors enabling this adaptation process? Finally, we also need to determine (5) how the concept of adaptation in entrepreneurial companies is related to existing concepts of change and adaptation. The purpose of this paper is to give an overview of different literature streams that are specifically relevant to entrepreneurial adaptation and the questions listed above, and to point out gaps in the existing literature requiring further investigation. We look at whether and how the existing literature can provide insight into each of those five questions. In a final section, we point out directions for further research.

INTRODUCTION

In recent years, researchers in entrepreneurship and economics have moved away from research on personality traits towards and have recognized the need to focus on the discovery and exploitation of opportunity (Shane and Venkataraman, 2000; Acs and Audretsch, 2003) and on entrepreneurial choice models (Evans and Jovanovic, 2002). Venkataraman (1997, p. 121) suggests that one of the most pertinent questions in the field of entrepreneurship research is *"why, when and how some [entrepreneurial companies] are able to discover and exploit opportunities while others cannot or do not."*

Various authors have put forward that it is not the clairvoyance of the entrepreneur or intrapreneur that determines this ability. There exist evidence that most initial selections of business models by new ventures have to be abandoned later on and that minor or major adaptations to the initial business model are needed.

New businesses often start from a vision or from a technological capability. In both cases, the initial idea needs to be translated into economic benefits through the development of a business model (Chesbrough and Rosenbloom, 2002). The business model is then considered a construct that mediates the value creation process, by selecting and filtering technologies and ideas, and packaging them into particular configurations to be offered to a chosen target market. The functions of a business model are "to articulate the value proposition, identify a market segment, define the structure of the value chain, estimate the cost structure and profit potential, describe the position of the firm within the value network, formulate the competitive strategy" (Chesbrough and Rosenbloom, 2002: p. 533-534).

Pitt and Kannemeyer (2000) question whether many entrepreneurs are able to define the business model correctly from the outset. To paraphrase Stoica and Schindehutte (1999: p. 1): *"Entrepreneurs start with a vision. ... When successful it is because they are able to translate this vision into a business concept that addresses a marketplace need. ... only in a minority of cases do entrepreneurs succeed because they define their concept correctly from the beginning, and rarely do they immediately achieve a good fit between the available opportunity and their approach to the business concept."* Or as Peter Drucker (1985: p. 189) has noted *"When a new venture does succeed, more often than not it is in a market other than*

the one it was originally intended to serve, with products and services not quite those with which it had set out, bought in large part by customers it did not even think of when it started, and used for a host of purposes besides the ones for which the products were first designed.”

Existing research data confirms this. Brokaw (1991), in her update of the twenty seven ventures that were profiled in Inc.'s "Anatomy of a Start-up" series between the period of 1988 and 1990, found that by 1991, a large fraction of the surviving ventures had adapted their initial business model: *"What has made or broken many of the companies we've watched...is... the ability (or inability) to recognize and react to the completely unpredictable... To be flexible, and not just in response to small surprises but to really big ones- like discovering you're selling to the wrong customers or selling through entirely wrong channels. Some companies even find they have to revamp from top to bottom in order to survive. They discover they're in the wrong business"* (Brokaw, 1991: p. 54).

In the context of new venture development, **adaptation thus refers to the entrepreneur's willingness and ability to make appropriate adjustments to the business concept and marketing approach as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle** (Morris et al., 1999; Pitt and Kannemeyer, 2000).

If adaptation is so important for entrepreneurial companies, we need to ask ourselves a number of questions. (1) What causes this need for adaptation? (2a) What is the precise effect of adaptation on a start-up's performance or survival and (2b) is this effect similar for all start-ups? Also, (3) what do we know about the process of adaptation? And (4) what are factors enabling this adaptation process?

We must note that the concept of adaptation described above is different from the one used in literature on established companies (see for example the work of Tuominen et al., 2002; Oktemgil and Greenley, 1997; Hrebiniak and Joyce, 1985, Van de Ven and Poole, 1995, Jankowicz, 2000, Burgelman, 1991). The latter regards adaptation as an organization's response to changes in external factors, threats and opportunities. Organizational adaptation or change is then defined as *"change in a significant organizational attribute, such as basic business strategy or organizational structure in response to environmental changes..."* (Kraatz, 1998).

While Kraatz' definition of adaptation suggests that companies need to adapt to changes in their environment, the entrepreneurial adaptation on which this paper focuses is needed regardless of environmental change. It is about entrepreneurs and ventures who need to find their place in the environment, or even about them finding the most appropriate environment. Consequently, we cannot readily answer the questions above by applying insights on adaptation in established firms to entrepreneurial companies. We therefore also need to ask ourselves (5) how the concept of adaptation in entrepreneurial companies is related to existing concepts of change and adaptation.

The purpose of this paper is to give an overview of different literature streams specifically relevant to entrepreneurial adaptation and the questions listed above, and to point out gaps in the existing literature that need further investigation. In the following sections we look at whether and how existing literature can answer each of these five questions. In a final section, we point out directions for further research.

WHAT CAUSES THE NEED FOR ENTREPRENEURIAL ADAPTATION?

Mortality rates among new ventures are known to be high. About 40% of them fail in the first year of their existence. About 50% of them fail in the first three years. About 60% of them fail in the first six years, about 70% in the first eight years, and about 90% during the first ten years (see, amongst others: Timmons, 1994; Smilor and Gill, 1986; Bruno et al., 1992; EC, 1993; Cooper et al., 1994; Bhidé, 2000). In addition, many 'surviving' firms attain only 'marginal survival.' This phenomenon of firm failure and marginal survival explains why the tails of firm size distributions are so long, populated as they are with a multitude of small firms continuously entering an industry while failing to grow and to prosper in the longer run.

Liabilities

The high mortality risk new ventures are facing is often seen as a consequence of various types of liabilities they are confronted with from their conception onwards (see for example Mc

Cartan-Quinn and Carson, 2003). In general, we can discern between three types of liability: liability of smallness, of newness, and of foreignness.

The **liability of smallness** hypothesis points to the relationship between size and mortality. The theoretic rationale behind this hypothesis dates back to Hannan and Freeman's original paper on population ecology (1977), in which they state that 'the appropriate time scale for a selection process increases with the size of the organizations under consideration'. Population ecologists have given two main reasons for this liability of smallness phenomenon. A first explanation is given in Singh and Lumsden's review (1990:176): "*the level of structural inertia increases with size....since selection processes in modern societies are such that they favor organizations with greater structural inertia (i.e. inert organizations have lower mortality rates) larger organizations must have lower mortality rates...*"

Barron et al (1994:388) analyze the liability of smallness hypothesis from a slightly different point of view: "*large organizations can retrench by reducing their scale of operations over long periods of poor performance before they are forced to disband. Small organizations have little room to contract, and they fail quickly once fortunes decline...*"

Other explanations focus on the fact that large organizations have more 'slack resources' on which they can rely during periods of environmental change (Haveman, 1993). Slack resources facilitate experimentation with new strategies and products and facilitate entrance in new markets because it buffers organizations from downside risks. Not only do small, independent ventures dispose of limited financial resources (see for example Berry & Taggart, 1998; Bhidé, 1992, 1994, 1996; Hite & Hesterly, 2001). According to Wyer and Smallbone (1999), a lack of finance may hinder the management process of small companies at the level of business strategy as well as on the level of operational strategy. In addition, small companies also often lack the human capabilities that are needed to commercialize technological innovations (Steensma et al., 2000, see also Baum et al., 2000). The founders of technology-based ventures usually represent a limited range of technological competences, and market as well as managerial knowledge. Wyer and Smallbone (1999) also point to a possible lack in management time and to the fact that these firms are too small to employ internal specialists. In addition, external consultants are often unaware and insensitive to the needs of small companies. Also, many classical management concepts are unsuitable for application in a small firm context (Mc Cartan-Quinn and Carson, 2003).

Most of the early empirical studies support the 'liability of smallness hypothesis' (i.e. negative monotonic effect of size on mortality rates), which has become conventional wisdom in organizational theory. The liability of smallness hypothesis was also consistent with a long tradition of empirical economic studies on the size distribution of firms. This stream of research, which was initiated by Simon and Bonini's seminal article (Simon and Bonini, 1958), had traditionally found that in most industries the distribution is lognormal. Although most economists relied on Gibrat's law of proportionate growth to explain this kind of distribution, the lognormal distribution is also the result if the liability of smallness hypothesis receives support. For example, small organizations might face consistently more problems than large organizations, which increases their mortality rates.

Complementary to this liability of smallness, **liability of newness** is often identified as a major cause of mortality (Shepherd et al., 2000; for an overview see Eisenhardt & Schoonhoven, 1990). The theoretical explanation goes back to Stinchcombe's (1965) observations that new organizations have higher failure rates than older ones, which is known as the 'liability of newness'.

Hannan and Freeman (1984) have subsequently made the same observation, which they explained by an evolutionary argument: They argued that in modern societies organizations with high levels of 'reliability' and 'accountability' are favored by selection processes. New ventures lack a 'track record' with customers and suppliers (see also Hay et al., 1993), and the employees and founders of these ventures are not always able to quickly take on the new roles and relationships that are required. Business relationships with stakeholders need to be built, legitimacy and reputation need to be established, new employees must be recruited and trained (Lu & Beamish, 2001; Hite & Hesterly, 2001). Shepherd et al. (2000) suggest that this newness or novelty consists of novelty to market, novelty in production, and novelty to management. Hay et al. (1993) point to the existence of an 'asset accumulation gap' that ventures must close in order to satisfy early customers and outperform established rivals. Although these early customers may initially be attracted by benefits from new technology, they will not continue to tolerate the ventures deficiencies with respect to distribution, unproven service capability, supply shortages, or quality failures. Also Zahra et al. (2000) suggest that, even when offering a superior technology or product, ventures must learn new skills and competencies in order to position their products successfully and to survive. Singh and

Lumsden summarized (1990:168): "*Reliability and accountability of organizational forms require that the organizational structure be highly reproducible. Due both to processes of internal learning, coordination, and socialization within the organization and to external legitimation and development of webs of exchange, the reproducibility of organization structure increases with age. Because greater reproducibility of structure also leads to greater inertia, however, organizations become increasingly inert with age. And since selection processes favor organizations with inert structures, organizational mortality rates decrease with age -- the liability of newness....*"

Related to these liabilities of newness and smallness is the **lack of coordination mechanisms** in small, new companies, as explained by Bhidé (2000). Unlike large established firms, ventures do not have a broad portfolio of (tangible and intangible) assets nor effective mechanisms for coordinating these assets. Building a firm requires the entrepreneur to develop assets and coordination mechanisms from scratch. It is only as firms develop more extensive coordination capabilities that they tend to undertake activities where the returns from managing complexity can justify the increased administrative costs.

If in addition, a company enters new target markets dissimilar to its original markets, it is confronted with **liabilities of foreignness** (Hymer, 1976). This means that the knowledge and capabilities a venture has acquired by operating in its initial markets are not suitable for targeting these new markets. This inappropriateness arises from differences between home and foreign markets with respect to political, economic, cultural, and legal characteristics (Lu & Beamish, 2001).

The liabilities of smallness, newness, and foreignness as discussed above, all refer to a lack of resources, capabilities or knowledge within the venture. The characteristics of the venture itself cause problems for the development of technologies, products and markets. These characteristics may limit its ability to select and implement its strategies (Wyer and Smallbone, 1999). A commonly proposed solution is then to acquire these resources, capabilities, and knowledge through **learning and experimenting**. Shepherd et al. (2000), in their study of risk reduction in ventures, discern between evolutionary and procedural risk reduction. From an evolutionary viewpoint, mortality risk declines over time as liability is reduced through 'passive learning'. However, from a procedural point of view, ventures can engage in 'active learning' by taking deliberate strategic decisions leading to liability reduction. Networking and partnering are

often put forward as interesting strategies in this respect (Shepherd et al., 2000; Foray, 1991; Teubal et al., 1991; Baum et al., 2000). Active and intelligent experimentation is put forward by innovation literature as a valuable tool for information exchange and learning in situations characterized by high levels of ambiguity (Loch et al., 2001; Thomke, 2003; March, 1978; Loch and Terwiesch, 1998).

Uncertainty and ambiguity

However, not only the characteristics of the venture itself can cause problems. Characteristics of technologies, products and markets, and more specifically uncertainty and ambiguity regarding their viability pose major threats to new ventures' survival. The future profitability of a business opportunity is impossible to determine beforehand (Saemundsson and Linholm Dahlstrand, forthcoming). Although the entrepreneur functions in the economic environment only if the environment is uncertain (Gifford, 2003), **uncertainty and ambiguity** form the major obstacle in ventures' search for viable business models (see also Morris et al., 1999; Shane and Stuart, 2002; Aldrich and Fiol, 1994), especially in the case of new technology-based ventures that are coping with high degrees of both technical and market newness (Garnsey, 1995). Nohria (1992) points out that in the creation of new ventures, different elements must be combined, taken apart and recombined (see also Baker and Faulkner, 1991) and that *"successfully putting these puzzles together is no easy matter, given the [...] uncertainty inherent in the creation of a new enterprise"* (Nohria, 1992: 243).

Uncertainty can be defined as characteristic of a situation in which the problem solver understands the structure of the problem (including the set of relevant decision variables), but is dissatisfied with the knowledge available on the value of these decision variables (Schrader et al., 1993). Ambiguity is then defined as lack of clarity regarding the relationships between the variables and the problem solving algorithm and sometimes even about the set of relevant decision variables itself. Ambiguity relates directly to Daft and Lengel's notion (1986) of equivocality, which they define as *"ambiguity, the existence of multiple and conflicting interpretations about a situation."*

Because both **technical** and **market** uncertainty are involved in this translation and because environments may change rapidly, the set of all feasible business models is not foreseeable in

advance (see also the work of Druilhe and Garnsey, 2002 and 2004 on university spin-outs). Certainly during the early stages in its life, a new business unit is confronted with high degrees of both uncertainty and ambiguity while confronted with a limited knowledge base and experiencing restricted access to resources (see for example: Bhidé, 2000). Not only is the nature and the outcome of their technical activities inherently unpredictable (Steensma et al., 2000), but also the market selection and commercialization process itself poses problems of uncertainty and ambiguity (Chesbrough, 2003; Chesbrough and Rosenbloom, 2002; Chesbrough, 2002). Utterback (1987) distinguishes between technical and target uncertainty. When initially developing a business model, the business unit is confronted with uncertain innovation targets, unclear product performance requirements, unclear demand functions and ambiguous design criteria. Innovations are by definition only successful when they succeed in coupling a technological capability to a user need (Teubal et al., 1991). During this process, innovations face considerable selection pressures on their way to commercialization (Nelson and Winter, 1982). Venkataraman (1997) proposes that entrepreneurial opportunities are opportunities to bring into existence markets for goods and services that do not yet exist. New markets are often created by the users of the goods or services produced by the innovator (Von Hippel, 1998), some of whom adopt innovations more quickly than others (Rogers, 2000; Moore, 1995, 1999).

The range of options - and problems - that founders of new business units confront is vast. Entrepreneurs and intrapreneurs must continuously ask what application they want to strive for and what competencies they need to develop in order to accomplish that prowess (Bhidé, 1996). In emergent markets, technological options are at best marginally understood, distribution channels and sources of supply are problematic, market needs are not clearly defined, and hence, market viability cannot be proven a priori (see Abernathy and Utterback, 1975 & 1978; Debackere, 1997; Eisenhardt and Schoonhoven, 1990; Bhidé, 1992, 1994, 1996 & 2000; Teubal et al., 1991). There is some evidence that uncertainty with respect to markets has an even larger effect on the development of opportunities than technological uncertainty (Eisenhardt and Schoonhoven, 1990; Autio and Lumme, 1989; Saemundsson and Lindholm Dahlstrand, forthcoming).

As a logical consequence, it is not possible for a venture to identify upfront what will be the most viable business model. Uncertainty and risk occasions many needs to change (Pitt and Kannemeyer, 2000). In general, high levels of uncertainty are known to require adaptive

approaches to organizations (Timmons et al., 1990). Market signals may reveal information about the external environment that was unknown and or uncertain at the outset, indicating a possible need to change or adapt the initial business model (Stoica and Schindehutte, 1999). As Stoica and Schindehutte (1999) put it: "*The adaptive entrepreneur allows the business concept to develop over time as he/she gains experience with products, markets, suppliers, employees, and other key variables surrounding the enterprise*" (Stoica and Schindehutte, 1999: p. 1-2). In the context of new venture development, adaptation thus refers to the entrepreneur's willingness and ability to make appropriate adjustments to the business concept and marketing approach as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle (Morris et al., 1999; Pitt and Kannemeyer, 2000).

Conclusion

According to the existing literature, the need for entrepreneurial adaptation originates from the presence of uncertainty and ambiguity both on the technical and on the market side. Certainly during the early stages in its life, new business units are confronted with high degrees of uncertainty and ambiguity with respect to technology and market potential. At the same time, they are confronted with liabilities of newness, smallness and foreignness which hinder them to cope with problems, including the ways in which they should handle uncertainty and ambiguity.

The standard approach to deal with uncertainty and ambiguity often is through trial and error, experimentation and learning. Hence it is about adaptation, adapting, and adaptability.

WHAT IS THE PRECISE EFFECT OF ADAPTATION ON PERFORMANCE?

Although the importance of adaptation for new ventures is widely accepted, relatively little research has been done to investigate the precise effect of the initial business model's adaptation on the survival of new business units and to investigate the factors moderating this relationship.

Effect of adaptation

Literature on established firms points to the danger of not only 'under-adaptation', but also 'over-adaptation'. Snow and Hrebiniak (1980) find that mean performance (measured as income divided by assets) is the highest for moderately adaptive firms. McGee et al. (1989) replicate this result with performance measured as return on assets. As explained by Stoica and Schindehutte (1999, p.7) "*under-adaptation can lead to unintended costs (especially inventory), low customers, and missed opportunities. Over-adaptation utilizes resources unnecessarily, may find the firm under-emphasizing its core business, and frequently finds the firm pursuing courses of action that do not generate requisite payoffs.*" This negative effect of adaptation appears to be more pronounced depending on the type of adaptation. Cottrell and Nault (2004) find - for a sample of microcomputer software companies - that changes in product variety through new product introductions improve firm performance, whereas extensions to existing products hinder firm and product performance. Also, products that encapsulate more application categories perform better, while products that cover more computing platforms perform worse.

Stoica and Schindehutte (1999) propose that the danger of over-adaptation is especially present in the context of entrepreneurial business units. They point out that entrepreneurs are opportunists, but that resource constraints limit the thorough analysis of these new opportunities. It is thus not unlikely that they will spread out their resources too thin over various opportunities, reducing the possibility to succeed in any of them. Their research study indeed finds a curvilinear relationship between adaptation and performance. However, their sample - where the typical firm has been in business between 5 and 25 years, and has fewer than 100 employees - does not appear representative of entrepreneurial start-ups.

So, a certain degree of adaptation appears important for the performance and survival of new businesses due to the inherent presence of uncertainty and ambiguity in new business development. However, new studies should verify whether too much adaptation can be detrimental in this context.

Moderating factors

As indicated above, the need for adaptation can be attributed to the presence of uncertainty and ambiguity aggravating the effects of liabilities. As a consequence, the relationship between entrepreneurial adaptation and performance is expected to be moderated by characteristics of the organization (more precisely: liabilities) and of its environment (contributing to the presence of environmental uncertainty and ambiguity).

Company characteristics

The need for adaptation may for example be dependent on the origin of the start-up and on the former experience of the founder. Based on the **origin of the start-up**, one can discern between different types of new businesses. Shane and Eckhardt (2003) identify four types of entrepreneurial efforts as a function of the locus of discovery and exploitation, depending on whether the entrepreneur is an independent individual or a member of an existing organization. Their approach leads to the following typology: (1) Independent Start-ups (both discovery and exploitation are done by independent individuals), (2) Spin-offs (discovery is done by a member of an existing organization, but exploitation is done by an independent individual), (3) Acquisition (discovery is done by an independent individual, but exploitation is done by an existing organization), and (4) Corporate Venturing (both discovery and exploitation are done by members of existing organizations). Given our interest in how new businesses succeed in developing a viable business model, we limit our discussion to independent start-ups and spin-offs. We can further distinguish between academic and non-academic spin-offs, depending on whether the discovery takes place at a university (or other research institute) or in a business organization. The origin of a new business can be expected to affect its need for adaptation.

Academic spin-offs for example may in some cases start purely from specific technology, without having much complementary knowledge. Non-academic ventures, on the other hand, can be expected to have a better idea of potential applications and markets. Academic ventures may therefore need to be more adaptable to reach long-term survival than their non-academic counterparts. Also, research (see for example Burgelman, 1983; Bhidé, 2000; Feeser and Willard, 1990; Chandler, 1996; Zucker et al., 2002) suggests that spin-outs of existing companies will have fewer problems defining a viable business model – and thus less need for adaptation - than independent start-ups. In his study of the internal corporate

venturing process, Burgelman (1983) shows how the initiation of the project definition process involves technical linking as well as need linking activities. While the new product, process, or system is still in the definition process, market interest already needs to be created. Burgelman observes that unauthorized selling efforts are started even before the project becomes an official venture. This is only possible because group leaders have direct involvement in research activities and sufficient awareness of market needs. Bhidé (2000) shows how employees of established corporations who develop new initiatives, can use the cash flows, relationships, and reputation provided by existing businesses. This helps them to secure customers, employees and other resources for their start-up. Feeser and Willard (1990) and Chandler (1996) found that similarity between the activities of the company and its parent with respect to technology and markets positively affected the growth of the company. Also Zucker et al. (2002) find that new biotech units of established firms obtain more and higher-quality patents than new entrants. Since patents need to demonstrate potential practical applicability, this can be considered an indication that new units of established firms are better at commercializing technology. Spin-outs of established companies are thus believed to be less hindered by liabilities of newness, smallness and foreignness than independent start-ups and academic spin-offs.

Even if activities spin-out of established firms and become completely independent, or even if the entrepreneur starts the venture without any support from his original employee, **former experience** of the entrepreneurs very often provides the new venture with a relatively clear view on potential applications and markets, thus reducing the need for adaptation. In many cases, the venture becomes a supplier or a competitor of the 'mother organization'. The experience and background of the founder(s) may reduce liabilities and also uncertainty/ambiguity about the viability of the business model, and therefore also the need for adaptation. Christensen and Raynor (2003) in this respect refer to the work of McCall (1998). In this view, business units can be thought of as schools of experience, and *'the management skills and intuition that enable people to succeed in new assignments were shaped through their experiences in previous assignments'* (Christensen and Raynor, p. 179). Not the attributes of an entrepreneur or his past successes, but his previous activities - albeit successful or unsuccessful - will determine whether or not he is fit to perform similar activities in the context of the new venture. Entrepreneurs that have experience in spotting and developing opportunities in a certain sector will be able to do the same thing in a new venture context.

However, some evidence exists that intrapreneurs need to be equally adaptable. In one of the corporate ventures of Xerox studied by Burgelman (1983), the initial focus of the project to improve plastics turned out to be on the wrong size of bottles. Although a basis for corporate support had been demonstrated, adaptation was necessary. At such instances, the experience of the intrapreneur may even act as a hindrance by making him or her 'blind' for the required changes and adaptations. Shane (2002) shows that prior knowledge enables entrepreneurs to discover only a limited set of opportunities. A similar effect of functional background and parent organization strategy on strategic choices is found by Boeker (2000). Chesbrough (2002) even suggests that corporate ventures need to be even more adaptable than independent start-ups, because they need to free themselves from the dominant business logic of the parent company. In his study of 35 Xerox spin-offs, he found that *"those spin-offs that became successful did so through evolving business models that came to differ substantially from that of Xerox..."* (Chesbrough, 2002, p. 529).

In his review of different literature streams on employee startups in high-tech industries, Klepper (2001) points out that incumbents have serious difficulties in assessing certain types of innovation, such as architectural innovations (Henderson and Clark, 1990), competence-destroying innovations (Tushman and Anderson, 1986) and innovations that appeal to new users due to reliance on feedback from current customers (Christensen, 1993). Holmstrom (2002) argues that established firms are focused on routine activities such as exerting control over employees and satisfying current market expectations, which hinders them to pursue new opportunities. Abernathy and Utterback in their seminal work (see for example Abernathy and Utterback, 1975 and Utterback, 1994) describe how incumbents fail to cope with breakthrough innovations by placing their bets only half-heartedly on the emerging dominant design, because they are crushed under the obligations and the momentum of their ongoing concern. Also Christensen and Raynor (2003) show that companies face a large number of difficulties when trying to balance disruptive innovations and exploitation of existing activities. All this suggests that new business units of established firms will have even greater difficulties than independent start-ups in defining the initial business model and therefore will need to be more adaptive afterwards.

Sector characteristics

In addition to the background of the new business unit, the characteristics of the sector in which it operates may equally affect the need for adaptation of the initial business plan. Morris et al.

(1999) suggest that ambiguity and risk influence the need for adaptation in entrepreneurial companies, but they do not investigate these effects empirically. Other research findings confirm this suggestion however.

Firstly, the **maturity** of the industry sector in which a technology-based venture operates – and more specifically the emergence (or not yet) of a dominant design (Utterback, 1994) – may influence the need for adaptation. The maturity of a sector goes hand in hand with the presence of uncertainty/ambiguity in that sector (as suggested by Morris et al, 1999). In mature markets, dominant designs, process technologies, and strategies are clear. New business units have few difficulties identifying the accepted, viable business model for the industry. Growth markets, on the other hand, are viable but turbulent. There may be multiple options for how to compete within an overarching dominant design. And in emergent markets, the timing of commercial takeoff and the viability of certain business models are impossible to predict.

Secondly, the need for a new technology-based venture to adapt its initial business model may be influenced by the **capital intensity** of the sector in which it operates. Research has shown that scale economies and capital intensity lower the likelihood of survival of new firms (Audretsch, D.B., 1991). Mean growth rates of small firms decrease with their initial sizes, whereas for initially large firms, growth rates and size are unrelated (Caves, 2000). One would logically reason that the need for large investments (R&D and other types) hinders shifts in business models. However, under these circumstances, the need for adaptation increases, since failure will lead to greater losses. Indeed, whereas a small financial loss will not immediately jeopardize survival, business units may not be able to overcome the obsolescence of large investments.

As we already noted, adapting various aspects of the business model may be necessary not only to find an appropriate place in the environment or to find the most appropriate environment; it is also necessary when environmental circumstances change (see for example the work of Tuominen et al., 2002; Oktemgil and Greenley, 1997; Hrebiniak and Joyce, 1985, Van de Ven and Poole, 1995, Jankowicz, 2000). In the latter case, established companies as well as new business units may need to change course. Of important influence in this respect is the regime of **technological opportunity** in a sector. Technological opportunity 'can be regarded as the set of production possibilities for translating research resources into new techniques of production' (Cohen and Levin, 1989, p. 214). Klevorick et al. (2002) identify three

major sources of technological opportunities: advances in science, feedback from industry developments and transfer of advances from other industries. This explains why technical advance may be higher-paced in some industries than in others (see also Audretsch, 2002). The regime of technological opportunity influences the pace and the direction of technical advance in a broad sense and especially in the long run. If the industry's technology advances, established companies as well as new business units will need to adapt their business model in order to remain competitive.

Conclusion

Literature on established firms points to the danger of not only 'under-adaptation', but also 'over-adaptation', suggesting the existence of an inverse u-shaped relationship between adaptation and performance. Since this relationship has not yet been investigated for a sample of young, entrepreneurial companies, it deserves further research attention. In addition, entrepreneurship literature suggests that this relationship between entrepreneurial adaptation and performance may be moderated by characteristics of the start-up such as the characteristics and former experience of the founder(s) and whether the company has its origin in an established company or research organization. Sector studies insights point to the possible moderating effect of maturity, capital intensity and regime of technological opportunity on the relationship between adaptation and performance. We can therefore conclude that new research on the relationship between entrepreneurial adaptation and performance needs to take into account these possibly moderating individual, company and sector characteristics.

WHAT ABOUT THE PROCESS OF ADAPTATION?

When trying to understand how ventures adapt their initial business model, we can draw on insights from two important literature streams: the life-cycle literature and research on the development of innovations. On the one hand, life-cycle literature studies how ventures change over different stages of their life and how each of these life stages is characterized by specific opportunities and challenges. The challenge of adapting its initial technology and business concept into a viable business model is one such challenge faced in the early stages of a

company's life. On the other hand, we can hope to gain useful insights from research on the management and development of innovations. Although most of these studies have taken place in business units of large, established organizations, some insights may provide useful in the context of technology-based ventures.

Life-cycle literature

Numerous studies in the life cycle literature (for an overview see: Hanks et al., 1993; Kazanjian and Drazin, 1989 & 1990; Bamford et al., 1999; Reynolds and Miller, 1992 or Vesper, 1990) suggest that ventures change over their life and that it is exactly this change that is crucial to their success and survival. Most of this literature argues that companies progress through different stages of growth in a fixed, predictable order. Life-cycle literature argues that in each stage of a company's life, specific growth and market opportunities (e.g. Scott, 1970; Chandler, 1962) as well as challenges (Greiner, 1972; Kazanjian and Drazin, 1989) and demands (Siggelkow & Levinthal, 2005) must be addressed through the use of adequate skills and organizational structure. There is no consistency in the literature on the number of life stages a company can go through. Three stage, four stage (e.g. Kazanjian, 1989, 1990; Hanks et al., 1993), five stage (e.g. Galbraith, 1982; Greiner, 1972; Miller & Friesen, 1984), and even seven and ten stage models have been proposed. These differences are largely due to the fact that most existing models were developed in a conceptual manner, without much empirical testing, as well as to the lack of specific measures for the relevant contextual and structural dimensions (Hanks et al., 1993).

When reviewing the lifecycle literature (for an excellent review, see Hanks et al., 1993 and Kazanjian and Drazin, 1989 & 1990), we are forced to conclude that the majority of life cycle models do not provide us with an adequate framework for studying entrepreneurial companies. Churchill and Lewis (1983) distinguish three reasons for this. First of all, the assumption of traditional life stage models that companies must either grow or die, does not seem to hold (see also Autio, 1997). A lot of entrepreneurial companies deliberately choose to stay small in order to avoid increased complexity that comes with growth (Carter and Ram, 2003; Storey, 1994). Others do not see opportunities for growth due to the bounded rationality of the entrepreneurial team. A second reason is that traditional life stage models often measure growth in terms of sales, whereas other factors - such as personnel, turnover, geographical

diversification, changes in products or services, and value-added - are more appropriate indicators of initial entrepreneurial growth. A last reason is that most models do not pay enough attention to the initial stages in a company's life. For the purpose of our research on entrepreneurial adaptation, we are especially interested in the literature on the early stages in a venture's life. It is in this stage that the venture needs to adapt its initial technology and business concept into a viable business model. We will therefore turn to a number of models that do pay special attention to these early years.

Uni-directional stage-based models

In general, we find that life-cycle literature distinguishes between two phases in which the development and adaptation of an initial idea into a viable business model takes place. An overview of these models is shown in Figure 1. In a first phase, the **product or service is developed as well as the first sales**. This phase has been termed 'start-up' (Hanks et al., 1993), 'conception and development' (Kazanjian and Drazin, 1989, 1990), 'existence' (Churchill and Lewis, 1983), etc. During this stage, the product or service is developed, often through prototyping (Kazanjian and Drazin, 1998, 1990). Products and services are customized (Abernathy and Utterback, 1975, 1978) to suit the needs of innovators and early adopters (Moore, 1995, 1999). Other authors discern between different phases within this first phase. Clarysse and Moray (2004) as well as Vohora et al. (2004), in their study of academic spin-offs, find evidence for the existence of (1) a research or idea phase, (2) a phase in which the opportunity is framed and validated, (3) a phase in which resources and organizational arrangements are put in place, and (4) a phase in which strategic focus is gained, where the venture tries to generate revenues and possibly adapts its business model. Vohora et al. (2004), find that a venture must pass through the previous phase in order to progress to the next one but that each phase involves an iterative, non-linear process of development in which there may be a need to revisit some of the earlier decisions and activities.

In a second phase, the **product or service is commercialized on a larger scale**. The venture is investing heavily in growth (Churchill and Lewis, 1983) by targeting early majority (Moore, 1995, 1999) and by standardizing the initial prototypes and customized products (or services) (Abernathy and Utterback, 1975, 1978). So also in this phase, there are changes taking place with respect to target customer segments, products and services; all aspects of the initial business model.

- INSERT FIGURE 1 ABOUT HERE -

Multi-directional and non-sequential models

The models above suggest that venture develops in sequential phases. Quite a number of empirical studies obtained results that support the lifecycle view (see for example: Miller and Friesen, 1984; Hanks et al., 1993; Kazanjian and Drazin, 1989; Roure and Keeley, 1990, Hansen and Bird, 1997). Although Vohora et al. (2004) argue that each phase of their model involves an iterative, non-linear process of development in which there may be a need to revisit some of the earlier decisions and activities, they do propose that a venture must pass through the previous phase in order to progress to the next one. Although feedback loops appear necessary, the model assumes that no phases can be skipped and that there exists an 'optimal', sequential order in the development of a company.

Other authors however have argued that the linear idea of a uni-directional sequence of life stages is too simplistic (e.g. Tornatzky et al., 1983; Utterback, 1987). They suggest that multiple paths through and towards these stages exist (e.g. Adizes, 1979). Reynolds and Miller (1992) and Gersick (1994) have confirmed the stochastic nature of a firm's adaptive processes. Autio (1997) proposes a more systemic view, moving away from a linear evolutionary view and looking at how firms become embedded in the innovative environment in which they operate. The embeddedness of a firm in its environment relates to the "Gestalt view." According to this view, the hypothesized existence of related lifecycle phases should be criticized. The lifecycle model should then be replaced by different and distinct organisational categories. Each category then represents an adequate organizational approach for dealing with driving forces such as technology, environment, internal structure and leadership (Kazanjian and Drazin, 1989). Among these "Gestalts," no determined progression patterns exist. They are hence episodes rather than phases or stages. The terminology of 'episodes' hence underlines the idea of non-linearity and multi-directionality.

Recent work has proposed cyclical models of venture development. Druilhe and Garnsey (2004), describe venture development as an iterative, non-linear, and bi-directional interaction between shifting opportunities and emerging combinations of resources (see Figure 2). New businesses then go through alternating cycles of opportunity detection and resource mobilization, combination and organization. The authors find that the interaction between opportunities and resources is iterative, non-linear, and bi-directional. On the one hand, the

type of business opportunity selected in the initial business model influences the resource requirements, on the other hand, improved knowledge of resources and opportunities will allow entrepreneurs to adapt and modify their business model.

- INSERT FIGURE 2 ABOUT HERE -

Innovation literature

The literature on innovation is vast and diverse. Hence, it is not our goal to provide an all-inclusive overview of its research findings here. Only aspects deemed useful for gaining further insight in the entrepreneurial adaptation process will be discussed. First, we will discuss the work of Van de Ven et al. (1999) who have modeled the innovation process based on in-depth studies in business units of established organizations as well as in new ventures. We will see that this model relates to the bi-directional life-cycle models discussed above. Second, we will give an overview of relevant findings from new product development literature. Whereas technology-based ventures try to develop an initial technological opportunity into a viable business model, new product development teams struggle with the transformation of an initial idea into a viable product for their company. Because of this similarity, the insights from the new product development literature - where decision-making under uncertainty and ambiguity has since long been a central theme – might help us to increase our understanding of the entrepreneurial adaptation process and of the variables influencing this process.

The innovation process

Van de Ven et al. (1999) model the innovation process (in new as well as in established companies) as a **cyclical process** consisting of two phases in a set sequence of divergent and convergent behavior (see Figure 3). **Divergence** involves the exploration of new directions. **Convergence** on the other hand implies testing and exploiting a given direction. The concepts of divergence and convergence are highly related to March's discussion of exploration and exploitation (March, 1991). Whereas exploitation refers to activities like refinement, implementation and execution, exploration denotes search, variation and discovery-oriented activities. According to the Van de Ven et al. (1999), it is the complexity of the problem that warrants divergent search behavior. Divergence is triggered by the infusion of resources while convergence is triggered by external constraints (such as institutional rules) and internal

constraints (including resource limitations and the discovery of a possibility that focuses attention) limiting the complexity of the problem. This model is characterized by the same cyclicity as the life-cycle model by Druilhe and Garnsey (2004) discussed above. Innovators alternate between episodes of divergence and convergence.

- INSERT FIGURE 3 ABOUT HERE -

Van de Ven et al. (1999) pay special attention to the different ways of learning a company can and must use in order to develop an innovation. They suggest that in the divergent phase, companies must learn through **discovery**, by exploring a variety of new directions. In the convergent phase, **trial and error learning** should take place by testing a given, more focused direction. The authors consider **complexity** as the reason for choosing one way of searching/learning over the other and suggest that this complexity results from different factors, namely (1) the ambiguity or uncertainty inherent in the development of an innovation, (2) the fact that most innovations consist of families of related new products and procedures and not of a single new device, product or procedure (see also the notion of platform innovation projects by Wheelwright and Clark, 1992), (3) the division of labor among functions and organizational units, (4) the use of diversification for risk reduction, and (5) the fact that complicated development paths may result from pursuing alternative processes in different parts of the innovation.

The model by Van de Ven et al. (1999) appears more realistic than the life-cycle models discussed above for three reasons. A first reason is that, contrary to many models from life-cycle literature which are developed without much empirical testing (Hanks et al., 1993), this model is based on detailed, longitudinal empirical observations. Second, the cyclicity of their model relates to and confirms the bi-directionality and non-linearity described in recent life-cycle models. And third, the model reserves a specific – although small - role for complexity and ambiguity, the latter being the main driver for entrepreneurial adaptation (as shown above).

New Product Development literature

The literature on new product development may provide us with additional insights on the role of uncertainty and ambiguity in the entrepreneurial adaptation process. In the literature on new product development, we find various classifications of different types of uncertainty. Sometimes, uncertainty is classified by its source (technicalities, market issues, quality issues,

etc) or by its potential impact (see for example: Chapman, 1990). Other classifications relate uncertainty to the different management techniques required dealing with them. The latter type of classifications often distinguishes between 'uncertainty' and 'ambiguity' (see for example Schrader et al., 1993). '**Uncertainty**' is thereby defined as a situation in which the relevant decision variables are known, but the organization does not know the exact values these variables should take. There thus is a difference between the amount of information available and the amount of information required to execute a task at hand (Galbraith, 1977). There hence exists an information asymmetry. Under **ambiguity** on the other hand, there is lack of clarity regarding the relationships between the variables and the problem solving algorithm and sometimes even about the set of relevant decision variables itself. Differing interpretations of the situation exist. It is unclear to the actors involved which information is needed to solve these differences (Van Looy, Debackere & Bouwen, 2001). De Meyer et al. (2002) elaborate on this distinction: they talk about 'unforeseen uncertainty' and 'chaos' as two types of ambiguity, and about 'foreseen uncertainty' and 'variation' as two types of uncertainty.

According to the new product development literature, the adequacy of various organizational approaches will differ depending on the presence and the balance of the degrees of uncertainty versus ambiguity (and not on the complexity of a problem as suggested by Van de Ven et al., 1999). In situations dominated by uncertainty, '**traditional**' **project management** is appropriate (Debackere and Van Looy, 2003). The success of the new product development project depends on the speed and the resources with which all project phases are completed. Extensive use of clear goals and planning - using milestones and phases - can reduce uncertainty in the decision-making process and should reduce lead-times (see for example: Eisenhardt and Tabrizi, 1995).

In situations marked by high levels of ambiguity, characterized by different interpretations on the nature and the scope of the application envisaged, the 'traditional' approach of planning and intensive preparation of the product definition is not longer sustainable. **Flexibility and adaptability** (Iansiti, 1995; Verganti et al., 1998) allowing for the continuous inclusion of new information on market and technological developments until late in the development process (i.e. the pursuit of a 'window of opportunity' as suggested by MacCormack, 1998), gathering and incorporating sufficient knowledge before committing to one specific product concept, delaying the final concept choice, and experimenting (i.e. solving problems through iterative,

though intelligently pursued, trial and error) then become the dominant organizational themes (Eisenhardt and Tabrizi, 1995; Thomke et al., 1996; Verganti et al., 1998).

The different organizational strategies that might be deployed as a function of the type of uncertainty encountered during the project, have been further elaborated by Pich et al. (2002). They discern between (1) instructionist, (2) learning and (3) selectionist approaches to project management and organization, with the relevance of each approach depending on the (in)adequacy of the information available and the risk involved. The authors suggest that these three project management approaches may represent different phases in a stage gate process, in which uncertainty is gradually reduced over the course of a new product development project. Note that this suggests a linear, uni-directional path through different stages, which we have shown to be a point of discussion in life-cycle literature.

Conclusion

The model by Van de Ven et al (1999) is an interesting representation of the innovation process. It is based on detailed empirical observations and describes innovation as a cyclical process consisting of two alternating episodes of respectively divergent and convergent behavior. This cyclicity implies that it is non-linear and bi-directional (features that have gained acceptance in more recent work on life-cycle models). The authors consider complexity as the main driver behind this cyclical model. However, in the context of new ventures, we might ask ourselves if uncertainty and ambiguity should not be given a more prominent role in this model. We have indeed shown that the presence of uncertainty and ambiguity is the core reason why new businesses are unable to define a viable business model upfront. It is exactly the presence of uncertainty and ambiguity that forces new businesses to adapt. Complexity can be better handled when ambiguity is minimal or absent. Co-ordination between the various tasks of a highly complex endeavor then becomes more predictable. Under circumstances of minimal ambiguity, the interpretability of the tasks to be executed increases, as well as their analyzability, while equivocality decreases (Perrow, 1967; Van de Ven & Delbecq, 1974; Daft & MacIntosh, 1981; Daft & Weick, 1984; Daft & Lengel, 1986). It hence appears that uncertainty and ambiguity instead of complexity form the driver of the adaptation process. Further modeling of the adaptation process should take this into account. Attributing more importance to the role of uncertainty and ambiguity in the adaptation process could also be substantiated by findings

in the new product development literature that management should be made contingent on the degree of uncertainty and ambiguity inherent in these projects (and not on the complexity as suggested by Van de Ven et al., 1999). The new product development literature also provides us with detailed insights on different types or degrees of uncertainty and ambiguity (see for example De Meyer et al., 2002). Also – contrary to the distinction between the divergent and convergent approach by Van de Ven et al. - multiple management approaches have been put forward in the new product development literature (Pich et al., 2002). We should therefore verify whether the model by Van de Ven et al. with two episodes and approaches is not too crude a representation of the adaptation process.

WHICH ORGANIZATIONAL FACTORS ENABLE ADAPTATION?

When reviewing the literature on adaptation in entrepreneurial companies, we find that not much work has been done to determine which factors enable a venture to adapt its business model. Pitt and Kannemeyer (2000) studied the effect of the entrepreneur's **personality traits** (intolerance of ambiguity, locus of control, and risk taking propensity) on the degree to which marketing strategy had changed. Stoica and Schindehutte (1999) find that **organizational culture** is related to entrepreneurial adaptation. Morris et al. (1999) suggest that **leadership** and **a tradition of change** might enable adaptation, but do not test these hypotheses. On the other hand, literature on adaptation in established organizations suggests that adaptation is related to **slack and inefficiency in resources** used (McKee et al., 1989, Muzyka et al., 1995; Holbrook et al, 2000). Entrepreneurship has been recognized to be intimately connected with the appearance and adjustment of unique and idiosyncratic resources (Alvarez, 2003). To our knowledge, no one has studied the effect of resource availability on entrepreneurial adaptation. We consider this an important question, especially since research shows that new ventures often have difficulties in acquiring resources (see our discussion of liabilities of smallness, newness and foreignness).

As summarized by Shane and Stuart (2002), some organizational studies propose that initial resource endowments have lasting effects on performance (Stinchcombe, 1965; Baron et al., 1996 and 2002; Hannan, 1998). Other researchers believe that these initial resource stocks often dissipate quickly (Bruderl and Schussler, 1990; Fichman and Levinthal, 1991). Cockburn

et al. (2000) refer to this duality. They point out that, whereas initially population ecology explained differences in performance by differences in firms' initial conditions and the strategic management literature was concerned with firms' response to environmental signals, the current understanding is that inertial forces as well as adaptation have a role to play. Initial conditions include the prior experience and initial capabilities of the company managers (see for example Helfat, 2000; Helfat and Raubitschek, 2000; Klepper and Simons, 2000; Holbrook et al, 2000; Raff, 2000; Cockburn et al, 2000; Langlois and Steinmuller, 2000). Ongoing efforts include gathering feedback from the environment (see for example Helfat and Raubitschek, 2000; Holbrook et al, 2000; Raff, 2000), paying attention to the various functional areas in the company (Holbrook et al., 2000), acquiring human and physical assets (Holbrook et al., 2000), and the presence of individual leadership (Rosenbloom, 2000). Also the ability of a company to change is expected to be determined by the initial founding conditions of the firm as well as by the ongoing efforts it makes to adapt (Helfat, 2000; Holbrook et al., 2000; Langlois & Steinmuller, 2000). Shane and Stuart point out that there is not much evidence on the effect of initial resource endowments because of the difficulty of obtaining information on the early phases of new ventures' lives.

By complementing existing insights on change in established organizations with findings from the innovation and entrepreneurship literature, we now develop an overview of possible enablers for entrepreneurial adaptation. The first two factors represent initial resource endowments, while the next five effects relate to resources that are developed over the venture's life.

The effect of prior experience on adaptability

The long-term success of a technology-based venture is associated with human capital endowments (Bruderl et al., 1992). Greater variation in the **industry experience** of its founders (Eisenhardt and Schoonhoven, 1990), founder's **experience with the specific technical problem** (Nerkar and Shane, 2003) and **with starting-up new companies** and/or with working in new ventures appears crucial (Nerkar and Shane, 2003)¹. Eisenhardt and Schoonhoven (1990) also found that the **joint working experience** of founding team members enhances the

¹ We must note however that some authors (see for example Carter and Ram, 2003; Kolvereid and Bullvag, 1992) refute the importance attributed to previous experience.

venture's chance on long-term success. Roberts et al. (1968, 1969, 1970) and Littunen and Tohmo (2003) show that it is important to start a venture with a team of entrepreneurs and a **sufficient variety in the functional backgrounds of entrepreneurs and co-workers**, since this allows the venture to acquire a sufficiently large capabilities and knowledge base.

It is not unlikely that this effect on long-term success is due to the fact that a variety in prior experience enables adaptation. Indeed, Helfat and Raubitschek (2000) and also Holbrook et al (2000) point out how prior experience has an impact on innovation and market entry decisions. As summarized by Helfat (2000), organizational change is constrained by initial capabilities (Helfat and Raubitschek, 2000; Holbrook et al, 2000; Raff, 2000; Cockburn et al, 2000; Langlois and Steinmuller, 2000), accumulated knowledge-bases, and path-dependent cognition (Tripsas and Gavetti, 2000). Also Klepper and Simons (2000) show that pre-entry experience affects the amount of innovation, and thus change, in a company. The school-of-experience view (see Christensen and Raynor, 2003; McCall, 1998) suggests that the problems entrepreneurs have wrestled with in the past have '*developed the skills and intuition for how to meet the challenge successfully the next time around*' (Christensen and Raynor, 2003, p. 180). Entrepreneurs who have had experience in adapting their strategy or business model – albeit in an established company or in an entrepreneurial company - will probably be better at adaptation in the context of a new venture.

The effect of the initial technological platform on adaptability

Tegarden et al. (1999) showed that it is not the initial technological choice of a company, but the adaptability of its technological capabilities, that determines its success. However, the **broadness of a venture's technology platform** may be of influence on its adaptability. Helfat and Raubitschek (2000) show how core knowledge – which they consider being often scientific or technological - can form foundation for multiple products and stages, across different vertical chains as well as within vertical chains. Also Teece et al (1997) point out that the depth and width of technological opportunities in the neighborhood of a firm's prior research activities will impact its future options (see also Saemundsson and Dahlstrand, forthcoming).

In general, a certain technology can be developed into a number of applications, which in turn can be developed into a number of product/market combinations. Miller (2004) shows that

diversifying firms have a greater breadth of technology than their industry peers prior to the diversification event. The broader a company's technology portfolio, the larger the number of business models on which information can be gathered (see also Nerkar and Shane, 2003, on the effect of general-purpose technologies). This may have various effects. First, more information requires longer information processing time, and thus leads to less rapid changes. Second however, the availability of more information will enable a venture to make higher quality decision with respect to change. And third, statistically speaking, the larger the number of business models, the higher the chance that one of these combinations turns out to be valuable for further development. The broader a venture's technology platform, the smaller the chance that it will have to depart from it. If a venture has to depart from its existing technology platform in order to generate/consider a number of additional options, its survival may become seriously endangered. It does appear however, that companies should not incorporate the full breadth of their technology platform into one product. Cottrell and Nault (2004) in their study of the microcomputer software industry, find that product covering more computer platforms will perform worse. The use of a broad technological knowledge therefore does not lie in the possibility to produce an all-comprehensive product, but in the potential for diversification and adaptation.

The effect of financial resources on adaptability

The availability of and the access to **financial resources** need to be taken into account as an influencing variable. Financial resources will have an effect on the adaptability of a new technology-based venture. Holbrook et al (2000) show how the inability to acquire physical assets may hinder a firm's ability to change. Existing literature states that a certain amount of slack has to be available for opportunity capture (Muzyka et al., 1995; Evans and Jovanovic, 2002), but that this does not mean that huge amounts of financing are needed (Dorfman, 1983; Stevenson and Gumpert, 1985).

The effect of human resources on adaptability

Existing literature points to the importance of internal human resources for new technology-based ventures. Holbrook et al (2000) point out how the inability to acquire human assets may

hinder a firm's ability to change. The internal organization (such as internal R&D, knowledge systems, and personnel) may enable or inhibit adaptation of the venture.

Successful exploitation of important information and technology – albeit from customers, suppliers or other external partners – is related to the capacity of adapting and improving this technology through **internal R&D**. Complementarities of external and social capital on the one hand, and internal capabilities on the other hand are necessary. Linkages with universities for example, do not lead to performance if internal capabilities or "absorptive capacity" are absent (Lee et al., 2001, Cohen & Levinthal, 1990). In his study of British science parks, Macdonald (1987) already stressed that pleasant surroundings and the presence of a university are not enough. For these parks to succeed, an internal critical mass of resources and information networks is needed. However, van Dierdonck et al. (1991) propose that this internal critical mass is not a sufficient condition for success. New technological development is not confined to a specific region but occurs in broader professional communities. Science parks therefore need to be part of a broader and often international R&D community network.

Knowledge intensive ventures need to turn scientific/technical ambitions into solid market developments - including the challenge of complementing their technological/scientific strengths with those on the level of management and market orientation on the level of the personnel (Deeds et al., 1999). Roberts et al. (1968, 1969, 1970) already found that the success of technology-based university spin-offs was related to the attention paid to **managerial** issues. Helfat and Raubitschek (2000) pointed to the importance of obtaining market feedback. Technology-based ventures need to couple **development, production and marketing** (Freeman, 1991). The ability of entrepreneurial firms to continue identifying and developing new opportunities depends on the ability of its members to share and to articulate knowledge (West, 2001).

The literature suggests that it is not sufficient to develop R&D, production, marketing, sales and general management skills. In addition, there needs to be a close coordination between the different functions. The transformation of an entrepreneurial to an established organization *'involves a gradual accretive process that requires purposive coordination of efforts across functions and cross time'* (Bhidé, 2000, p. 288). Holbrook et al (2000), in their case study of Motorola, attribute the company's dynamic capability to the skill of its managers to coordinate R&D, marketing, and production. One suggestion in this respect is the use of a cross-functional

structure in larger, established organizations. Because of the small number of employees typical for new ventures, the development of such a sophisticated structure does not appear necessary or beneficial. Close coordination however does make sense. Bhidé (2000) in this respect attributes to the entrepreneur the crucial role of coordinator. Whereas managers of established companies risk being overwhelmed by coordination mechanisms, the entrepreneur needs to build them more or less from scratch.

The effect of formal networking on adaptability

As summarized by Helfat (2000), acquisitions (Karim & Mitchell, 2000; Eisenhardt and Martin, 2000) and feedback from the environment (Helfat and Raubitschek, 2000; Holbrook et al, 2000; Raff, 2000) are important vehicles for change. Holbrook et al (2000) show how the inability to acquire external know-how and information may hinder a firm's ability to change. The ability to monitor and forecast constitute the dynamic capability of a firm.

Although new ventures are normally not in the position to acquire other companies, alternative suggestions for gathering information and feedback have been put forward in the literature. Especially the positive effects of networking (often treated in relation with geographical proximity) have been discussed extensively from the perspective of resource dependence theory, from social capital theory, and transaction cost perspective (see for example, Steensma et al., 2000; Lee, Lee & Pennings, 2001, Yli-Renko, Autio & Sapienza, 2001, Littunen and Tohmo, 2003; Thornton and Flynn, 2003).

In order to be adaptable, the new venture needs up-to-date information on changing technologies and markets needs (see also Kaufman et. al., 2000; Low & MacMillan, 1988; Saxenian 1994). By using customer feedback, the product can be targeted to the needs of the emerging market. This may even imply shifting away from original technical efforts. Networking with (potential) customers thus allows for adaptability.

Not only does networking - with small as well as large firms, with competitors as well as strategic suppliers (Kaufman et. al., 2000) - provide a firm with information on technological and market changes, it also reduces development costs and risk of irreversibility (Stuart, 2000). Small firms do very often not possess all the resources and capabilities that are needed for

NPD. Moreover, internalising the total development process may have negative effects in the long term. Indeed, when organizations internalize all the needed resources, these tend to become more specific, limiting the range of choices available for the firm (Foray, 1991; see also the discussion of commitment versus flexibility by Ghemawat and del Sol, 1998). In the terminology of Ghemawat and del Sol (1998), networking relationships are firm-specific and usage-flexible resources, allowing for commitment and flexibility at the same time (see also Stuart, 2000; Larson, 1992; Nohria and Eccles, 1992).

Another positive effect of networking can be found when looking at changes in geographical diversification. Alliances can complement or form a useful alternative for FDI (Lu & Beamish, 2001). Collaboration with foreign partners provides knowledge of and access to local markets, reduces costs and market uncertainty, and allows for adaptability, by leveraging the resources of local partners, rather than committing own resources (Schrader, 2001; Lu & Beamish, 2001).

While literature treats in great length the advantages and disadvantages of alliances and partnerships, in our view, it does not pay enough attention to the prerequisites for a new venture to enter beneficial alliances. The success of a venture in creating long-term relationships depends on its reputation and complementary assets (Teubal et al., 1991). Ventures will be able to enter into relationships with interesting partners when they are able to offer specialized, unique skills (see also Smith et al., 1991). In order to ally, firms need to bring something to the alliance. However, in the light of our discussion of liabilities of newness and smallness, we need to raise the question whether new ventures have the potential to do this. It is not unlikely that there is only a **low likelihood** that a new venture succeeds in forming a partnership.

In this regard, Shaver and Flyer (2000) point to the danger of **adverse selection** in networks. They suggest that weaker firms have more incentives for geographical clustering and networking, as compared to strong firms that have less to gain. A strong partner would be one that is able to offer some of the assets which the new venture needs but is not able to acquire or develop itself. In other words, a strong partner has relevant complementarities to offer.

As discussed above, networking can have an effect on the adaptability of a venture. However, we suggest that this not necessarily always the case. The process of developing a solid basis for collaboration – consisting of mutual trust and/or contract agreements - takes time,

manpower and resources, and can therefore lead to a loss of technical lead (Smith et al., 1991). The efforts put into establishing a solid partnership can be compensated if a venture is able to find a partner that is worth going through all this trouble. A first criterion for partner selection is that he must have relevant complementarities. A second criterion relates to the exclusivity of the partnership. While literature treats in great length the advantages of alliances, the long-term effects of networking and geographical clustering on innovative capacity and information processing may be less positive. If relations with key customers become too close, they may insulate small firms from other sources of information and foreclose opportunities. Indeed, as the level of trust and the quality of the relationship become higher, the need to monitor diminishes, decreasing the level of information processing (Yli-Renko, Autio & Sapienza, 2001). Furthermore, a company's scope may become restricted to that of the cluster /network (Pouder & St John, 1996). This relates to Granovetter's argument (1973) on the bridging power of weak ties. Information spreads rapidly within strong cliques. Therefore, the diffusion of new ideas must come through the weak ties that connect people or businesses in separate cliques (Debackere and Clarysse, 1998). As the resources of collaborative firms become more integrated, and thus – according to Foray (1991) – more specific, the range of options that a firm has, decreases. Collective learning within networks is linked to specific technologies and therefore diffusion of innovation is often based on incremental adjustments. During periods of radical technological change, adherence to a network may therefore become an exit barrier from the established form of production (Bianchi & Bellini, 1991, Glasmeier, 1991), thus inhibiting adaptiveness and flexibility. The existence of **complementarities** as well as the **exclusivity** of the partnership may therefore determine the effect of networking on adaptability. When a new venture partners up with a company that does not have any relevant complementarities, it will not be able to gather or co-construct any necessary information from this alliance. Under exclusivity, the venture will not be allowed to look for relevant information elsewhere (that is: in other partnerships), and its adaptability will thus be negatively influenced. Under non-exclusivity, the venture will have more freedom to look for relevant information elsewhere, and its adaptability will be un-influenced. However, non-exclusivity may also provide the venture with fewer resources. In addition, enhanced performance does not only depend on the value of the individual alliances, but also on the way these alliances are **configured** into an efficient network, with a minimum of redundancy, internal conflict and complexity on the one hand, and a maximum of diverse information and capabilities on the other hand (Baum, Calabrese & Silverman, 2000).

Interaction effects

The absorptive capacity of an organization will influence its ability to use new information (Roberts, 1991) such as information gathered through networking (Ferriani, work in progress). Absorptive capacity can be defined as 'the ability to recognize the value of new information, assimilate it, and apply it to commercial use' and has been shown to be related to an organization's preexisting knowledge structure (Cohen & Levinthal, 1990). In the case of new technology-based ventures, the preexisting knowledge structure consists of knowledge present at founding (e.g. broadness of initial technology platform and prior experience of the founders; see also Shane, 2002), as well as knowledge that is accumulated over the venture's life through for example attention paid to different functions.

We may also expect an interaction effect between the prior entrepreneurial experience of the founders on the one hand and financial resources on the other hand. This may be especially true if the company can attract venture capital. Venture capitalists may provide entrepreneurs with much more than just financial resources (Hsu, 2004a). Their services may include business referral, mentoring, industry knowledge, recruitment assistance, etc. Venture capitalists differ in their value-added potential (Hsu, 2004a; Bygrave and Timmons, 1992; Sahlman, 1997). In addition, founders of new ventures differ in their ability to acquire venture capital. Entrepreneurial founding experience affects the timing and valuation of venture capital funding (Hsu, 2004b). Founders with prior experience of starting-up businesses may also be able to acquire 'higher-quality' capital, such as investments from experienced, well-networked venture capitalists. This means that the effect of financial resources on adaptation may differ depending on the experience of the founders. This effect may be larger for experienced founders because of the higher intrinsic quality of the financial resources they are able to gather.

Conclusion

When reviewing the literature on adaptation in entrepreneurial companies, we find that not much work has been done to determine which factors enable a venture to adapt its business model. Literature on adaptation in established organizations suggests that adaptation is related

to slack and inefficiency in resources used, but to our knowledge, no one has studied this effect in the context of entrepreneurial start-ups. This is particularly surprising given the difficulties new ventures often have in acquiring resources (see our discussion of liabilities of smallness, newness and foreignness). We therefore conclude that more research is needed to investigate the effect of resource availability (and substitutes such as alliances) on entrepreneurial adaptation. Furthermore, some organizational studies propose that initial resource endowments have lasting effects on performance, while others attribute more importance to continuously developed resources. Therefore, when researching the effect of resource availability and alliances on entrepreneurial adaptation, we need to look at initial resource endowments as well as at the resources acquired later on, and at the resource acquisition process itself.

THE CONCEPT OF ENTREPRENEURIAL ADAPTATION PUT INTO PERSPECTIVE

In the context of new venture development, adaptation refers to the entrepreneur's willingness and ability to make appropriate adjustments to the business model as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle (Morris et al., 1999; Pitt and Kannemeyer, 2000). For reasons of clarity, it is important to discuss how this concept of 'entrepreneurial adaptation' relates to the more traditional concepts of adaptation and change in existing literature.

The concepts of adaptive behavior and change are used in a variety of contexts. Literature on change in **groups** (see for example Okhuysen, 2001; Isenberg, 1981) points out that in order for a group to accomplish an ambiguous task, the ability to change to meet unexpected challenges or to take advantage of new opportunities is critical. As the requirements for the task become evident, the group needs to adapt and change its activities accordingly. Also in research on **new product development** (see for example Iansiti, 1995; Verganti et. al., 1998) the success of a project is attributed to a team's flexibility and adaptiveness to continuously incorporate new information on markets and technological developments until late in the development process. The longer a project team has worked together, the more this ability to continuously incorporate new information decreases because team members become averse to and uninterested in information which is not generated internally (the not-invented-here syndrome as described by Katz and Allen, 1982). Case studies on **regional development**

have demonstrated the importance of dynamic adaptiveness in addition to static efficiency of regional clusters (see for example Storper and Harrison, 1991; Saxenian, 1994). In addition change in the structure of industries has been addressed in depth by literature on **industry evolution** (see for example Rumelt, 1984; Utterback, 1987; Klepper and Simons, 2000; Barnett, 1995; Klepper and Graddy, 1990). The concepts of adaptation and change are certainly relevant on the level of groups, teams, clusters of firms and industries. In the following section, however, we will restrict ourselves to discussing them on the level of the organization.

We will start by reviewing existing definitions of organizational change. We will then discuss a number of prominent streams in the change literature. To conclude, we will analyze how the concept of 'entrepreneurial adaptation' relates to the existing literature and where its value-added lies.

Definitions of change: dimensions of pressure, radicality and timing

Organizations can be viewed as dynamic systems of adaptation and change - two terms that are often used interchangeably - that contain multiple parts that interact with one another and the environment (Morel & Ramanujan, 1999). Existing views on adaptation and their definition of 'change' differ with respect to (1) whether the pressures for change reside within the organization or within the environment with which it interacts and with respect to (2) radicality and timing of change.

Internal versus external pressures for change

There exist different perspectives on whether the pressures for change are internal or external to the organization (for an overview, see Siggelkow & Levinthal, 2005). Change or adaptation is often seen as an organization's **response to changes in external factors**, threats and opportunities. Organizational adaptation or change is then defined as "...*change in a significant organizational attribute, such as basic business strategy or organizational structure in response to environmental changes...*" (Kraatz, 1998).

Just as some research stream look at environmental pressures, others focus on **internal** pressures for organizational change. As shown by Siggelkow & Levinthal (2005), authors such

as Chandler (1962) and Lawrence and Lorsch (1967) alluded to internal reasons for change and most life-cycle models adhere to this perspective.

A more inclusive view on change suggests that **both external and internal pressures** for change are relevant (Morel and Ramanujan, 1999). Also the innovation literature pays attention to internal as well as external change forces. Examples are the distinction between market pull and technology push, the concept of architectural innovation (Henderson and Clark, 1990) as an internal driver for innovation, and also the moving focus from product solutions to customer solutions as an indication of external pressures for change (von Hippel, 1988; Christensen, 1997; Christensen and Raynor, 2003). We can then define organizational change or adaptation as change in a significant organizational attribute in response to changes internal and/or external to the organization.

Timing and Radicalness of change

Literature distinguishes between **radical and gradual change**. The distinction between radical and gradual change often appears inextricably coupled to the one between **periodical and continuous change**. Different perspectives exist on how change is distributed over time (for an overview, see Tyre and Orlikowski, 1994). While some research streams put forward the idea that change is continuously distributed over time, others propose that change takes place through periodic, on-time corrections.

One-time corrections are for example put forward in life-cycle literature (Gersick, 1994; Romanelli & Tushman, 1994; Tushman & Romanelli, 1985). Similarly, Winter (2003) suggests that one way of dealing with change is by 'firefighting' or **ad hoc problem solving**. This type of high-paced, contingent, opportunistic, perhaps creative search for satisfactory alternative behaviors typically appears as a response to novel challenges from the environment or other relatively unpredictable events. Ad hoc problem solving behaviors are largely non-repetitive and intendedly rational; they are not routines, not highly patterned and not repetitious. An advantage of ad hoc problem solving is that its cost largely disappear when there are no problems to solve or changes to make.

However, when change is frequent and 'firefighting' becomes expensive, then different – more continuous - ways of dealing with it should be taken into consideration (Winter, 2003). Also studies on innovation (Brown & Eisenhardt, 1997; Muzyka & de Koning, 1995; Nonaka, 2000)

as well as on industry evolution and evolutionary economics suggest the need for **continuous change** over extended periods of time. Teece et al (1997) look at how firms operating in environments of rapid technological change are able to achieve and sustain competitive advantage. The ability of a firm to achieve new forms of competitive advantage are generally termed **dynamic capabilities** (Teece et al., 1997).

Dynamic capabilities

The notion of continuous change or adaptation is closely related to the concept of 'dynamic capabilities'. In contrast to 'ad hoc problem solving' (see Winter, 2003), the concept of dynamic capabilities refers to continuous change. A firm's competitive advantage can be eroded, depending on the stability of market demand, the ease of replicability and imitability. Organizational capabilities that are the source of competitive advantage in equilibrium – termed zero-level capabilities by Winter (2003) - may become inadequate for sustaining this competitive advantage under conditions of **change**. Dynamic capabilities are considered the source of sustained competitive advantage in changing markets. They relate to the capacity to renew competences so as to achieve congruence with the changing business environment. Eisenhardt & Martin (2000) therefore consider research on dynamic capabilities as the extension of the resource-based view to dynamic markets. Winter (2003) points to the broad consensus in literature that dynamic capabilities contrast with ordinary capabilities by being concerned with change. According to Collis (1994) dynamic capabilities govern the rate of change of ordinary capabilities. In Winter's terms (2003), this corresponds to first-order capabilities, representing change in the zero-level capabilities. Examples are capabilities that change the product, the production process, the scale, or the customers. Product development strategic decision making, and alliancing have been put forward as concrete examples of first-order dynamic capabilities (Eisenhardt & Martin, 2000; Teece et al., 1997). The difference between zero-order and first-order capabilities is closely related to Collin's distinction between static, dynamic, and creative capabilities. **So, according to the existing literature, dynamic capabilities are concerned with changes in zero-order capabilities.**

According to Eisenhardt and Martin (2000) dynamic capabilities integrate, reconfigure, gain and release resources. Similarly, Teece et al. (1997) propose that dynamic capabilities are about **continuously integrating, building and reconfiguring** internal and external competences to

address rapidly changing environments; with competences signifying organizational routines and processes (e.g. quality, miniaturization, systems integration) that are typically viable across multiple product lines and even outside the organization (see also Helfat & Raubitschek, 2000; Helfat & Peteraf, 2003). Eisenhardt & Martin (2000) propose that dynamic capabilities are idiosyncratic in their details. They are specific to every individual firm since they emerge from the path-dependent history of this specific firm. However, dynamic capabilities also exhibit common features associated with best practices across firms. This implies that there are multiple (idiosyncratic) ways of developing similar dynamic capabilities (i.e. with common features). The value of dynamic capabilities for sustainable competitive advantage therefore does not lie in the dynamic capabilities themselves, but in the resource configurations they create, by enhancing existing resource configurations, by building new ones or by releasing resources that no longer provide competitive advantage (Eisenhardt & Martin, 2000).

The literature on change exhibits a variety of concepts related to the notion of 'dynamic capabilities'. As pointed out by Eisenhardt and Martin (2000) and Dosi et al (2002), the terms 'competences' – as in 'architectural competences' (Henderson and Cockburn, 1994) and 'core competences' (Prahalad and Hamel, 1990) - and also 'combinative capabilities' (Kogut and Zander, 1992) are very similar to 'dynamic capabilities'; all being concerned with the firm's ability to carry off the balancing act between continuity and change in its capabilities.

The building blocks of dynamic capabilities

A good starting point for understanding the concepts of capabilities and dynamic capabilities is the research on **competitive advantage** of organizations. According to the resource-based view of the firm, organizations can achieve competitive advantage when they have resources that are valuable, rare, inimitable, and non-substitutable (Eisenhardt and Martin, 2000). Although some authors (e.g. Barney, 1986) consider all resources as buyable and separable from the firm context, the generally accepted view is that some resources are not for sale and can only be gradually accumulated and shaped within the firm. In addition, they may not be of any value in the market when offered in isolation. Unique, difficult-to-imitate resources acquired through organizational learning are then seen as sources of competitive advantage (Dierickx and Cool, 1989).

According to Dosi et al. (2002), **capabilities** are a prominent example of such gradually accumulated and shaped resources, critical for a firm's competitive advantage. They define

organizational capabilities as *"the know-how that enables organizations to perform and extend its characteristic 'output' actions"*. Some examples of organizational capabilities are the production, marketing, sales of a product or service. Essential to the notion of capabilities is that they cannot be readily assembled through markets (Teece et al., 1997; Teece, 1982, Zander and Kogut, 1995).

Dosi et al. (2002) elaborate on the difference and relation between capabilities and **routines**. Capabilities in their view relate to *"a fairly large-scale unit of analysis, one that has a recognizable purpose expressed in terms of the significant outcomes it is supposed to enable, and that is significantly shaped by conscious decision both in its development and deployment."*

The role of intentionality, conscious deliberation, planning, and expertise for building capabilities contrasts and adds to the evolutionary view that low-level operating routines quasi-automatically will lead to performance. Whereas the building of an organizational capability is intentional, specific exercise thereof may be intentional but may also be quite automatic. In the latter case, capabilities are structured through a self-organizing, bottom-up process rather than through the intention to exercise them. This distinction between the purposeful building of capabilities and the quasi-automatic exercise thereof, relates closely to Winter's definition (2003) of organizational capability as *'a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type'* and to Collis' definition (1994) of organizational capabilities as *"the socially complex routines that determine the efficiency with which firms physically transform inputs into outputs"*.

Nelson & Winter (1982) view routine as organizational memory: organizations remember a routine by doing/exercising it. Similarly, Winter (2003) describes routines as behavior that is learned, highly patterned, repetitious, or quasi-repetitious, founded part in tacit knowledge. This emphasis on repetition and frequency over long periods of time corresponds to the view of Dosi et al. (2002) that capabilities involve the execution of high-frequency, repetitive daily business. Routines are regarded as the building blocks of capabilities, although other building blocks such as individual skills (where 'skills' on the individual level correspond to 'routines' on the organizational level; see Nelson & Winter, 1982) exist as well. Some routines may be called organizational capabilities if they satisfy the criteria of fairly large-scale, purposefulness and intentionality (Dosi et al., 2002). **So, according to the existing literature, capabilities**

consist amongst others of routines, and these routines are learnt through frequent repetition over long periods of time.

Capabilities are generally characterized as complicated routines that emerge from **path-dependent** processes (Nelson & Winter, 1982). Teece et al. (1997) demonstrate that processes (i.e. current routines) are shaped by the firm's current asset positions and molded by its paths. These path-dependencies exist because learning tends to be local. Related reasons – as put forward by Nelson and Winter (1982) – are that control processes of organizations tend to resist mutation, and that change takes the path of least resistance. Dosi et al. (2002) show how this aspect of firm capabilities relates to Evolutionary Economics, where firm capabilities are **not considered to change radically in short periods of time**. Instead, the emphasis is on accumulation of capabilities and the fact that the options for further development are limited by past decisions. A nice illustration is the suggestion by Nelson and Winter (1982) that their findings may have relevance for certain types of innovation, however not for organizations such as R&D laboratories and consulting firms that are involved in the production or management of economic change as their principal function. They suggest that innovation in organizational routines consists to a substantial extent of a recombination of existing routines and that highly flexible adaptation to change thus is not likely to characterize the behavior of individual firms. As shown by Teece et al. (1997), the Resource-Based View of the firm takes a very similar stance, in that it considers resources/capabilities/endowments sticky in the short-run. Or as Cockburn et al (2000) put it: *"The Resource based view of the firm often seems to suggest that organizations can only change through limited, local search. Strategy is then not only about the cognitive ability of senior management and their ability to make the 'right' decisions, but also about their ability to work creatively with the raw material presented by their firm and their environment."* **So, according to existing literature, routines and capabilities cannot change radically in short periods of time.**

The applicability of 'dynamic capabilities' beyond situations of gradual change

Some of the characteristics of dynamic capabilities discussed above have limited the general use of the 'dynamic capabilities' concept to situations of moderate change. As argued above, purposeful routines form the building blocks of zero-level as well as higher-order capabilities. Routines – and thereby also dynamic capabilities – can only be learnt through frequent repetition over long periods of time. They will normally stop being repeated (at least purposefully) when change renders them obsolete. The logical conclusion appears then that

dynamic capabilities can only be developed when circumstances are relatively unchanged over a significant period of time. This is exactly the stance that Nelson and Winter (1982) take when pointing out the limitations of their work on capabilities. Because of the notion of 'routines', they describe their work as being related mainly to organizations that provide goods or services that are visibly the same over extended periods of time. **So, according to existing literature, capabilities and thus also dynamic capabilities can only be developed when circumstances are relatively unchanged over a significant period of time.**

In addition, dynamic capabilities are concerned with changes in zero-order capabilities and their constituent routines. If dynamic capabilities are per definition about changes in lower-order capabilities and constituent routines, and if routines and capabilities cannot change radically in short periods of time, then the logical conclusion seems that dynamic capabilities cannot enable radical, short-term change. They will therefore not be valuable under circumstances of fast-paced, radical change. **So, according to existing literature, dynamic capabilities are not valuable under circumstances of fast-paced, radical change.**

However, **some empirical research findings contradict the proposition that dynamic capabilities can only be built and are only valuable under long periods of moderate change.** The study that maybe most explicitly opposes to this proposition, is by Eisenhardt and Martin (2000). They explicitly discern between dynamic capabilities for moderately dynamic markets and for high-velocity markets. Moderately dynamic markets are characterized by frequent, but roughly predictable and linearly evolving changes, a relatively stable industry structure, clear market boundaries, and well-known players. High-velocity markets demonstrate highly unpredictable, non-linear changes, unclear industry structure, blurred market boundaries, ambiguity about and shifts in relevant players. Sustained competitive advantage is considered unlikely in dynamic markets (D'Aveni, 1994). Similarly, Eisenhardt and Martin do not believe in the possibility of leveraging existing resource configurations in the pursuit of long-term competitive advantage in high-velocity markets. Under the resource-based view of dynamic capabilities as the ability to leverage competences to address rapidly changing environments, this is the same as saying that they do not believe in the value of dynamic capabilities in high-velocity markets. However, Eisenhardt and Martin do not adhere to this traditional definition of dynamic capabilities. Instead, they propose that the strategic imperative under high-velocity markets is change, and not leverage. Instead of enhancing/leveraging the existing resource configurations in the pursuit of long-term competitive advantage, an

organization in high-velocity markets should build new resource configurations in the pursuit of temporary advantages or opportunities, thus creating a series of temporary advantages.

Referring to well studied processes such as product development, alliance-formation and strategic decision making, the authors point out that this broader definition of dynamic capabilities calls for a richer conception of routines that goes beyond the usual view of efficient and robust processes to include these more fragile, semi-structured ones that are effective in high-velocity markets. In moderately dynamic markets, dynamic capabilities are described as analytic, stable processes, relying extensively on existing knowledge, 'learning before doing', and linear execution (beginning with analysis and ending with implementation) to produce predictable outcomes. They resemble the traditional conception of 'routines' (i.e. complicated, predictable, analytic, relying on existing knowledge, linear, slowly evolving over time). However, for high-velocity markets, the authors describe dynamic capabilities as simple, semi-structured, experiential processes, relying on 'learning by doing', rapidly created situation-specific new knowledge and iterative execution to produce adaptive, but unpredictable outcomes. Dynamic capabilities in high-velocity markets are difficult to sustain because they rely on simple routines that are easy to forget. In high-velocity environments, effective routines are adaptive to changing circumstances. The price of that adaptability is unstable processes with unpredictable outcomes.

Similarly, Eisenhardt and Martin propose that the learning mechanisms guiding the evolution of dynamic capabilities differ depending on market dynamism. In moderately dynamic markets, the organization builds up experience in closely related but different situations. This kind of experience – with frequent, small variations – will be effective in sharpening dynamic capabilities. In high-velocity markets, the selection of relevant past experience becomes more important than variation. Selection is difficult because it is challenging to figure out which experience should be generalized from the extensive situation-specific knowledge that occurs (see also the schools-of-experience view; Christensen and Raynor, 2003; McCall, 1998).

Not everyone supports the hypothesis of Eisenhardt and Martin to broaden the traditional definition of routines and dynamic capabilities in order to encompass the more fragile, semi-structured ones they discuss in their study. Winter (2003) for example, simply categorizes these experiential, fragile, semi-structured activities as 'ad hoc problem solving'. In his view, ad hoc problem solving may be patterned at a higher level, guided by adherence to relatively

simple rules and structural principles; and he considers the activities put forward by Eisenhardt and Martin as examples thereof. Many researchers are still very skeptical about the existence of dynamic capabilities for high-uncertainty/high-velocity environments. They believe success under these conditions simply depends on luck, leadership, culture and good management practice or ad hoc problem solving. We might ask ourselves whether ad hoc problem solving in itself is not a dynamic capability in high-velocity environments. Although specific solutions may differ across problems and over time, understanding and organizing for these frequent problems may require certain routines and capabilities.

Entrepreneurial adaptation: a dynamic capability?

We defined 'entrepreneurial adaptation' as the entrepreneur's willingness and ability to make appropriate adjustments to the business model as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle (cfr. Morris et al., 1999; Pitt and Kannemeyer, 2000). According to Druilhe and Garnsey (2004) opportunity detection and mobilization, combination and organization of resources are critical parts of this adaptation process. In their view "*entrepreneurial projects progress through the continual interaction between shifting opportunities and emerging combinations of resources*" (Druilhe and Garnsey, 2004, p. 273). They find that the interaction between opportunities and resources is iterative, non-linear, and bi-directional. On the one hand, the type of business opportunity selected in the initial business model influences the resource requirements, on the other hand, improved knowledge of resources and opportunities will allow entrepreneurs to adapt and modify their business model. Similar to Druilhe and Garnsey (2004), Vohora et al. (2004) find that "*the entrepreneurial teams faced the challenges of continuously identifying, acquiring and integrating resources and then subsequently re-configuring them.*"

These findings of Druilhe and Garnsey (2004) and Vohora et al. (2004) characterize entrepreneurial adaptation as a **continuous** change process and show remarkable similarities to the description of **dynamic capabilities** as put forward by Teece et al. (1997) as being about continuously integrating, building and reconfiguring internal and external competences to address rapidly changing environments; with competences signifying organizational routines and processes. However, whereas in general the literature on dynamic capabilities regards adaptation as an organization's response to changes in the environment, 'entrepreneurial

adaptation' is needed regardless of environmental change. It is about entrepreneurs and ventures who need to find their place in the environment, or even about them finding the most appropriate environment.

Although entrepreneurial adaptation shows remarkable similarities to the concept of dynamic capabilities in established organizations, there are issues that need further investigation in this respect. According to existing research, entrepreneurial adaptation can lead to **gradual as well as radical change**. Van de Ven et al. (1999) show that the development process of an initial idea into a viable business model is characterized by converging and diverging phases, in which the entrepreneurial team respectively elaborates/confirm/refines a certain opportunity, or completely changes course by radically altering the business model. The possibility of radical and at the same time continuous change goes against the traditional view on dynamic capabilities. However, it would correspond to the findings of Eisenhardt and Martin (2000) on the existence of dynamic capabilities in high-velocity markets.

SUMMARY AND DIRECTIONS FOR FURTHER RESEARCH

In this paper, we have tried to give an overview of insights that are relevant to entrepreneurial adaptation. These insights all relate to the questions (1) What causes the need for entrepreneurial adaptation? (2a) What is the precise effect of entrepreneurial adaptation on a start-up's performance or survival and (2b) is this effect similar for all start-ups? Also, (3) what do we know about the process of entrepreneurial adaptation? And (4) what are factors enabling this adaptation process? A number of relevant insights have already been validated in existing research. With regard to question (1), various studies demonstrate that the need for entrepreneurial adaptation is caused by the presence of uncertainty and ambiguity. Liabilities of newness, smallness and foreignness hinder new ventures to cope with problems, including with this presence of uncertainty and ambiguity.

Other suggestions from literature on entrepreneurship, on adaptation in established organizations and on innovation management, appear relevant, but need empirical testing in the context of entrepreneurial adaptation. With regard to question (2a), literature on established firms points to the danger of not only 'under-adaptation', but also 'over-adaptation', implying an

inverse u-shaped relationship between adaptation and performance. Since this relationship has not yet been investigated for a sample of young, entrepreneurial companies, it deserves further research attention. Besides, the entrepreneurship literature suggests that this relationship between entrepreneurial adaptation and performance may be moderated by characteristics of the start-up such as the former experience of the founder(s) and whether the company has its origin in an established company or research organization. Sector studies point to the possible moderating effect of maturity, capital intensity and regime of technological opportunity on the relationship between adaptation and performance. So, with regard to question (2b), we can conclude that new research on the relationship between entrepreneurial adaptation and performance needs to take into account these possibly moderating company and sector characteristics.

In order to gain more insight in the entrepreneurial adaptation process itself (question 3) we reviewed various literature streams, including life-cycle models and literature on innovation management. The model by Van de Ven et al (1999) is an interesting representation of the innovation process. It is based on detailed empirical observations and describes innovation as a cyclical process consisting of two alternating episodes of respectively divergent and convergent behavior. This cyclicity relates to and confirms the bi-directionality and non-linearity described in recent life-cycle models. However, in the context of new ventures, we might ask ourselves if uncertainty and ambiguity should not be given a more prominent role in this model. This would relate to other findings in new product development literature that management should be made contingent on the degree of uncertainty/ambiguity inherent in these projects (and not on the complexity as suggested by Van de Ven et al., 1999). In addition, the model in two phases with two learning mechanism by Van de Ven et al. should be reviewed in detail, given the fact that others have proposed more than two types/degrees of uncertainty/ambiguity (De Meyer et al., 2002) and the existence of multiple management approaches (Pich et al., 2002). Therefore, more research is needed to iteratively test the model by Van de Ven et al. (1999) and additional insights on the role of uncertainty/ambiguity drawn from new product development literature.

When reviewing the literature on adaptation in entrepreneurial companies, we also find that much work still needs to be done to determine which factors enable a venture to adapt its business model (question 4). Literature on adaptation in established organizations suggests that adaptation is related to slack and inefficiency in resources used, but to our knowledge, no

one has studied this effect in the context of entrepreneurial start-ups. This is particularly surprising given the difficulties new ventures often have in acquiring resources (see our discussion of liabilities of smallness, newness and foreignness). We therefore conclude that more research is needed to investigate the effect of resource availability (and substitutes such as alliances) on entrepreneurial adaptation. Furthermore, some organizational studies propose that initial resource endowments have lasting effects on performance, while others attribute more importance to continuously developed resources. Therefore, when researching the effect of resource availability and alliances on entrepreneurial adaptation, we need to look at initial resource endowments as well as resources acquired later on.

By investigating these questions more in-depth, we may also learn more about (5) how the concept of entrepreneurial adaptation is related to existing concepts of change and adaptation. More precisely, we will be able to investigate whether the adaptation process consists of underlying routines, whether it is governed solely by 'ad hoc problem solving', or whether maybe 'ad hoc problem solving' itself is a kind of routine or capability in high-velocity environments. Research on the adaptation process and its enabling factors will also reveal whether entrepreneurial adaptation is really an organizational capability or a personal skill of the entrepreneur. These insights will provide us with new insights in the existence and role of dynamic capabilities in young organizations active in high-velocity environments. They will also allow us to validate or refine the definition and the anatomy of dynamic capabilities.

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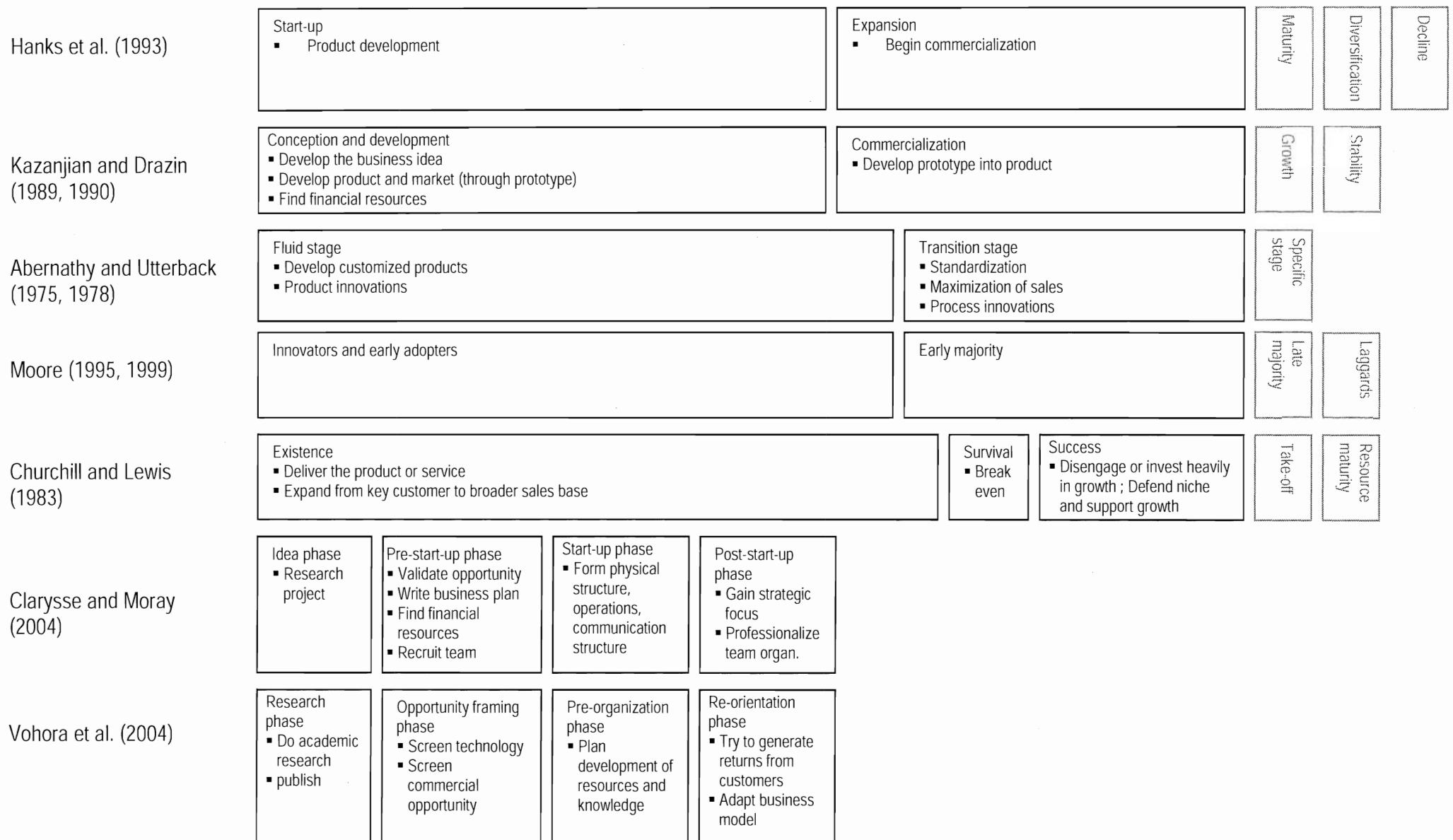


Figure 1: Overview of the major literature streams on start-up phase

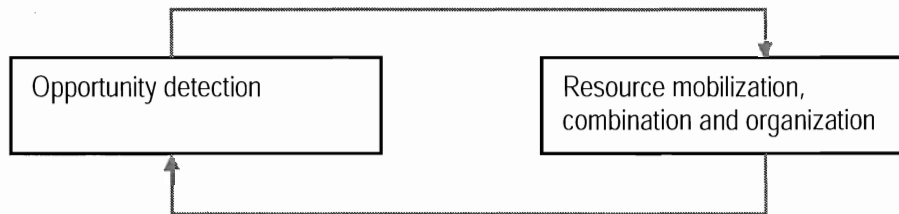


Figure 2: Cyclical model by Druilhe and Garnsey (2004)

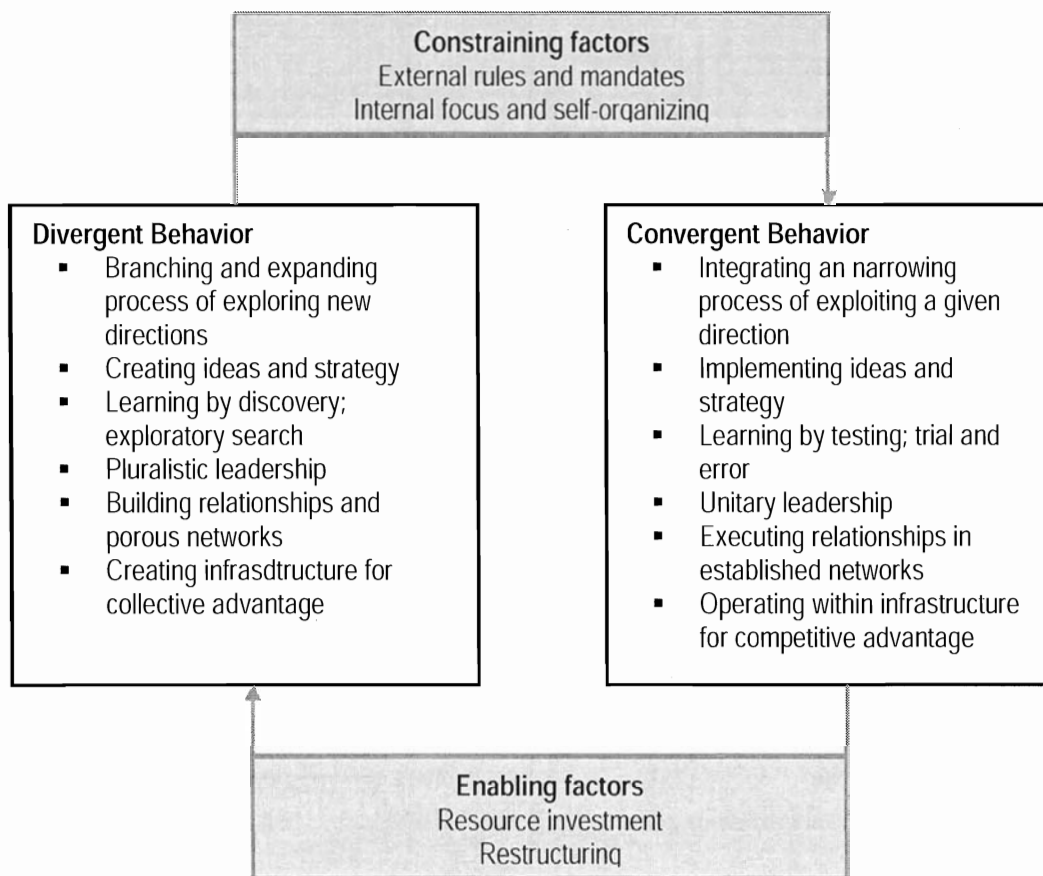


Figure 3: Cyclical model by Van de Ven et al. (1999)