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RESEARCH IN COMPETENCE-BASED MANAGEMENT
VOLUME 3

A Focused Issue on

UNDERSTANDING GROWTH: ENTREPRENEURSHIP, INNOVATION AND DIVERSIFICATION

RON SANCHEZ
AIMÉ HEENE
Editors

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RESEARCH IN COMPETENCE-BASED MANAGEMENT

Series Editors: Ron Sanchez and Aimé Heene

Volume 1: The Marketing Process in Organizational Competence
Edited by Ron Sanchez and Jörg Freiling

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UNDERSTANDING GROWTH: ENTREPRENEURSHIP, INNOVATION, AND DIVERSIFICATION

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EDITORS' INTRODUCTION

We are pleased to serve as editors of this volume of the journal *Research in Competence-Based Management* (RCBM). We would like to thank all the authors who have contributed papers to this important volume.

We would also like to take this opportunity to introduce RCBM to readers. This volume is the third issue in a new journal for peer-reviewed research papers contributing to advancement of competence-based management theory. Although published in hardcover format, RCBM is designed as a peer-reviewed academic journal and is intended initially to appear twice a year. Each volume will contain approximately 10 papers, and successive volumes will address a broad range of management topics being investigated today through the competence perspective. The researchers contributing papers to each volume will typically come from a number of institutions and countries around the world, as our list of contributors in this volume attests.

Like the present volume, each volume in RCBM will be partially or wholly focused on a key aspect of competence theory. The focus in this volume on "Understanding Growth: Entrepreneurship, Innovation, and Diversification" reflects the fundamental importance in the competence perspective of organizational growth and development through processes of competence building and leveraging. The previous two volumes of RCBM have focused on similarly important aspects of competence theory.

Volume 1
The Marketing Process in Organizational Competence
Ron Sanchez and Jörg Freiling, Editors

Volume 2
Managing Knowledge Assets and Organizational Learning
Ron Sanchez and Aimé Heene, Editors

Future volumes will feature additional focal themes and editors. Researchers in the competence perspective who would like to organize or act as a coeditor of a future volume are invited to contact Ron Sanchez or Aimé Heene with expressions of interest.

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INTRODUCTION TO UNDERSTANDING GROWTH: ENTREPRENEURSHIP, INNOVATION, AND DIVERSIFICATION

Inherent in the concepts of competence building and leveraging are notions of organizational growth in several forms. Changing competitive environments today virtually force firms to continuously build and leverage new resources, capabilities, and competences. Entrepreneurship – whether enacted by the lone entrepreneur or through processes of corporate "intrapreneuring" – is an increasingly important form of growth activity. To grow current market positions and to stake out new market positions, firms today must also be able to continuously innovate new technologies, products, and market positions. As firms seek or discover opportunities to leverage their existing capabilities beyond their current markets, both diversification and alliances are becoming increasingly prevalent and economically important forms of growth activity.

The papers in this volume examine many aspects of these three important forms of growth: entrepreneurial activity, innovation, and corporate diversification. We briefly summarize below the main topics and contributions of each paper in this volume.

PART I. ENTREPRENEURSHIP

In their paper "Entrepreneurial drives and dynamic capabilities in situations of encompassing change," Maria Bengtsson and Carin Holmquist clarify the roles of entrepreneurial actors in the development of dynamic capabilities. They suggest how four "entrepreneurial drives" – technological, market, business, and development – lead entrepreneurs and their firms to try different strategies to cope with broad market and other forms of environmental change through building different sets of capabilities. Their study of four high-tech firms suggests how these entrepreneurial drives can lead to the creation of new organizational units and new combinations of external and internal capabilities. They suggest that finding ways to combine these different drives is important, as is the formation of specific kinds of entrepreneurial roles (creators, expanders, and builders).

Markets are complex systems of interactions among diverse actors, and both the structural and dynamic complexity of markets has increased over time and is expected to increase in the future. In their paper "Entrepreneurial volition to take action and the United States markets of the 1990s," Janice Black and Gerard Farias analyze how some of the complexity in markets results from entrepreneurs taking action in the face of uncertainty and ambiguity. They suggest that understanding how to take action in the face of uncertainty and ambiguity – and then to evaluate market responses to such action – is an increasingly important capability to be cultivated by today's managers and entrepreneurs. To assist both researchers and managers, Black and Farias present a model of competence-based entrepreneurial action-taking, and ways in which entrepreneurial action-taking can influence markets. The theoretical model is applied to the "dot.com phenomena" during the height of the dot.com frenzy.

In their paper "Corporate venture capital: Leveraging competences, hedging uncertainty, or creating an ecosystem?" James Henderson and Benoit Leleux examine the increasingly important role of corporate venture capital (CVC) programs in sustaining or renewing profitable corporate growth. They show how CVC funds have increased in recent years as a strategic response to rapid changes in new technology, to new opportunities in the internet economy, and to the attractive returns made by independent venture capital funds. They argue that the mission of CVC programs could also be shifted to profitable opportunities to overcome incompatibilities within various aspects of a firm's strategic objectives. Using resource-based, real options, and network perspectives, the authors develop a taxonomy of CVC activities to categorize investments as leveraging competences to develop new or improved products/activities, hedging against market and technology uncertainties, or creating an "ecosystem" of third-party implementors and complementors. Clinical research using this CVC taxonomy on several CVC programs based in North America and Europe is described and its managerial implications discussed.

PART II. INNOVATION

Global corporations in high-tech industries are involved in fierce competition to develop innovative technologies and businesses. In a growing number of cases, these corporations are seeking to meet this challenge by stimulating business growth and development through corporate "intrapreneurship" activities supported by internal and external corporate venturing activities rather than conventional research and development processes. Applying a competence-based strategic management perspective, Tino Michalski in his paper "Corporate entrepreneurship from a competence-based management perspective" analyzes these alternative forms of managing corporate innovation. He proposes ways of putting these alternative forms of corporate innovation management to good use in the increasingly fast-moving global innovation race. Michalski's analysis especially addresses the question of how to maximize innovation success through corporate venture portfolios.

In order to remain competitive in changing competitive settings, firms have to continually innovate in products, processes, resources, and capabilities. In his paper "Innovation strategies in small firms: A competence-based model for empirical research," Emilio Bellini proposes a competence-based methodology for researching innovation strategies of small firms. His paper discusses key concepts used by current strategy schools, and specifically focuses on the relevance of "emotional and intuitive energy" in innovation management in small firms. He also elaborates how the "strategic intent" approach proposed by Prahalad and Hamel can be integrated with the "strategic logic" approach proposed by Sanchez and Heene. His proposed model for empirical research identifies specific categories of resources and capabilities that are useful in defining a firm's innovation strategies. This model is then applied to the analysis of innovation processes in five small software firms. These cases show that the common trait of the most successfully innovative firms is the ability to integrate "marketing resources" and "technological resources."

The paper "Building new competences for new business creation based on breakthrough technological innovations" by Wim Vanhaverbeke and Robert Kirschbaum focuses on the co-evolution of new business development and technology-driven competence building processes and on the co-evolution of strategizing processes and corporate venturing initiatives. The authors analyze how corporate ventures that are set up to develop and commercialize radical innovations can play a central role in the process of building new competences that become the basis for a range of new businesses. The authors also suggest factors that improve the ability of new business development and corporate venturing to stimulate corporate renewal. The authors argue that new competences can only be built through a sequence of corporate venturing initiatives and that both competence building and new business development can only be fully understood in relation to corporate strategy making. They also discuss the need for balance in the tension between a corporate vision that should stretch the company beyond its existing resources and knowledge base, on the one hand, and new competence building that drives and refines the cognitive processes of corporate strategy, on the other.

PART III. DIVERSIFICATION AND ALLIANCES

In their paper "Competence at work: Empirical evidence for competence-based diversification in the world automotive supplier industry," Eric Pfaffmann and Michael Stephan investigate the investment strategies of 20 non-German large multinational automotive supplier companies (MSCs) in the German market, where MSC acquisitions of local German suppliers have totaled $6.7 billion in recent years. The authors develop a conceptual framework to investigate the proposition that MSCs are investing in Germany to complement their existing technological capabilities in order to be able to supply complete product systems to their German and international customers. They suggest that the MSCs studied are acquiring knowledge needed to complete their product portfolios and thus to become or remain first tier suppliers to OEMs (original equipment manufacturers). They find that MSCs acquiring German automotive component suppliers are seeking to broaden and complement their product portfolios to respond to the increasing demand of OEMs to buy complete systems of components from first tier suppliers.

In their paper "Technology-based diversification: Decision-making process characteristics," Marika Osterloff and Tomi Laamanen examine the decision processes that drive large firms' technology-based diversifications. They develop a competence-based model of a technology-based diversification decision-making process that is tested through a survey investigating 63 large firms' technology-based diversification initiatives. Their results suggest that three managerial levels (top management, middle management, and operative management) play quite different roles in technology-based diversification decisions. Their findings also show that direct application of existing technological capabilities in new markets reduces deviation from managers' growth expectations, and that technological learning during the diversification process contributes positively to realization of growth objectives.

Norbert Hoelzl and Ursula Schneider propose in their paper "Building the passive innovator: A framework for performance architectures" that in many contemporary competitive settings, the single enterprise or corporation has increasingly become an inappropriate research object for studying processes of exploring and exploiting strategic opportunities. Traditionally, strategic management research focuses on studying "business units," "enterprises," or "industries," but does not deal with the question of how those units of analysis come into being. Norbert Hoelzl and Ursula Schneider therefore introduce the concept of "business models" as a new research construct that integrates a market-based view (represented through a "passive innovator") and a resource-based view (represented through a "capability cycle"). They describe how business models emerge from the combination of three constituent elements: a value proposition, a performance architecture, and a revenue model. The authors argue that a monitoring meta-capability (represented through a "coordinative capability") for prototyping business models is critical to effective deployment of a firm's capabilities within its market spaces.

In order to maximize the generation of rents from alliances, firms increasingly have to develop and leverage capabilities in managing alliances. In their paper "A study into the alliance capability development process," Koen Heimeriks and Geert Duysters introduce a model of the development of a firm's alliance capability (defined as "the capability to successfully manage alliances and to maximize rent generation in alliances"). The model is built from an extensive literature review, and three propositions are derived from the model. These propositions relate the role of firm experience and capabilities (consisting of micro-level mechanisms and routines) to alliance performance. The model and derived propositions illuminate important aspects of the processes underlying the development of the alliance capability.

Ron Sanchez
Aimé Heene
Editors

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PART I: ENTREPRENEURSHIP

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ENTREPRENEURIAL DRIVES AND DYNAMIC CAPABILITIES IN SITUATIONS OF ENCOMPASSING CHANGE

Maria Bengtsson and Carin Holmquist

ABSTRACT

We lack knowledge concerning the importance of entrepreneurial actors in development of dynamic capabilities. Entrepreneurial drives lead the entrepreneur and his/her firm into different strategies to cope with encompassing change and in building different sets of capabilities. A case study of four high-tech firms suggests that entrepreneurial actions determined by entrepreneurial drives (technological, market, business, and development) lead to the creation of new modules and to combinations of external and internal capabilities that increase the balance between contradicting demands. This suggests that a combination of different drives is important, as is the formation of entrepreneurial roles (creators, expanders, and builders).

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INTRODUCTION

There is a growing awareness that firms in situations of rapid change need to develop and combine diverse capabilities. There is also a need to recombine capabilities differently over time in order to stay competitive, i.e. the firm must have a dynamic capability. During recent years, scholars have attempted to understand how this capability develops (see among other Amit & Schoemaker, 1993; Conner & Prahalad, 1996; Henderson & Clark, 1990; Teece, Pisano, & Shuen, 1997). Although this research has contributed extensively to the understanding of the development of dynamic capabilities, several issues remain.

First, regardless of it that the development of dynamic capability has been studied on many different levels: the corporate or multi-business firm level (Baden-Fuller & Volberda, 1997; Ciborra, 1996; Galunic & Eisenhardt, 2000), the single business firm level (Volberda, 1996) and the project level most often focusing on product development projects (Brown & Eisenhardt, 1997; Henderson, 1994) we still lack knowledge concerning the individual level and the importance of entrepreneurial actors in the development of dynamic capabilities. This individual level is of special importance if dynamic capability in high-tech firms is in focus (Arend, 1999). High-tech firms are often started by entrepreneurs and the firm is built on these entrepreneurs' knowledge and skills (Bolland & Hofer, 1998). Even large high-tech firms, as Cisco and Microsoft were started by the entrepreneurial actions of only a few individuals and these individuals are still important for the firms and their development. Entrepreneurs are usually involved in both the creation of capabilities and the coordination and organizing of capabilities. However, the entrepreneurs' involvement in these activities can sometimes be problematic. Most entrepreneurs in high-tech firms are driven by an interest in technology, and hence, their skills are often oriented towards exploration of basic and applied technology. In order to sustain in a situation of encompassing change the entrepreneur needs to stimulate not only further exploration of technology, but also exploitation of technology and market. Furthermore, the entrepreneur has to develop a dynamic capability that is completely different from the ability to explore, and the ability to exploit. These multi-dimensional demands posed on entrepreneurs in high-tech firms will be further scrutinized in this chapter.

Second, firms need dynamic capability to become flexible and to "address rapidly changing environments" (Teece et al., 1997, p. 516), yet the relation between the contradicting demands that arise in situations of rapid change and a firms' dynamic capability has not been the focus of research. Rapid technological change is akin to Nagarajan and Michell's idea of radical innovation. "Radical innovations often destroy capabilities, both in the ability to create goods and services and in the ability to sell them in a market" (Nagarajan & Michell, 1998, p. 1065). Encompassing change implies that both the firm's technological competence base and its market are continuously changing, and that the challenge is to simultaneously develop new technological capabilities and solutions, and create a demand and a market for these solutions. The firm needs to simultaneously explore technology and market, and exploit existing certainties. March argues that "adaptive systems that engaged in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits" (March, 1991, p. 71). Applying the concept dynamic capability to the situation of change described by Nagarajan and Michell (1998) facilitates an understanding of the function of dynamic capability. Dynamic capability is needed to balance the contradicting demands for exploration and exploitation of markets and technology. It is however important to make a clear distinction between the capability to explore and exploit market and technology and the capability to manage or arrange the different capabilities generated through exploration and exploitation. In entrepreneurial firms facing a situation of encompassing change, especially high-tech firms, these capabilities are strongly linked to the entrepreneur and his/her competence and ability to build dynamic capabilities. This means that the entrepreneurial drives are important since these drives will lead the entrepreneur and his/her firm into different strategies to cope with encompassing change – embracing it or trying to limit its influence on the firm. The drives will also lead to the building of different sets of capabilities. In other words the entrepreneurial drives function as a blueprint for a strategic orientation, a blueprint formed by and internalized by the entrepreneur but with effects on the emerging strategy of his/her firm since it leads to choice of entrepreneurial actions. In entrepreneurial firms action is closely linked to the attitudes and values of the entrepreneur since he/she forms the organization by day-to-day activities (Holmquist, 2003). Differences in entrepreneurial drives might help explain the differences in chosen strategies that we have found in an earlier study (Bengtsson & Holmquist, 2000). Another study shows that certain entrepreneurial drives are more common among entrepreneurs with sustainable business success (Holmquist, 2004).

The purpose of this chapter is to *explore the role of entrepreneurial drives in the building of a firm's dynamic capability within industries characterized by encompassing change*. As depicted in Fig. 1, entrepreneurial drives influence

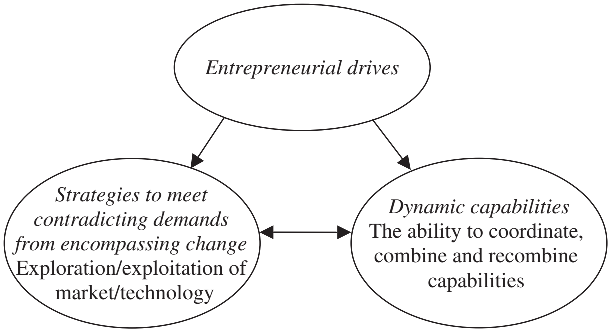

Fig. 1. Entrepreneurial Drives Influence Strategies to Handle Encompassing Change and the Building of Dynamic Capabilities.

the chosen strategies to meet the contradicting demands of encompassing change and also the building of dynamic capabilities.

In this chapter we first elaborate on the situation of encompassing change in order to understand the different demands to which such situations give rise. The following section discusses the content and development of dynamic capabilities. In the third section, we highlight important aspects of the role of entrepreneurs and entrepreneurial drives in the development of dynamic capabilities in situations of encompassing change. Next, we describe four high-tech firms that began as a result of an entrepreneurial event and that continue to utilize the role of the entrepreneurs in firm decision and activities. We describe the entrepreneurial actions and drives within the four firms. We conclude by discussing important conditions that both hinder and stimulate the development of firms' dynamic capability.

CONTRADICTING DEMANDS IN SITUATIONS OF ENCOMPASSING CHANGE

Encompassing change often develops within industries as a result of a technological breakthrough that destroy capabilities, both to create and produce products, and to sell them in a market (cf. Nagarajan & Michell, 1998; Abernathy & Clark, 1985). Hence encompassing change is related to newness in two different dimensions: (1) newness in technology, i.e. the degree of destruction and re-creation of capabilities in technology, and (2) newness in market, i.e. the degree of destruction and re-creation of markets.

Encompassing change arises when old technological fields are destroyed by new technical innovations (cf. Schumpeter, 1934) or when a new technological subfield emerges. The destruction of an old technological field involves the destruction of resources and capabilities developed earlier and utilized by the incumbent firms within the field. Moreover, the destruction of an old technological field involves the destruction of the market (cf. Nyström, 1990). A firm cannot survive if there is no market for the invention, instead new firms will take over (Arend, 1999). Regardless of how technically perfect the innovation is, firms must develop or acquire new market capabilities if they want to prosper and survive (cf. Cooper & Schendel, 1976). The difficulty of simultaneously developing capabilities required for the technological (scientific) development and the development of new markets characterize innovative firms' operations and relations (cf. Fontes & Coombs, 1997).

However, even if the generation of alternative processes, products and practices is necessary and urgent for survival in a situation of encompassing change a strict focus on exploration has its drawbacks. March (1991) argues that exploitation is needed to gain financial resources supporting a sustained exploration. Exploitation is also needed to develop technological skills and capabilities within the newly developed technological field. Sanchez and Heene define capabilities as "organizational knowledge-in-action expressed through repeatable patterns of action in the use of assets" (Sanchez & Heene, 1997, p. 6). Repetition is obtained through exploitation, which hence is of importance for the development and refinement of organizational capability. In situations of encompassing change capabilities to explore and capabilities to exploit are needed but the latter is often absent.

Even if high-tech firms almost by definition begin in a situation of encompassing change, this situation may change, either by choice or necessity. The inherent dilemma in situations of encompassing change – to balance market and technology exploitation and exploration – can prove to be an obstacle for the firms' development since turbulence may be too strong. If the firm focuses on exploring only either technology or market, the turbulence is reduced. However, when for example technology but not market is being explored the balance between market and technology exploitation and exploration is not obtained. The firm might for instance completely ignore market exploration. One reason for this is that high-tech firms' prime resource base and core competence is often the entrepreneurs' knowledge and skills. Since entrepreneurs in high-tech firms often have a focus on technology, their inclinations tend to be towards technology exploration leading to a situation where entrepreneurs do not emphasize capabilities in the market sense. A different reason for an unbalance between market and technology exploitation and exploration is when the inventor is satisfied with the technological solution and only focuses on market exploration, i.e. establishing and developing new markets for that innovation. Eventually, a firm's new technology will become conventional, which facilitates further exploitation of this technology. A focus on the exploration of new markets and new application opportunities bears the risk of negligence of learning processes associated with technology (even if this generally seems to be a lower risk in high-tech companies with their inherent focus on technological development).

As discussed, firms that begin in a situation of encompassing change may choose (in order to lower turbulence and reduce uncertainty) to focus solely on either technology or the market in terms of exploration and subsequently exploit the other dimension. Another, and even more radical, option is to reduce the turbulence created by exploration completely, and move to a situation of strict exploitation of the initial innovation and market. Firms that choose to only modify products and market efforts end up in a situation of incremental change (cf. Nagarajan & Michell, 1998). For high-tech firms, such a development is possible when they have explored new technologies and developed innovative processes, products or services and developed a market for their innovation. March (1991) argues that exploitation poses less risk and gives short-time profits, which makes it an attractive alternative. At the same time, firms that choose to exploit rather than explore miss the possibility of creating long-term advantages that may help survival and performance in the long run: "systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in sub optimal stable equilibria" (March, 1991, p. 71). Basic learning processes that do not involve exploration tend to loose their focus. Hence high-tech firms without exploration may reach a dead end in terms of the development of capabilities needed for survival.

DYNAMIC CAPABILITY – DISTINCTIVE FEATURES AND DEVELOPMENT

Above we pointed out that firms in situations of encompassing change need to develop a variety of technology and market related knowledge and capabilities in order to fulfill contradicting demands for simultaneous exploration and exploitation of market and technology. These contradicting demands need to be accounted for if a firm's dynamic capability is to be understood. In this section we will elaborate on the dynamic capability of firms by discussing two aspects of dynamic capability. First, we define the concept dynamic capability. Second, we examine how dynamic capability develops.

The different definitions of a firm's dynamic capability are confusing. A firm's ability to explore and exploit market and technology and its ability to coordinate or combine and recombine different capabilities are incorporated in the definitions of dynamic capability (see the two lower circles in Fig. 1). Teece et al. (1997) define firms' dynamic capability as the "…ability to integrate, build and reconfigure internal and external competencies [sic] to address rapidly changing environments" (p. 516). The inclusion of the building or creation of capabilities implies that both the creations of market and technology-related capabilities in order to build firm-specific assets, and the ability to integrate and reconfigure these capabilities over time, are integrated in their definition. Galunic and Eisenhardt (2000) also integrate these two types of abilities by defining a firm's dynamic capability as its ability to develop "new productive assets in the firm and the change abilities needed to position them within the market place" (Galunic & Eisenhardt, 2000, p. 2). Galunic and Eisenhardt, however, mainly elaborate on the firm's ability to coordinate, combine, and recombine different capabilities.

Galunic and Eisenhardt (2000) develop the concept of modular corporate forms. They study multi-business corporations and the modular organization of different business units within a corporation. Sanchez and Mahoney (1996) also discuss the modular organization but apply the concept on a product level, as they argue that products can be built in a modular design. The main idea presented by these researchers, irrespective of the level of analysis, is that market and technology-related capabilities are organized in separated domains and they need to be integrated and combined in different ways through the overall modular architecture. In this chapter, dynamic capability refers to this architectural knowledge about different capabilities and the ability to coordinate, combine, and recombine internal and external capabilities. Contrary to the definitions quoted above, the ability to explore and exploit different market and technology "modules" is excluded from our definition. We argue that it is important to make a clear distinction between the ability to coordinate and integrate capabilities and the ability to create market and technology-related capabilities, although they are closely related to each other.

The demand for a clear distinction between these two abilities is obvious if we acknowledge the development of different capabilities. The learning processes that lead to a development of technology and market capabilities that form specific knowledge modules, and the learning processes that lead to the development of dynamic capabilities are different from one another. Development of capabilities within demarcated modules is best understood from theories on group learning, whereas the development of dynamic capabilities takes place on an organizational level. New knowledge or capabilities are most often developed within smaller groups of people who share experience through interaction and share the tacit insights provided by these experience (cf. Argote, 1999; Brown & Duguin, 1998). Brown and Duguin (1998) call these groups 'communities of practice' and argue that "collective practice leads to forms of collective knowledge, shared sense-making, and distributed understanding that does not reduce to the content of individual heads" (p. 96). The proximity between individuals in a group, and the social and professional interaction between them, results in the development of common languages, beliefs, and evaluation criteria that ease the creation of new knowledge.

In industries characterized by encompassing change boundary-spanning communities of practice are formed. Powell et al. (1996) show that learning within biotechnological firms depends on both informal and formal links to other firms. Powell's finding implies that boundary-spanning communities of practice are important to the development of new knowledge. In a similar way, Hansen (1999) argues that network links are important for the development of knowledge and that strong ties are needed to facilitate efficient knowledge sharing (see also Clark & Fujimoto, 1991; Henderson & Cockburn, 1994; Eisenhardt & Tabrizi, 1995). In situations of encompassing change many internal and boundary-spanning communities of practice are necessary to continuously develop different market and technology related competence modules in order to fulfill the contradicting demands discussed earlier. Hybrid groups of interdependent and overlapping communities are formed within and around the organization. Although learning in communities of practice is important for the development of technology and market capabilities of importance for the firms, this learning does not reflect the firms' development of dynamic capability. Dynamic capability is needed to integrate the different capabilities and to recombine them over time as well as to hinder potential negative consequences of the separation or modularization of these capabilities.

The separation of communities of practices is dangerous for two reasons. First, separating communities of practices implies a risk for reinforcing behavior within a community. Second, communities can become introverted and lack the ability to place their own development in a larger context. To prevent these negative effects, learning that leads to a dynamic capability is needed on the organizational level. The risk that communities of practice develop reinforcing behavior due to common beliefs, evaluation criteria and knowledge can be reduced if the organization as a whole challenges those beliefs (cf. Garud & Rappa, 1994; Leonard-Barton, 1995). The organization can provide knowledge and information different from the knowledge collectively held within a group, thereby the diversity needed for learning is provided (March, 1991). By recombining and reorganizing individuals within the different communities through the organizing of activities in temporary project, new ideas and knowledge can be combined and reinforced behavior can be hindered. A prerequisite for this dynamic capability is that knowledge is created about the organization as a whole. Hence, knowledge about the development in all communities of practice, as well as knowledge about the technological and market development in general is needed.

Contextual comprehension, signifying both the organizational context and the technological and market environment in which a firm operates, needs to be developed through organizational learning. Organizational learning is different from the learning that takes place in communities of practice. Cohen and Levinthal (1990) develop the concept 'absorptive capability' to describe organizational learning, and they define absorptive capability as the ability to "recognize the value of new external information, assimilate it, and apply it to commercial ends" (p. 128). On an organizational level, absorptive capability is dependent on the information provided both in the interfaces between the organization and the external environment, and in the interfaces between different modules or subunits within the organization. The structure of communication in the different interfaces is important for the ability to combine and rearrange capabilities developed in different locations (see also Sanchez & Mahoney, 1996). Cohen and Levinthal (1990) argue that shared knowledge is of crucial importance for communication and that gatekeepers in the interfaces need to have a knowledge base that is similar to those in the different subunits or communities of practice. We agree with Cohen and Levinthal, but argue that the knowledge needed to develop a firm's dynamic capability is knowledge about the result of creative processes and not the tacit knowledge need for the creative processes as such. The outcome of creative processes can to some extent be codified and communicated and is therefore easier to access in order to build the architectural knowledge that underpins the ability to coordinate, combine, and recombine internal and external capabilities. Along with Hansen (1999) we stress that this knowledge can be transferred in weak ties between individuals and firms in a larger context. Dynamic capability implies a capability to monitor many learning processes that individuals within the organization are involved in and to monitor technological and market development in the environment. If the knowledge in use becomes too specialized, the overall sight as well as the architectural knowledge will be lost.

Not only the discovery of new technological or market opportunities, but also the discovery of new possibilities to coordinate, combine, and recombine capabilities are entrepreneurial acts of importance for the development of firms. The entrepreneurs, who initially develop the invention that gives rise to situations of encompassing change, often play a central role in the firm for a long time. Hence, the entrepreneurs need to be involved in entrepreneurial acts that develop the dynamic capability discussed above. The entrepreneur's role both in the development of capabilities and in the development of a dynamic capability will be discussed in next section.

ENTREPRENEURS AND FIRMS DYNAMIC CAPABILITY

In the first two sections we described and discussed the contradicting demands in situations of encompassing change, as well as the need to develop a dynamic capability to coordinate, combine, and recombine capabilities in order to balance the contradicting demands (the two lower circles in Fig. 1). The main question raised in this chapter concerns the role of entrepreneurial drives in situations of encompassing change discussed earlier (the upper circle in Fig. 1). Entrepreneurship is the core of business and the process of entrepreneurship is heavily linked to the actor, the entrepreneur, who achieves the actions in the process (Holmquist, 2003). The entrepreneur is likely to be involved in the creation of capabilities in different communities of practice, and also in the development of a dynamic capability or the building of the entire business.

In March's (1991) terms, the entrepreneur may perform both exploration and exploitation. Exploration is frequently associated with entrepreneurship, as entrepreneurship involves the creation of new possibilities. Exploitation is also an entrepreneurial act as exploitation of old possibilities might involve using market possibilities not previously used. In this sense entrepreneurs are involved in the creation of capabilities needed to fulfill contradicting demands in situations of encompassing change. The process of building a company is also an entrepreneurial action, and moreover it is a part of the process of building a firm's dynamic capability or the architectural knowledge needed to combine and recombine different capabilities. As shown earlier the learning processes that lead to different abilities are very different from one another. Therefore, it is a risk that one of the entrepreneurial activities is neglected. To better understand the role of entrepreneurs and how entrepreneurs cope with different demands, we will elaborate on the forces behind the entrepreneurial action – the entrepreneurial drives. Architecture and the building of architectural solutions are influenced by these drives. An understanding of the drives helps us better understand the process of forming dynamic capabilities. Before discussing these drives it is however necessary to clarify some definitions and approaches used in theories on entrepreneurship.

Entrepreneurship as a field of research is scattered. We agree with Shane and Venkataraman's (2000) suggestion that entrepreneurial research needs to be integrated into a more interdisciplinary field (see also Douglas & Shepherd, 2000). The common concept of entrepreneurship is, however, defined by the ability to create and exploit possibilities (cf. Brazeal & Herbert, 1999; Sexton & Landström, 2000 for an overview). The research on entrepreneurship is strongly linked to research on the actor – the entrepreneur. Most research on entrepreneurs focuses on two issues: (1) finding the underlying factors that determine who becomes an entrepreneur and examining why this happen, and (2) comparing entrepreneurs to others or comparing different groups of entrepreneurs to one another (Davidsson, 1989; Cooper & Dunkelberg, 1986).

Even though there are attempts to create typologies to understand entrepreneurship (cf. Woo, Cooper, & Dunkelberg, 1991), research is not uniform and old theories are constantly revised. Recent research shows that not even the basic assumption about the difference between entrepreneurs and non-entrepreneurs always holds true (Baron, 1998; Chen et al., 1998). For example some studies show that there are differences between novice, parallel and serial business founders (Westhead & Wright, 1998; Alsos & Kolvereid, 1998) in terms of activities and level of commitment in different phases of the business formation process. Stewart et al. (1999) found differences in motivation, risk propensity, and innovation preferences between entrepreneurs focusing on growth (entrepreneurial discourse) and entrepreneurs focusing on stability (owner/managerial discourse). This finding is in line with Moran (1998) who develops a method aimed at profiling entrepreneurs in terms of growth orientation and argues that there seems to be an implicit drive motivating some entrepreneurs to be more entrepreneurial than others. Related to the concepts put forward in this chapter, we propose a distinction between entrepreneurs focusing on growth (expanders), entrepreneurs that are more managerial (builders) and entrepreneurs that are focusing on the creative side of entrepreneurship (creators). The distinction between entrepreneurs focused on creation respective on building and expansion corresponds with the distinction between creative processes in communities of practice, and development of a dynamic capability to build architectural solutions. Hence, creators are more suitable for the first entrepreneurial activity, whereas builders – and possibly expanders – are more suitable for the subsequent entrepreneurial activity.

Even if there is research examining the motives of entrepreneurs as well as research that proposes typologies of entrepreneurs (see, e.g. Lumpkin & Dess, 1996, with a typology built on autonomy, innovativeness, risk taking, proactiveness, and competitive aggressiveness) there are few studies addressing the basic orientation of the entrepreneurial effort. We argue that these studies would benefit from a more clear distinction between the actor and the action (Holmquist, 2003). In some contexts, non-entrepreneurs might carry out entrepreneurial actions, but an entrepreneur can only hold an entrepreneur's orientation. In our chapter, we focus on entrepreneurial actions and drives that are often performed and held by entrepreneurs.

We also want to mention that there are studies indicating factors that may facilitate or hinder the success of an entrepreneurial action. For example, in Cooper and Bruno's (1977) study of high-tech firms, they found that firms started by groups of entrepreneurs as an offspring from a larger organization are more successful than other newly established high-tech firms. This finding indicates that dynamic capabilities may well be learned in large organizations and applied in smaller firms. The arguments that large organizations are prone to inertia are also recently questioned since studies seem to indicate that the larger resource base found in large organizations may be used to achieve organizational learning. Commitment in terms of time allocation (by the entrepreneur) also seems to be a critical factor in the building of a business (Cooper, Ramachandran, & Schoorman, 1997). A limited initial commitment also seems to impair the building of long-term competitive advantages (Cooper & Smith, 1992). In a study of high-tech companies Deeds, DeCarolis, and Coombs (2000) found that product development was dependent on location, the characteristics of the scientific team, strategic alliances and the characteristics of top management. Moreover, location in terms of high concentration seems to impair product development possibilities.

The entrepreneurial actions in the four firms described in next section consist of strategies, choices, and activities that were a part of the creation of market and technology-related capabilities and a dynamic capability in the firms. Since all four firms are relatively small, the impact of the founder(s) is still visible. One of the reasons for the confusion between entrepreneur and entrepreneurial action is that in reality the entrepreneurial action is closely linked to one (and often only one) entrepreneur as we consider small business. Thus, the impact of the entrepreneur is always heavy in small organizations. Moreover, the impact may remain in the organization long after the entrepreneur has left, as it is easier to build new capabilities and structures than to change old ones (Boter & Holmquist, 1996). As Crossan, Lane, and White (1999) suggest, we believe that learning in organizations takes different forms depending on the level (individual, group or organization) on which the learning is based. Individual learning (often the case in newly started businesses) builds on intuition and interpretation. Group learning builds on integration and organizational learning builds on institutionalizing.

With these arguments for the importance of the individual(s) and the entrepreneurial (or formation) processes we believe that the drives behind the entrepreneurial actions are essential in the forming of strategies, choices, and activities. These processes create the learning environment of the firm and form the dynamic capabilities.

ENTREPRENEURIAL ACTIONS AND DRIVES IN FOUR HIGH-TECH FIRMS

The four high-tech firms included in this study (Permanova, Susar, Polar, and Vitec) begun their businesses in a situation of encompassing change but developed in different directions over time.

We will briefly describe the development of the four firms both in terms of the situation of change and the entrepreneurial actions taken as a part of the development of the firms. In an earlier chapter (Bengtsson & Holmquist, 2000) we quite extensively described strategies and actions taken in these four firms to address dilemmas created by balancing exploration and exploitation as well as technology and market newness. We refer the reader to this work. Here, we focus instead on the entrepreneurial drives and their roles in the building of dynamic capabilities.

Entrepreneurial Actions to Remain in a Situation of Encompassing Change – Permanova

One of the firms, Permanova Laser System Ltd., has remained in a situation of encompassing change and hence exemplifies the challenges provided by contradicting demands. Permanova began as an offspring from a research project at Chalmers University. The firm heavily focuses on the exploration of both laser technology and new markets and applications. Permanova develops and commercializes optical laser systems, and uses them in the development of pre-designed industrial production systems. Permanova faces the challenge of persisting in the technological forefront while marketing a product with no perceived demand. To stay in the technological forefront Permanova must develop or gain access to different capabilities and integrate these capabilities in the development of new technical solutions. The development of optical systems is dependent on basic research carried out at Chalmers University of Technology. Moreover, knowledge about both fiber optics and about the laser medium is necessary to integrate and adjusted fiber optics to lasers. In addition to build laser production systems lasers and fiber optics are combined with other equipment such as vacuum boxes, industrial robots, etc. The development of new knowledge in these areas, as well as the ability to integrate these different technologies, is important for the firm.

Furthermore, Permanova needs to know how lasers perform in practical use in order to develop products suitable for the customers' needs. The capabilities necessary to manage the newness from the perspective of the customer are of a different nature than the capabilities needed to cope with the technological newness. Permanova's product is primarily used for cutting, welding, and soldering in industrial production. These manufacturing processes have developed towards large-scale production and increased automatization. The advantage of using optical laser systems instead of common welding and cutting techniques is the possibility of setting up small-scale production on a large scale. Hence, Permanova is offering a product that builds on a new logic of production and the customer need not only to accept the product, but also to accept a new production philosophy. Permanova therefore faces a demand for capabilities completely different from those mentioned earlier and gives few opportunities for exploitation.

The entrepreneurial actions needed to explore both markets and technologies are performed in many interorganizational arrangements, ranging from informal networks to equity-based solutions. The entrepreneurs of Permanova, a group of four researchers, are heavily committed not only to the exploration of the patents but also to their peers. The common interest in laser technology and the ambition to solve technological problems join the engineers involved in developmental activities. Marketing and selling was not given priority from the beginning, even though the exploration of the market was integrated in the technological development. Large manufacturing firms participated in the development driven by their interest in further developing their production process through the use of laser technology.

Changes of ownership due to poor financial performance provided the firm with new more market-oriented entrepreneurs and a balance was thereby attained between market and technology exploration and exploitation. New departments were established to exploit developed products at the market and to develop new market segments. A need for laser equipment in the medical sector was for example explored and engineers were engaged in developmental projects to develop laser equipment for hospitals. The tension between contradicting demands was addressed by separation of explorative and exploitative activities between units within the firm and between different informal, non-equity-based relationships formed to gain access to capabilities not in the possession of the firm. In addition, Permanova formed an adaptive strategy whereby the effects of entrepreneurial actions were constantly reviewed. For example, when the relationships that were formed to increase market capabilities led to a decreased intensity in the relation with the university, additional measures were taken to revive the university relation. Different actions were in this way coordinated, combined and recombined to provide a balance between market and technology exploration and exploitation.

In sum, Permanova exhibits most of the traits of an explorative firm that has succeeded in maintaining its position at the forefront of technology and market application by maintaining its ability to develop competence within communities of practice. The entrepreneurial drives of Permanova get the most out of the ideas underlying the technology and market concepts. The original aim of the firm has not changed. This has been possible as managers and entrepreneurs within the firm developed the dynamic capabilities needed to survive in this situation of encompassing change.

Entrepreneurial Actions for Sustained Intense Technological Exploration – Susar

The second firm, Susar, began as an offspring to a research organization and is located in a science park near the university. Susar started their business in a situation of encompassing change but has reduced the turbulence by outsourcing market exploration and exploitation to be able to focus on the exploration of technology. Susar developed a new radar technology in the 1980s in close association with a public research organization, Norges

Teknisk-Naturvitenskapelige Forskningsråd (NTNF). Susar develops radar for applications in the air and underground, for example, to localize and characterize objects. As such, Susar's work was from the beginning based largely on the existing capabilities formed in NTNF. The first entrepreneurial action, to start the business, was a group decision, as the need for development could not be met within NTNF. Yet, there is still a cooperation agreement between NTNF and Susar regarding the development of radar technology. This agreement represents a permanent relationship based on social bonds and the parties' commitment to and enthusiasm for technology development.

Exploration of the innovation is the main aim of Susar. The driving force behind Susar was the leading researcher who took on the job of being the CEO of Susar. His inclination was to work on a cooperative basis as well as to work with specialization. For example, each member in the network has a given role from basic research to market application. Susar's role was to develop the patent. The competence base consisted of the researchers hired to develop the product. These researchers are highly qualified and specialized persons, and are all driven by the technological development. Susar also wants to stay small – preferring to hire competence when needed (legal, etc.) rather than expanding.

Susar's product was however new to the market as it replaced existing technology and also incorporated new and previously unknown applications for the customers. The customer profile is demanding, since customers are very large foreign firms with a high technological competence. Susar must develop the competence to meet the needs of its market. The strategy to meet their needs is to become more specialized and to use the exclusive rights of its unique technology. Susar focuses specifically on developing generic technology and aims at launching 50 products during a period of 5–7 years. The choice to specialize and focus capabilities on further development of its technology implies that Susar has chosen to pay less attention to building capabilities related to the market and the development of customers' awareness, than to the technological development. Susar is primarily focused on the need for exploration of technology and most market-oriented functions are therefore separated from the core business and outsourced to other firms. Insight into market exploration is however accessible by the experience gained in customers and network relations. Susar utilizes temporary equity-based relationships with customers around research and development projects and then outsources the marketing responsibility to these firms. By doing this Susar can keep contact with markets without the need to develop competence within the firm itself. Furthermore the equity-base makes it possible to reap the fruits of coming exploitation of markets without directly engaging in this. The formal relationship between Susar and the firms are used for outsourcing ends when the research project ends. However, the informal relationship remains and enables the outsourcing of marketing activities. Susar has many permanent informal relationships with NTNF and certain units at the University. These relationships are regarded as very important. They are permanent arrangements. Temporary teams around certain projects create flexibility.

We can discern a clear strategy in Susar. The basic strategy of Susar is to keep to developing the technology in close cooperation with other firms and to leave other parts of the process to others. The entrepreneurial actions build on the competence base of the employees (and the CEO), as this is very obviously a knowledge-based company. The CEO has been very strict about Susar participating in teams and project. This enables the firm to get knowledge and an understanding of the complementary parts of the process – even though the only responsibility is the development of the technology (but they have to understand the setting in which the product is to be used). In sum the separation and integration of functions leads to a situation where technology exploration is the core of the business but where formal and informal relationships are used to keep in touch with the development of capabilities in the other spheres.

Entrepreneurial Actions for Sustained Intense Market Exploration – Polar

Our third firm, Polar Electro, manufactures heart rate monitors. Polar is an offspring from Oulu University, and started their business in a situation of encompassing change as all the other firms studied. In contrary to the two firms earlier described Polar choose after the first period to reduce the turbulence by ignoring technological exploration and focusing on the exploration and exploitation of markets. The firm began with a heavy focus on R&D and prototype development. At the same time, however, the consumers' perspective was stressed. The founder, a technology professor, who still is very active in the firm, decided to start Polar based on his realization that his technological innovation, the heart rate monitor, had a vast market potential – "everybody has a heart".

The product, a heart rate monitor for everyday use, was new and was developed strictly from the perspective of the consumers' perceived demand. When several prototypes were developed, the final products were launched. Marketing then become the central aim for Polars business. Polar has a customer orientation and stresses the development of capabilities associated with this orientation. The market orientation was in fact obvious even from the start since the patent was formed from a user perspective. The inventor and founder of the firm is still a dominating actor and he stresses the necessity of a global perspective (less than 5% of turnover and less than 50% of personnel is domestically based). The strategy is to use the first-mover advantage and go for competitive markets (in the U.S., Germany, and Japan) to sharpen competitive strength. Polar's high growth is achieved by staying close to the market, which is necessary to develop new demand for the product. Polar focus primarily on the market and the function of other parts (e.g. R&D) is seen as complementary to this basic market orientation. Since the market demands highly developed products, Polar constantly builds technological competence, but only as a response to market needs and not because of perceived technological opportunities. Technological development is put under strict economic pressure since markets demand low-cost products and branding is as essential as generic product characteristics. Polar wants to become the equivalent of Nike. The firm wants to be creative and innovative at the market place to obtain that goal.

The firm is organized in a conventional way and Polar tries to integrate as many functions as possible within the organization to keep control over the value chain. Customer relations are most important and Polar searches to have control of all levels up to the point of the retailers. This has led to a large international organization with many subsidiaries and units. Other solutions (cooperations, etc.) were tried but Polar decided to take full economic and organizational control of its operations and Polar has therefore developed a global marketing network. Polar is a first-mover missionary in its market exploration, while manufacturing and R&D networks are seen as important but not as emphasized as the marketing aspect. The worldwide network of subsidiaries is linked to the retailers all over the world, which facilitates the creation of a worldwide market for heart rate monitors. The market has also expanded, from sports training marketing to athletes and trainers to the fitness sector and also the rehabilitation sector. This further demanded capabilities in terms of market knowledge and organization of distribution and marketing channels.

In summary the original entrepreneur and his persistent focus on market exploration has formed Polar. Every measure taken in Polar centers on the demands from the customer, and on the strategy to keep close control of the value chain from product development to contacts with retailers globally. This has led to an expansion of the firm, with the traditional growth problems. Still, the entrepreneur's decision to focus on market helps keep the firm on track and not expanding into new product areas. Even though the founder is a technician himself, this type of competence is not central to Polar – instead competence is formed in the day-to-day process of interacting with the customer.

Entrepreneurial Actions to Move from Encompassing to Incremental Change – Vitec

The fourth firm, Vitec, develops IT systems for energy and real estate businesses. This firm differs from the others as they choose to focus only on exploitation and growth after the first period of encompassing change when the product was developed. Two researchers started Vitec, an offspring of Umeå University. These entrepreneurs brought some of their colleagues with them to the new firm. Part of the product, IT systems for the energy sector, was developed while the entrepreneurs still worked at the university. These systems are applied for prognoses, auditing and optimizing electricity and energy consumption. The researchers began working with product development and marketing only part-time but the business grow and soon they began to work with the firm on a full scale. From the beginning, product development was essential. The aim of Vitec was to be at the absolute edge of technology. The high competences within the firm as well as contacts with the scientific community were means to this end. Vitec is mainly domestic and dominates this market, and thus, internationalization has been slow.

Vitec's customers are heating plants, which is a growing market due to the worldwide deregulation of energy production. The market is expected to grow strongly while competition remains weak. Vitec strives to grow as a firm and this goal overrides all goals concerning market and technology development. The aim to grow has led Vitec to a situation of incremental change. When Vitec enters a new market, it chooses mature markets to avoid the necessity of creating a demand. The close contact with the university has faded since Vitec now only adjusts its products to be more customer-adapted. Capabilities are developed within the field of learning how to expand and how to handle expansion. Vitec's first-mover advantage is estimated to be 2–4 years and then competition is expected to set in fully. Vitec does not attempt to avoid the inevitability of competition but simply tries to use the situation to grow.

The strategy of Vitec is consequently growth. From its inception it has been fast growing. Capitalization is achieved through profits as well as through new venture capital. Vitec develops business not markets or products. Developing business in lieu of markets or products makes Vitec different from the other firms, as growth is a goal in itself. Products and markets are differentiated, because business opportunities are followed wherever they occur. The plan to internationalize follows the same pattern, as it is a utilization of good business opportunities in some countries. Vitec takes the role of the follower, and allows other firms to be the missionaries and create markets. Vitec has few interorganizational relations, as most functions and relations are held within the firm. Of course there are conventional relations with customers but no important networks are formed. Vitec buys out competitors instead of forming coalitions with them. Equity is the key to relations, and it is through changes in equity that Vitec forms it external relations. Equity-based relationships create independence from other organizations – even though it increases dependence to the owners. The decision to go public has the advantage of generating capital for the ever-present expansion of the firm.

The two entrepreneurs of Vitec work with qualified personnel, who have a technical background. In addition the entrepreneurs are themselves researchers. Still, they focus on business growth and not on technology. Each of the two entrepreneurs takes somewhat different roles. One takes the conventional entrepreneurial role of looking for business opportunities and seeking out possibilities to increase the capital base. The other entrepreneur takes a more administrative role, keeping things together within the fast-growing organization.

This brief summary of the actions of the entrepreneurs shows similarities as well as differences between the four firms. All four are university based and started from a situation of encompassing change. Due to choice, often based on personal preferences, the firms have evolved differently leading to different processes and different sets of capabilities. Also due to choice, based on entrepreneurial drives, the firms used different strategies to cope with turbulence and reduce uncertainty – strategies that led the firms to stay in and expose themselves to situations of encompassing change or to limit the influence of encompassing change in different ways. Permanova and Susar (both with a focus on technology exploration) use separation and integration as strategies. Polar and Vitec (both without a focus on technology exploration) use ignorance strategies.

Separation strategies handle complexity and make the balancing of contradicting demands in situations of encompassing change possible. Outsourcing of functions and intra-firm separation of activities (in units or over time) are examples of these strategies. Integration strategies attain flexibility. Temporary equity-based relationships and informal relationships (permanent or temporary) are examples of these strategies. Dynamic capability in situations of encompassing change can hence consist of the combination of the separation and integration of different entrepreneurial activities.

Ignorance strategies also handle complexity and attain flexibility/stability, but foster a development towards a situation of more incremental change. Permanent equity-based relationships, engulfing of competitors and expanding of the functional organization are examples of these strategies. Instead of balancing the contradicting demands in a situation of encompassing change, some demands are ignored and other demands are developed. Growth and expansion are two important goals that motivate the ignorance of demands for technological development and exploration. Dynamic capabilities are not developed in such situations as the managerial ability is related to the ability to detect and coordinate business and market opportunities and not to the ability to balance the contradicting demands described earlier. In the remainder of this chapter we elaborate on the importance of the entrepreneurial drives in the process of creating dynamic capabilities in industries characterized by encompassing change. These entrepreneurial drives form the development pattern of the high-tech firm and are essential determinants behind the decision to stay in encompassing change or to move towards more incremental change.

ENTREPRENEURIAL DRIVES AND THE DEVELOPMENT OF DYNAMIC CAPABILITIES

From our cases we can identify entrepreneurial drives that explain strategies to meet the contradicting demands from encompassing change and also the building of dynamic capabilities. The actions taken by entrepreneurs can also be related to these drives. However, the actions have lead to partly different consequences than those anticipated from the character of the drives. Finally, the analysis suggests that the development of a dynamic capability is a process occurring over time that is affected by the drives identified and also is a consequence of trial and error. We will discuss these three issues in this section.

Entrepreneurial Drives towards Creation, Expansion, and Building

An analysis of the four firms' actions and development detects that the underlying entrepreneurial drive was different in each case. We do not talk about the motivation to become an entrepreneur, but rather about the basic inclination towards the situation. This inclination determines what is seen in the environment and what capabilities are formed and used. In Permanova, the entrepreneurial drive is characterized by a simultaneous focus on technological and market exploration. In Susar, the drive is characterized by a focus on technological exploration and in Polar the drive is characterized by a focus on market exploration. Finally, Vitec focuses on exploitation of existing possibilities. We examine only four cases. Yet, we propose that the entrepreneurial drives differ, tentatively in at least three ways:

- Technology-driven
- Market-driven
- Business-driven

Entrepreneurial drives concern the general direction and overall aim of the firm. If the firm is technology-driven all resources and all activities will have this general direction (Susar). When dominated by a market-oriented entrepreneurial drive (Polar) all business activities focus on this general direction. The business-oriented entrepreneurial drive (Vitec) leads the firm into a general direction where everything is viewed in terms of business opportunities and growth. As for Permanova, we see technological as well as market-oriented drives – a mixed entrepreneurial drive. We however propose that Permanova be

- Development-driven

i.e. the exploration as such is in focus – technology as well as market are only means to the end of developing ideas and strategies.

Related to the earlier distinction made between entrepreneurs as creators, builders, and expanders, the entrepreneurs of Permanova, Polar, and Susar can be described as creators whereas the entrepreneurs of Vitec are expanders. Clearly, no entrepreneurs are true builders. We argued earlier that builders are those that most probably are involved in the creation of a firm's dynamic capabilities.

The entrepreneurial drives in each firm have stimulated the development of capabilities in certain areas. In the case of Permanova, Polar, and Susar the entrepreneurs who started the firm have been deeply involved in the creation of new technological (Permanova and Susar) or market (Permanova and Polar) solutions. The development of these capabilities has lead to the formation of communities of practices related to different market, products, or technological parts. For example, the development of fiber optic laser systems occurred as a result of the close cooperation between one of the entrepreneurs that started the company, other individuals within Permanova, and individuals from Rofin Sinar. Here a boundary-spanning community of practice was formed. Other examples of boundary-spanning communities of practices are the communities formed in cooperation between people from the university and the entrepreneurs of Susar as well as the entrepreneurs' involvement in temporary product development projects initiated by Susar. The entrepreneurial drives towards exploration of market and/or technology stimulated the development of capabilities within separated modules. Yet, these drives did not stimulate the development of new modules, nor did they facilitate the combination of different abilities to create a match between the organization and the market and industry as such.

In the case of Vitec, formations of communities of practices focused on exploration of certain modules of market or technology related competence is not evident. Rather, the business-oriented drives have lead to a development of knowledge about the market and how to expand in this market. In this case the expanders are involved in learning processes more similar to those that lead to the development of dynamic capabilities. In a situation of encompassing change, however, the dynamic capability needed must acknowledge the contradicting demands present in such a situation and then combine and integrate different capabilities to obtain a balance between these demands. The entrepreneurial drive towards growth and profit hindered the Vitec entrepreneurs from attending to the demands for exploration and hence from reaching a balance between contradicting demands. A form of blindness or ignorance of the demand to explore market and technology was a result of a focus on expansion due to the business drive.

Dynamic Capability – The Managerial Ability to Balance Contradicting Demands

Focusing on exploring either technology or market implies that certain capabilities are developed, whereas other capabilities necessary to fulfill the contradicting demands in a situation of encompassing change are not. Hence, dynamic capability is absent if the entrepreneurs are not able to create conditions to facilitate the fulfillment of these demands. In the case of Permanova a new entrepreneur was hired when Permascand become one of the owners of the firm. The new entrepreneur was market-driven. The combined result of these entrepreneurs' efforts made it possible to fulfill the demands of simultaneously exploring market and technology. In the case of Susar a choice was made to hand over the responsibility for the market to the customers and to partners in different product development projects. The purpose of Susar's actions was not to shape an architectural structure better suited to fulfill contradicting demands, but to make it possible to focus solely on the exploration of technology. The entrepreneurial action and not the entrepreneurial drive led to an increase in the firm's ability to combine capabilities and balance the contradicting demand.

Development of Dynamic Capabilities – A Process over Time

The four case studies described above suggest that the entrepreneurial drives necessary to create dynamic capabilities include the creation of new modules of capabilities as well as the building of an architectural knowledge structure to combine and integrate these capabilities. We can see this clearly in small high-tech firms. However, the building of new modules may also be an important part of the dynamic capabilities of larger firms. The two parts of dynamic capability, the creation of new modules and the combination and recombination of these modules are related to each other in time. First, the modules necessary for the balancing between contradicting demands are developed. Subsequent to this process, the firm has to integrate, combine, and recombine these modules.

We did not find that the entrepreneurial drives directly lead to the creation of modules, or the creation of architectural knowledge in the firms studied in this chapter. However, entrepreneurial actions often determined by the technological, market, business, and development drives lead to the creation of new modules and to combinations of external and internal capabilities that increase the balance between the contradicting demands. This suggests that a combination of different drives is important, as is the formation of entrepreneurial roles (creators, expanders, and builders). To be able to sustain competitive advantages both on the technological and market sides and simultaneously be business-oriented in order to survive; a balance between entrepreneurial drives is needed. An alternative or complementary suggestion would be that other drives are needed to stimulate the development of increased dynamic capabilities.

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ENTREPRENEURIAL VOLITION TO TAKE ACTION AND THE UNITED STATES MARKETS OF THE 1990s

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ABSTRACT

It is no surprise that markets are complex systems (Anderson, 1999, Organization Science, 10, 216–232). Their apparent complexity has risen in recent years (D'Aveni, 1994, Hypercompetition. New York, NY: Free Press; Black & Farias, 2000, Emergence, 2(1), 101–113). The cycles of apparent complexity in the market place have been attributed to entrepreneurs taking action (Black & Fabian, 2000. In: Sanchez & Heene (Eds), Theory development for competence-based strategic management. Chichester: Wiley; Black & Farias, 2000). Indeed being able to take action in the face of uncertainty and ambiguity is a potential entrepreneurial competency (Black & Farias, 2000). Understanding that competence and its influence on the markets can be a necessary competence for today's managers. This chapter presents a model of entrepreneurial action taking, some influences on the market, and then examines the Dot.Com phenomena during the heat of the Dot.Com frenzy for evidence of action taking preferences.

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ENTREPRENEURIAL VOLITION TO TAKE ACTION AND THE 1990s

The difficulty in predicting the behavior of markets and the fact that markets have many independent actors attempting to organize themselves affirms the assertion that markets are complex systems (Anderson, 1999) and are indeed getting more complex (D'Aveni, 1994; Black & Farias, 2000). Entrepreneurs have been credited with contributing to the complexity of these markets because of the choices they make (Black & Fabian, 2000; Black & Farias, 2000). As argued by Black and Farias (2000), new markets tend to be equivocal or ambiguous because there is little information about that market place. By operating in that market place, information is revealed leading to less ambiguous or equivocal environments. As actors in such markets earn economic rents for their efforts, other actors are attracted to that market place, which is now less ambiguous because latent information has been revealed. Entrepreneurs now have to deal more with problems of uncertainty and less with ambiguity. (Our definitions of equivocality and uncertainty are based an Daft & L'Engle, 1984). However, a market place that continues to reward entrepreneurs with rents will continue to attract new actors, which will eventually lead to information overloads for both incumbents and new entrants. This information overload will tend to recreate conditions of ambiguity, now simultaneously with uncertainty. Note that the choices entrepreneurs make in the shifting information environment that they operate in implies that understanding the entrepreneurial volition in taking action in those conditions is increasingly important for today's managers. Such volition to take a particular type of action is called entrepreneurial conation. This chapter presents a model of entrepreneurial action taking, some influences on the market, and then examines entrepreneurial action choices during the time of the Dot.Com phenomena in the 1990s.

ENTREPRENEURIAL ACTION TAKING

The turbulent markets of the past decade (D'Aveni, 1994; Black & Farias, 2000) have highlighted the importance of organizations being able to take action in the presence of both, uncertainty and ambiguity. As noted earlier this uncertainty and ambiguity is generated in part by the actions of the entrepreneurs themselves. The ambiguity in particular suggests that outcomes cannot be predicted with confidence and surprises (Casti, 1994) may emerge and suggests the existence of dynamic complexity (Senge, 1990). Systems characterized by dynamic complexity are those where the relationship between cause and effect is subtle and separated in time and space. Complex systems also cycle between periods of apparent chaos and periods of patterned behavior (Brown & Eisenhardt, 1997, 1998; Black &Fabian, 2000). One possible source of these cycles is the decisions and actions that entrepreneurs take in their attempts to achieve competitive advantage (Black & Farias, 2000). It is important to note that we are using entrepreneurs in the same fashion as found in the school of Austrian Economics, namely someone willing to take on the market engagement whether that is in a new venture or in an existing firm (Kirzner, 1979).

Market action taking by entrepreneurs has been documented by many authors from the Austrian school of economics (Lachmann, 1977; Kirzner, 1978, 1979, 1982). Typical actions include market structuring actions and market refining actions (Lachmann, 1977; Kirzner, 1978, 1979, 1982; Black & Farias, 2000). Market structuring activities include those activities that define what it means to compete in a particular market or industry. Market refining activities result in the determination of the most effective and efficient ways to operate in that defined market. While for years Austrian economists emphasized the disequilibria aspects of the market cycles (Kirzner, 1982) and the neo-classical economists emphasized the equilibrium aspects of the market cycles (Peteraf, 1993), complexity theorists have no problem conceptualizing the appearance of both perspectives within a marketplace (Black & Farias, 2000). We present the dynamic cycling between the two perspectives in Fig. 1.

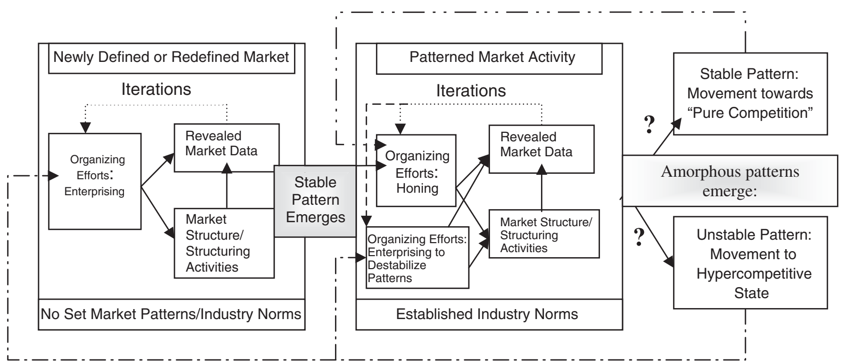

Fig. 1. Including the "EDGE OF CHAOS" at the ?'s.

The box on the left-hand side of Fig. 1 represents those situations when a new market has been created or an existing market has been redefined. At this stage, we will only refer to the creation of a new market to simplify the description. Assume an entrepreneur develops a new product or service. At this time, little is known about the market and entrepreneurial action is based largely on assumptions about the potential market response. The information environment in the market at this time is essentially characterized by equivocality. The market response to the product/service launch reveals information about the market place. At a basic level such information might simply reveal the existence of a market for the product/service. At a more detailed level, information about the potential size of the market, customer preferences and other information might be revealed. If market feedback indicates the existence of a viable market, the pioneering entrepreneur begins to structure the market based on the feedback. However, the information revealed by the feedback is available (at least in part) to other entrepreneurs as well, who may now enter the market. The pioneering entrepreneur operates in an ambiguity reducing or problem defining mode. The second and other late movers have the problem defined for them and operate in an uncertainty reducing or problem solving mode. With time, incumbents and potential entrants learn more about the market and continue to refine their definitions and solutions. A market structure emerges. The market moves towards the emergence of stable patterns and a state of equilibrium.

In this state of patterned activity (second box of Fig. 1), those entrepreneurs who are more inclined towards a problem solving orientation will attempt to further refine that market by developing greater efficiencies. They will attempt to reduce costs and improve quality by honing their skills and capabilities. On the other hand, those entrepreneurs with a problem defining orientation are attempting to redefine and destabilize the market to their advantage. The results of this tension could cause the market to move either towards equilibrium or pure competition, or towards hypercompetition. The information environment in the hypercompetitive state is again characterized by ambiguity or equivocality.

Austrian economic scholars have emphasized the point that information is not equally dispersed in a market, that entrepreneurs have to perceive it and then take action based upon that perception (Lachmann, 1977; Kirzner, 1982). In addition to perceiving and taking action, entrepreneurs are not infallible and often will make mistakes or choices that others do not reinforce (Kirzner, 1978, 1979). Thus, after the entrepreneur has acted, his or her actions indicate to others the reasoning and potential pattern behind the entrepreneur's actions. When such actions are taking place in an environment that has no previous market or industry established norms, ambiguity reduction skills are needed and the entrepreneurs that do act do so because of a preference for taking action in the face of ambiguity (Black & Farias, 2000). After enough activity has taken place, a pattern, whether real or not, will emerge in the minds of other entrepreneurs who prefer to refine market norms rather than set them (Black & Farias, 2000).

The will or volition to take action is called conation (Berry, 1996) and the entrepreneurial action taking preferences is called Entrepreneurial Conation (Black, 1998; Black & Fabian, 2000). Entrepreneurial conation has two "problem" preferences (Black, 1998). One preference is for ambiguity reduction or problem defining and the second preference is for uncertainty reduction or problem solving (Black, 1998; Black & Fabian, 2000). The dominant conation preference is matched to the marketplace phase (Black & Farias, 2000).

Entrepreneurs who prefer to make sense of their environment and to define the market "problem" are said to have a dominant entrepreneurial conation of "Enterprising" (Black & Fabian, 2000). Entrepreneurs who prefer to refine what it means to compete in a market are said to have a dominant entrepreneurial conation of "Honing" (Black & Fabian, 2000). Certainly, during times of market emergence or during times of hypercompetition, the Enterprising entrepreneur has an edge over the Honing entrepreneur. However, during times of regular and routine changes in an existing market, the Honing entrepreneur will have the competitive advantage over the Enterprising entrepreneur. Furthermore, each entrepreneur will tend to hire and retain others with a similar action taking preference (Black & Fabian, 2000).

THE CASE OF THE START-UPS OF THE 1990s

To begin to assess this theoretical understanding of the effect of entrepreneurial volition to take action, we utilize an exploratory case study. Case studies are not typically generalizable. They can, however, illustrate the occurrence of a particular phenomenon. To choose a specific case study, we looked for conditions where either or both of the orientations could logically occur. We found such a condition during the 1990s. The increases in information technology both in analysis of information and in dissemination of information made for a market place that had evidence of both entrepreneurial conation orientations. Many of the new business start-ups acted as if the Internet was a completely new market endeavor where the old rules did not apply. If that is the case, we would expect to see a large number of Enterprising-oriented entrepreneurs. However, many of the companies present on the Internet were variations on existing firms, hence the term "Click and Brick". Given that orientation, we would expect to see a large number of Honing-oriented entrepreneurs.

H1. Enterprising actions will dominate the reported actions of new businesses.

H2. Honing actions will dominate the reported actions of new businesses.

H3. Neither Enterprising actions nor Honing actions will dominate the reported actions of new businesses.

As an exploratory effort, we examined the entrepreneurial efforts recorded by a major journalistic effort, those new start-ups captured in business publications. Thus, to begin to examine these hypotheses, we examined a dozen articles from United States' nationally distributed business magazines that emphasized entrepreneurs and business start-ups. Specifically, we looked at articles about start-up firms in INC, Entrepreneur, and Forbes (see Table 1). Because we were interested in firms which had begun during the 1990s, we chose to examine articles from 1997 and 1998. Companies had to be no older than 5 years to be included in the article set being examined. Thus, the companies being examined would be from 1992 or 1993 through 1998. They would have begun at the earliest during the initial portions of the information age or when the age was under full swing. If we found any interesting patterns or support for our hypotheses, a more complete project could then be undertaken.

To examine the hypotheses, a group of research assistants were training in a set of key words which were used to identify the level of either enterprising or honing activities reported. A set of articles from 1997 and 1998 were identified and given to at least two of the research assistants to evaluate. If there was an agreement (which occurred in over 90% of the cases), the assessment was included; if there was a disagreement, the article was assessed independently by an additional research assistant and the majority assessment was recorded. As part of the coding process, the research assistants included the particular phrasing in an article that he or she believed supported the coded assessment. All such support was scrutinized a final time by the lead researcher for consistency of use and logical support. Again if there was a problem, the article was given to another researcher and reanalyzed until the support was shown for the coding (very few had to be

Table 1. Summary Table of Initial Evaluation of Start-ups via Published Articles.

	Magazine	Date	Article	Co Name Industry	Enterprising	Honing
1	INC	4/97	It's a Dog's Life: Three Dog Bakery on Handling and Managing Rapid Growth	Three Dog Bakery Dog treat Industry	Low	High
2	INC	4/97	Dear Max: Drop Dead. Love, GoCard	GoCard Postcard Advertising Advertising Industry	Mod	High
3	INC	7/97	Have Cookies, Will Travel: A Start Up That Delivers	Five Star Cookie Co. Inc. Baked Goods Industry	Mod	High
4	INC	9/97	Hola, Chica: D. C. Mag Targets Latinas	Latina Style Print Publishing Industry	Mod	High
5	INC	11/97	Needle Doctor Plays On	Needle Doctor Phonograph Industry	Mod	High
6	INC	11/97	Born to Be Wild	Excelsior-Henderson Motorcycle Industry	Mod	High
7	INC	12/97	Interest in Sunburn Solution Heats Up	SolarTech Retail UVA/UVB Measurement Device Industry	High	High
8	INC	3/98	Electric Bikes Plug In	Zap Power Systems Electric Bikes/Scooters Industry	Mod	High
9	Forbes	10/97	Spaghetti deluxe	The Pasta Shoppe Inc. Dry Pasta Industry	Low	High
10	Forbes	3/98	E-muscle	FreeMarkets Online Inc. Online Auction Industry	Mod	High
11	Forbes	4/98	Pay Dirt	Brookhill Group Environmental Clean-up Industry	Mod	High
12	Entrepreneur	4/97	Nebraska: Golight Inc.	Golight Inc. Flashlight Industry	Mod	High

handled in this fashion and of those that did most were recoded in the same way independently). The magazine examined, date of article, article title, and coding appear in Table 1.

While this work is just exploratory, some interesting results are appearing. For example, there is great variation on the Enterprising dimension and no variation on the Honing dimension. While we could claim that Hypothesis 2 was supported and Hypotheses 1 and 3 were not, this seems a bit extreme for the amount of articles that we examined. However, given that all articles had high Honing and all articles were from national United States magazines, there may be additional biases due to the type of media or country location.

How interesting is it to report in national media that a local business entrepreneur has opened a new Burger King franchise (low honing/low enterprising) or that a local hospital has opened a new cancer treatment center in response to a group of physicians opening one (moderate honing/low enterprising). To examine this potential bias, we turned to local newspapers of small to mid-sized cities located in the southwestern part of the United States. We again only examined a dozen articles covering the time period of 1997 through 1998. However, there is a distinct difference in the coverage. Both the Enterprising and the Honing evaluations had variation. There was one high Enterprising and three high Honing responses (Table 2).

We next examine the placement of the two sets of data on the Entrepreneurial Conation Grid. The Grid is simply (see Table 3) the graphical representation of the data covered earlier. We see the national magazine articles clustering in the high Honing and Moderate Enterprising cell (75%), where the local newspapers have a widely dispersed pattern.

Neither reporting mediums had very many articles on organizations that could be classified in the high Enterprising cells (total of 8% across the media). The moderate Honing level appeared to have the highest number of organizations (59%), while the mid-level set of placements was in the low Enterprising area (33%). The local media sources provided a slightly higher number of organizations classifiable as Low (50%) versus moderate Enterprising (42%).

Remember that the high Honing cells had 100% of the organizations detailed by the national media. The local media described 25% of the organizations as fitting into the high Honing level; 33% of the organizations were placed into moderate Honing areas and 42% were classified as being low Honing.

Hypothesis 2 was best supported at the national level, while Hypothesis 3 appeared to have some support at the local level. While, there is not sufficient information to make conclusive statements, there were surprising

Table 2. Summary Table of Initial Evaluation of Start-ups via Published Articles.

	Newspaper	Date	Article	Co Name	Enterprising	Honing
1	Local	1/97	Signs, Flags and Kites – all in one store	Signergy Productions Printing Signs & Wind Born Products Industries	Mod	High
2	Local	3/98	Spirit Winds: Breath of Fresh Air	Spirit Winds Retail food: Coffee Bar/Restaurant/ Gift Shop	Low	Mod
3	Local	3/98	Chile rancher makes multipurpose products	New Mexico Chile Ranch Condiment Industry	Mod	High
4	Local	4/98	Oriental King changes hands	Oriental King Retail food: Restaurant	Low	Low
5	Local	5/98	It's always coffee time at Nabes	Nabes Retail food: Coffee Bar/Restaurant/ Newstand	Low	Low
6	Local #2	8/97	City Company re-refines used oil	Safety-Kleen Environmental Clean-up/Recycling Industry	High	Mod
7	Local #2	10/97	Ripening business	Casa Rondena Winery Industry	Mod	Low
8	Local #2	12/97	Let Them Do the Driving	Santa Fe Ski Shuttle Transportation: Taxi/Bus Service Industry	Mod	Mod
9	Local #2	12/97	Weekly Alibi turns five	Weekly Alibi Print Publication Industry	Low	Low
10	Local #2	12/97	Toy store owner makes it fun	Pick Up Your Toys Retail Store: Toy Industry	Low	High
11	Local #2	1/98	Importer helped put Madrid back on the map	Maya Jones Imports Retail Store: Gifts/Clothing	Mod	Low
12	Local # 2	12/98	Flamdoodle Draws Attention	Flamdoodle Amimation Entertainment Production Industry	Low	Mod

Table 3. Entrepreneurial Conation Grid.

N = national articles L = local articles		Enterprising		
		Low	Moderate	High
Honing	High	N,N L	N,N,N,N,N,N,N,N,N L,L	N
	Moderate	L,L	L	L
	Low	L,L,L	L,L	

differences between the local and national reportings of entrepreneurial action taking choices.

DISCUSSION

While earlier we noted that it might be tempting to say that a honing orientation was the dominant orientation, given the preponderance of high honing placements of the organizations reported on by the national magazines, it is evident that such a conclusion would be premature on more than one front: (1) we had a very small sample size from a very limited set of magazines that may be biased, (2) it is the combined placement of both the elements that can reveal a richer understanding of organizational start-ups, (3) many of the articles reported on companies that were close to the 5-year mark which means that they were formed at the very beginning of the rapid increase in use of computers and information technology and (4) the specifics on age of market, and amount of information in the market was not taken into account for the variety of industries involved.

The national media was dominated by reports of firms that tweaked the rules of competition and which paid high levels of attention to their stakeholders. The local media was more evenly divided between those who accepted the competition rules and those who tweaked them. However, local media also reported on organizations that were less likely to be highly involved with their customers and more likely to have an internal definition of what it meant to be in business or one that utilized competitors (often those from out of the area) to help in defining the problem solving methods.

Furthermore, very few of these business start-ups were high technology based (12.5%). This may be due to their being started before the wide spread influence of the information age. However, if this low number continues in later issues of the national magazines and local papers, we would conclude that to examine the high technology and information technology start-ups and their placements we need to examine more specialized data sources.

Given the small sample sizes (typical in a case study), the results could also have be skewed by the requirements of the particular industries. These results may only be an artifact of the particular set of industries found in this set of articles. This issue too is one that can be resolved by an expanded research effort.

CONCLUSION

We began this exploratory work by noting that entrepreneurs are both the coordinating pattern setting actors of the market and the disruptive pattern breakers of the market. We suggested that there may be times when one or the other of the Entrepreneurial Conation preferences may dominate the market places. In this exploratory work, using articles about start-up companies, we found mixed results. National media reported the most on firms who engaged in high honing activities. Local media tended to report least frequently on this type of firm and to instead report on those with low to moderate levels of honing and enterprising.

Given the different patterns of reporting, we concluded that the data source may bias the analysis when we use popular press media. The fact that most firms had been in business for several years may also have biased our results in finding one orientation more dominant as may the fact that firms came from a wide range of industries. To better examine this model and its hypotheses requires the following changes. (1) Articles need to be drawn from a large number of local newspapers from cities across the United States. (2) To better reflect the time period of emergence of the high tech industry, such articles should come from the years 1997, 1998, 1999, 2000, and 2001. (3) If using national magazines, a wide variety of magazines, including those specifically oriented to online organizations, also needs to be included across the years of 1997, 1998, 1999, 2000, and 2001.

Entrepreneurs are major actors in our markets. Understanding when specific entrepreneurial action preferences may be required will help us in giving advise to nascent entrepreneurs, economic development agencies, and in providing business education. This work, while preliminary, indicates that examining the entrepreneurial orientations may clarify our understanding of needed competences for various markets and market stages.

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CORPORATE VENTURE CAPITAL: LEVERAGING COMPETENCES, HEDGING UNCERTAINTY, OR CREATING AN ECOSYSTEM?

James Henderson and Benoit Leleux

ABSTRACT

Corporate venture capital (CVC) programs have been recognized as critical activities in sustaining or renewing profitable corporate growth. CVC funds have increased in recent years either to take advantage of the rapid changes in new technology, to establish a stake in the internet economy, and/or to participate in the attractive returns made by the independent venture capital (VC) funds. This chapter argues that the focus concerning the mission of corporate VC programs should be shifted from "strategic" or "financial" to potential incompatibilities within various categories of "strategic" objectives. Using resource-, real options-, and network-based perspectives, the chapter introduces a "strategic" CVC categorization where investments either (1) leverage competences to develop new or improved products/activities; and/or (2) hedge against market and technology uncertainties; and/or (3) create an "ecosystem" of third-party implementors and complementors. Empirical evidence on this CVC categorization and its managerial implications has been

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gathered through clinical research on several CVC programs based in North America and Europe.

INTRODUCTION

Corporate venture capital (CVC) programs, where large companies take minority equity investments in early-stage enterprises, have long been recognized as an important strategic activity in either sustaining or renewing profitable growth in large corporations. Indeed, CVC funds increased between 1995 and 2000 partly to take advantage of the rapid changes in new technology, to establish a stake in the internet economy, and to participate in the attractive returns made by the independent venture capital (VC) funds. For example, some 350 CVC funds were reported in existence worldwide in mid-2000, up from 110 in 1998 (Campbell, 2000). Corporate investors also accounted for approximately 8% of the total VC (~$16 billion) invested in 2000, up from 1% in 1997 (Barry, 2000).[1] Yet, despite this increasing participation, CVC funds have been, on average, less successful than independent VC funds; they tend to pay too much and have shorter lives (see e.g. Gompers & Lerner, 1998).

Researchers in the last two cycles of CVC programs (e.g. the 1970s and 1980s) have provided numerous reasons why CVC programs have not been fully effective, often stemming from the fact that there is a well-defined VC market already. First, the commitment to corporate venturing has often been limited (Hardymon, DiNino, & Salter, 1983; Rind, 1981; Sykes, 1990). Decrease in the performance of the base business typically negatively impacts the survival of CVC units. Furthermore, negative comparisons with independent VC may prompt questions of continued existence. Finally, the reassignment of the corporate champion typically results in the disappearance of CVC programs.

Second, contrary to independent venture capitalists, corporations have frequently been reluctant to compensate their venture managers through "carried interest" provisions, i.e. direct equity stakes in the ventures, fearing (1) that they might need to make huge payments if their investments were successful, (2) that it might create a double culture in the company and a lot of disruptive envy between those working hard with and without equity stakes, and (3) that it may elevate revenue expectations for all in the company (Block & Ornati, 1987).

Finally, and seemingly most glaring, corporations found that their mission for the CVC activity was not well defined (Fast, 1978; Siegel, Siegel, & MacMillan, 1988). Unlike the mission for independent venture capitalists – generate attractive financial returns – for CVC programs, the mission has often resulted in multiple incompatible objectives such as supporting the existing strategy and, at the same time, generating attractive financial returns. As a result of these reasons, in addition to the evaporation of the IPO markets, these programs, as has been shown in the recent downturn, have often been short lived.

Yet, despite these potential shortfalls, Gompers and Lerner (1998) in their examination of a sample of some 30,000 transactions by corporate and other venture organizations, found that corporate venture investments in entrepreneurial firms appeared to be more successful than those backed by independent venture organizations, when there was a "strategic overlap" between the corporate parent and the portfolio firm. Yet, the authors' operationalization of what constituted a strategic overlap was rudimentary, consisting simply of whether the start-up firms belonged to the same line of business as the corporate investors.

The objective of this chapter is to pursue a categorization of CVC investments that incorporate this notion of "strategic overlap" in more depth. We argue that since financial success of CVC programs is inherently linked to strategic overlap, the mission of CVC programs should be shifted from "financial" or "strategic" to managing the various categories of "strategic overlap." This categorization draws heavily on the resource-, real options-, and network-based perspectives. This chapter argues that "strategic" CVC investments can (1) leverage or upgrade competences through the transfer and combination of resources, (2) hedge potential technology and market uncertainties, and/or (3) develop an "ecosystem" of third-party implementers and complementors. Based on a clinical study of CVC programs based in Europe and the U.S., this research highlights some of the challenges of managing these different types of CVC investments.

The chapter is organized as follows. We first introduce previous research on the mission and objectives of CVC programs. In the following section, we propose based on the resource-, real option-, and relation-based perspectives, a categorization of strategic CVC investments. We then show how the CVC programs sample dealt with the obstacles and incompatibilities within this categorization of investments. In the last section, we conclude by discussing the implications for CVC program management.

STRATEGIC OBJECTIVES OF CVC PROGRAMS

Corporations appear to pursue multiple goals and strategies in their CVC activities. Siegel et al. (1988) found that return on investment was the most important goal of corporations, followed by exposure to new technologies and markets. For Sykes (1990), identifying new opportunities and developing business relationships was critical. Silver (1993) highlighted finding acquisition targets, getting exposure to new markets, adding new products to existing distribution channels, externalizing R&D, exposing middle management to entrepreneurship, training managers, and utilizing excess plant space, time, and people as the most important objectives. Bannock Consulting (2000), in a survey of 150 European corporations, found that 62% of the firms interviewed had primarily "strategic" goals, while 27% invested for mainly "financial reasons," but most had multiple objectives. Recent research has shown that strategic and financial objectives are not substitutes; instead both are very important motivations for corporations (Alter & Buchsbaum, 2000; Bannock Consulting, 2000; Keil, 2000). Based on seven in-depth cases studies of external corporate venturing activities of information and communications technology corporations, Keil (2000) concluded that, while strategic objectives are often the driver for setting up CVC program, investments are often made using financial criteria.

Some recent research has attempted to provide finer-grained classifications of goals and objectives in CVC programs. Kann (2000), for example, distinguishes three classes of strategic objectives: external R&D (to enhance internal R&D by acquiring resources and intellectual property from new ventures), accelerated market entry (to access and develop resources and competences needed to enter a new product market), and demand enhancement (leveraging their strong resource base and stimulating new demand for their technologies and products by sponsoring companies that use and apply those technologies and products). Keil (2000) identifies four primary strategic objectives: (1) early market warning signals; (2) "learning" new markets and new technologies, using the relationships with the ventures to learn; (3) option building, or placing bets to be ready if certain markets prove important and valuable; and (4) market enactment, the use of CVC investments to shape markets, set standards, and stimulate demand. Finally, an alternative classification of strategic goals for CVC programs suggested by Maula (2001) utilizes three main categories: learning (about markets, ventures, or indirectly about processes and skills), option building (identifying potential acquirees or markets, hedging risks), and leveraging (stimulating demand for the company's products or services, and leveraging complementary resources).

Yet, this line of research suffers from its descriptive nature, i.e. a lack of theoretical grounding. Most studies simply formalize self-reported responses by CVC managers. This lack of theoretical grounding impairs the ability to draw meaningful inferences. In the next section, we develop a solid conceptual basis on which to construct an internally consistent framework for CVC activities.

RESOURCE-BASED, REAL OPTIONS AND NETWORK-BASED PERSPECTIVES ON CVC PROGRAMS

The three underlying perspectives for this study are the resource-, real options-, and network-based views of the firm. Each is discussed in more detail.

Resource-Based View

In the resource-based view, there have been two branches of inquiry. The first concerns an exploration of how resources may be created and developed (Dierickx & Cool, 1989; Amit & Shoemaker, 1993; Teece, Pisano, & Shuen, 1997; Galunic & Rodan, 1998). One way to create new resources is through innovation or searching out new resources or ways to combine them. Indeed, Schumpeter (1934) argued that entrepreneurship is a critical force in generating innovations that could alter existing industries or spawn new ones. He also considered the source: recognizing the value in underlying parts of diverse systems and determining that these parts could be combined or recombined in new ways. As Nelson and Winter (1982) argued, innovation "consists to a substantial extent of a recombination of conceptual and physical materials that were previously in existence (p. 30)."

The second branch of inquiry concerns the question of which and why resources are valuable (i.e. scarcity-based rents) (Wernerfelt, 1984; Barney, 1991). The argument is that if the resources are unique, long lasting, hard to copy, hard to substitute, and are appropriated by the owner of the resources, then they will lead to a sustainable competitive advantage (Barney, 1991). Once these "competences" (Prahalad & Hamel, 1990) are known, they can be leveraged and/or upgraded by further resource transfers and combinations. Thus, so long as companies can create, develop, and sustain unique, durable, long lasting, and hard to copy resources or competences through entrepreneurial behavior, whether internal or external, the company is in a very good position.

Yet, where the resource-based view falls short, concerns the decision of which original resources to seek or combine. Indeed, according to the resource-based view, achieving a competitive advantage is simply a function of "luck" or through the initial resource endowment called "company foresight" (Barney, 1986).

Real Options-Based View

While blind luck certainly may play a part, the real options perspective tips the scales toward "foresighted luck." A real option is analogous to a financial option contract in that it is a limited-commitment flexible investment in an asset with an uncertain payoff that conveys the right, but not the obligation, to make subsequent investments if the payoff were to look attractive or to abandon if the payoff were to look unattractive (McGrath, 2000). Thus, the more volatile the payoff of the investment due to numerous sources including demand, speed of adoption, competitive pre-emption, path dependence, network externalities, regulatory hurdles, input costs, etc., the more valuable the option or limited-commitment investment becomes. Furthermore, after making an initial investment, management can then turn its attention to other issues, wait for the uncertainty reducing factor to appear before making the decision to proceed or abandon. Positive news on the uncertainty reducing factor would result in the exercise of the option or further investment and higher profits. Negative news allows the company to limit itself to the price of the option through abandonment.

Yet, as in the resource-based view, real option thinking also falls short. The theory assumes that the value of the option is in fact exogenous to the company's strategic actions. In other words, the investing company cannot take steps to influence the uncertainty reducing factors (Adner & Levinthal, 2004). Yet, the value of a particular option is in fact deeply embedded in the strategic context of the firm and cannot be considered as a separate item (McGrath, 1997).

Networks-Based View

One area where companies can in fact influence uncertainty is through the development of networks. The network-based view uses the terms network organization (Powell, 1990), interfirm networks, business groups (Granovetter, 1994), organization networks (Uzzi, 1996, 1997), flexible specialization (Piore & Sable, 1984), multi-firm partnerships (Dyer, 1997), constellations of firms (Jones, Hesterly, Fladmoe-Lindquist, & Borgatti, 1998), or ecosystem (Moore, 1993) to refer to the network's ability to coordinate at a low cost across organization boundaries to create network-based resources. This low-coordination cost is enabled through what researchers have dubbed, social capital, a multi-dimensional concept typically referring to the structural, relational, and cognitive elements of the network (Nahapiet & Ghoshal, 1998). The structural elements refer to the network ties (who you know), and network configuration (density, connectivity, and hierarchy) of the network. The relational elements refer to trust, norms, and identification and the cognitive factors refer to shared codes and language. In essence, these factors are pursued either unintendedly or consciously to enhance the networks position within the market. Indeed, networks do not form an industry but rather a subset where they exchange frequently with each other but rarely with other members of the industry (Jones, Hesterly, & Borgatti, 1997). Used strategically, they could indeed tip an industry toward one particular technology, business model, or way of doing things, thus reducing the type of uncertainty described in the real options view.

In summary, we argue that depending on the theoretical lens, value can be realized in a number of ways. Refer to Table 1 for a summary of these views. First, from a resource-based perspective, value can be realized through leveraging or upgrading existing competences through resource combinations or transfers between the corporation and the start-up. Second, from a real options perspective, value can be potentially realized through reserving the right to play (through learning and potentially acquisition) in certain technologies or markets. Through a real option, the downside is limited to a small investment made while the upside could be formidable through further internal development or acquisition. Finally, from a network perspective, value can be realized through the ecosystem effect in the investment portfolio, where uncertainty is tipped to the corporation's favor such that the total value created in the network is greater than the individual sum of the parts.

By applying these three perspectives, we can thus conceptualise the objectives of CVC programs as (1) leveraging or upgrading competences; (2) reserving the right to play in alternative markets/technologies; and/or (3) shaping an industry's future through the building of a supportive network of investments.

Table 1. Description of Theoretical Lenses as Applied to Corporate Venture Capital.

Theory	Resource-Based View	Real Option-Based View	Network-Based View
Concept of the firm	Bundle of resources	Bundle of investments	An actor embedded in a network of social relationships
Unit of analysis	Resource	Investment	Relationships
Key determinants of value realization	Uniqueness	Uncertainty	Network configuration
Actions to realize value	Resource combinations Resource leveraging Resource upgrading	Reserving the right to play	Network governance
Applied to CVC	Adding products to existing distribution channels (Alter & Buchsbaum, 2000; Siegel et al., 1988; Silver, 1993; Sykes, 1990; Winters & Murfin, 1998)	Antenna-like identification of, monitoring of and exposure to new technologies, markets, and business models (Keil, 2000; McNally, 1997; Silver, 1993; Sykes, 1990; Winters & Murfin, 1988)	Building an ecosystem
	Using excess plant space and time (Silver, 1993)	Identify and assess potential acquisition targets (Alter & Buchsbaum, 2000; McNally, 1997; Seigel et al., 1988; Silver, 1993; Sykes, 1990; Winters & Murfin, 1988)	Increase demand for technology and products (Kann, 2000; Keil, 2000)
	External R&D (Kann, 2000; McKinsey, 1998; McNally, 1997; Silver, 1993; Sykes, 1990)	Accelerated market entry (Kann, 2000)	Shape markets (Kann, 2000; Keil, 2000)
	Improving manufacturing processes (McNally, 1997; Siegel et al., 1988)	Option to expand (Chesbrough, 2000; Keil, 2000; Sykes, 1986)	Steer standard development (Kann, 2000, Keil, 2000)

Leveraging and Upgrading Competences

Value creation may come from the combination of resources of the two entities or the transfer of resources from the corporation to the venture or from the venture to the corporation. For example, resource combinations could be in the form of joint product development or joint task forces. Furthermore, resource transfer from the corporation to the venture could be in the form of the venture leveraging the corporation's existing distribution channels, gaining access to product development expertise, brand names, or supplier networks. For example, Compaq Ventures would take a stake in start-ups with battery and wireless technologies that could leverage Compaq's brand and vast distribution network. Resource transfer from the venture to corporation could come in the form of complementary technologies or activities, new business model know-how, product development expertise that may supplement or upgrade the existing competency base of the corporation. For example, Deutsche Telekom's T-Ventures invested in a company called Intershop to gain access to its e-commerce engine as a basis for driving e-commerce sales on its Deutsche Telekom's online network.

Reserving the Right to Play in Alternative Markets/Technologies

Another way of creating rents through CVC is to provide "strategic feelers" to not only identify early substitute technologies/markets, but also to coopt them through minority investments. The minority investment (rather than a full-scale acquisition or full-scale development program) can be seen as a learning option/probe/hedge into a new technology or market, which the company has not pursued but exhibits significant uncertainty. While resource combinations and transfers may provide the basis on which near-term value is created, they also enhance the firms' commitments in either one or a set of the company's competences. In the presence of potentially substitutive technologies or markets, these competences could become core rigidities or liabilities (Leonard-Barton, 1992). For example, in the late 1980s, Apple Strategic Investments Group focused on competence-leveraging investments only, committing more and more resources to its own operating system. Microsoft, on the other hand, was investing in parallel in a number of alternative, potentially substitutive, operating systems: while launching Windows 3.1. In the late 1980s, Microsoft had feelers in SCO UNIX, Apple OS (through its applications), and IBM OS/2 since it did not know at that time which one would become the de-facto standard.

Building an Ecosystem
CVC programs not only realize value through leveraging and upgrading competences and reserving the right to play in alternative technologies or markets, but also through the network it develops from the portfolio of investments. As the economy grows into a networked collection of resources, competences, and activities, the importance of the network has grown relative to the value of the individual pieces. Indeed, many researchers have recognized the importance of network-based competition. For example, Gomes-Casseres (1994) refers to the competition between the CISC (complex instruction set computer) and RISC (reduced instruction set computer) standards in computing. Rather than firms competing against each other in a vertical part of the industry value chain, they are competing as a network along the value chain against other horizontally coordinated networks. In recognition of this fact, a number of industry players have migrated a significant proportion of their corporate VC programs toward the support and development of these complementary network nodes to shape the industry to their view, which ultimately support the success of their new technologies. Thus, rather than hedge against alternative industry futures, the CVC program can be seen as an instrument in shaping the industry through the development of an ecosystem or network of investments that support a particular technology whether proprietary or in the public domain.

Combining these three overlapping but also potentially incompatible strategic objectives of leveraging and upgrading competences, reserving the right to play, and/or building an ecosystem creates an additional set of challenges on the structure of the CVC operations. What incentives should be in place? What processes are required to manage these differing motives? How does the CVC balance the portfolio along these objectives? How does it guarantee the independence of the CVC team? What experience set is required of the CVC team members? What metrics should be used according to these motives? The answers to these questions were addressed by the companies that we interviewed.

RESEARCH METHODS

While concerns for external validity and generalizability indeed remain, grounded, case-based research was chosen over pure deductive reasoning in order to gain greater insight into a phenomenon that has not been completely understood yet: the nature and function of "strategic" CVC programs (Yin, 1984; Eisenhardt, 1989). In such situations, a grounded theory

Table 2. Description of Companies Interviewed.

Region/Country	Primary Industry	Company Name	Number of Interviews
N.A./U.S.A.	Telecom and cable	ATT Ventures	2
N.A./Canada	Telecom and cable	Shaw Ventures	2
N.A./Canada	Telecom and cable	Rogers Ventures	2
N.A./Canada	Telecom and cable	BCE Capital	2
N.A./U.S.A.	Telecom equipment	Lucent New Venture Group	2
N.A./U.S.A.	Computers	Compaq Ventures	2
N.A./U.S.A.	Semiconductors	Intel Capital	1
Europe/Germany	Telecom and cable	Deutsche Telekom T-	3
Europe/Norway	Telecom and cable	Ventures	2
Europe/Sweden	Telecom and cable	Telenor Ventures	2
Europe/Finland	Telecom and cable	Telia Business Innovation	2
Europe/Italy	Telecom and cable	Sonera Ventures	2
Europe/Denmark	Telecom and cable	Telecom Italia	2
Europe/ Netherlands	Telecom and cable	TDC Innovation	2
Europe/Sweden	Telecom equipment	KPN Valley	2
Europe/ Netherlands	Consumer electronics	Ericsson	2
		Philips	32

building approach is more likely to generate in-depth and relevant insights on the phenomenon than relying on past research (Glaser & Strauss, 1967; Eisenhardt & Brown, 1997).

The setting for this study is the fast-paced high-technology sector in Europe and North America including telecommunications, cable, wireless, wireless equipment, satellite, computers, and components industries. Table 2 provides a list of the CVC units interviewed, where they come from, their industry representation, and the number of interviews. All of them stated that their main objective for CVC investing was strategic in nature.

Data about the CVC programs was collected through interviews, questionnaires, observations, and secondary sources. The primary source of data collection was semi-structured interviews with the respondents. To facilitate the company interviews, in most cases, an initial contact was established by an introductory letter sent to a senior partner of the fund management team followed by a telephone call approximately 1 week later to set up the meetings. Among the participating companies, we conducted interviews at the company site and over the telephone. The 32 interviews conducted were taped and transcribed. The interviews lasted approximately 90 min on average, although a couple lasted more than 3 h. An interview guide was used to conduct the semi-structured interviews. The guide contained both specific questions regarding the CVC programs and some open-ended questions concerning the management of the venture investments or the portfolio. The data analysis process consisted of two different stages, which were carried out over two different time periods. During the first period (6 months), the interviews were conducted, transcribed, and analyzed in order to get a better understanding of the motivations, processes, and outcomes of the CVC programs. Using these interviews and the secondary sources regarding CVC programs, we developed in-depth case studies. Once the cases were developed, we used a crosscase analysis (see e.g. Eisenhardt, 1989) to create the insights along these three motives of strategic CVC investing.

OBSERVATIONS

For each CVC program studied, we documented which strategic objective they pursued, the challenges associated with managing these objectives, and finally, the success measures. Refer to Table 3 which provides information on each CVC program: the name of the fund and the number of IPOs and acquisitions out of the total number of investments, the size of the fund, the number of years investing, the status of the program, and finally, which objectives were pursued. The management challenges focused primarily on incentives for the CVC units and the business units, and the relationships between the business units and the CVC units. The success metrics concerned the size and longevity of the CVC program and the percentage of ventures that had gone public or had been acquired (for those investments greater than 3 years). Ideally, we would like to use investment returns as a measure of success; however, Venture Economics, our source, does not compile the ownership stake held by each investor. We thus resorted to examining the status of the venture in late 2003 while limiting the program to those investments made prior to 2001 (see e.g. Gompers & Lerner, 1998 for a similar methodology). The two changes in status that interest us are: going public and being acquired. One study in 1988 discovered that a $1 investment would yield a cash return of $1.95 on top of the initial investment if the venture went public and 40 cents if the venture was acquired (Venture Economics, 1988). Thus, while this measure is crude, it does provide some indication regarding the success of the program. However, we must be cautious in interpreting these measures. For example, Intel Capital

Table 3. Descriptive Data on the Case Studies.

Name of Company (% IPO or Acquired)	Experience in CVC	Fund Size	Status of Program	Combinations and Transfers	Reserve the Right to Play	Ecosystem Development
(a) *North American*						
ATT Ventures (Venture management services) (45/71)	14 years	$225 million (several funds)	Ongoing. Separate but affiliate program	Yes	Yes	
Shaw Communications (2/7)	5 years	No limit	Ongoing. Direct investing	Yes	Yes	
Rogers Communications (4/10)	3 years	No limit	Ongoing. Direct investing	Yes	Yes	
BCE Capital (11/27)	11 years	$94 million	Ongoing. Separate but affiliate program	Yes	Yes	
Lucent Venture Partners (27/86)	4 years	$300 million	Ongoing. Separate but affiliate program	Yes	Yes	
Compaq Ventures (18/38)	10 years	$250 million	Subsumed into HP. Subsidiary	Yes	Yes	Yes
Intel Capital (157/162 total) (12/57 Intel 64 fund) (8/79 Intel Comm. fund)	12 years	Direct investing – no limit Intel 64 – $250 M Intel Comm. Fund – $500 M	Ongoing. Subsidiary of Intel Corp.	Yes	Yes	
(b) *European*						
T-Ventures (Deutsche Telekom) (14/49)	3.5 years of direct investing	$250 million	Ongoing; subsidiary	Yes	Yes	

Table 3. (*Continued*)

Name of Company (% IPO or Acquired)	Experience in CVC	Fund Size	Status of Program	Combinations and Transfers	Reserve the Right to Play	Ecosystem Development
Telecom Italia (1/9)	4 years of direct investing	$30 million	Ongoing; subsidiary	Yes		
Telenor Ventures (5/29)	9 years of direct investing	Latest fund $25 million	Ongoing; separate but affiliate program	Yes	Yes	
KPN Valley (N/A)	6 years of direct and indirect investing	$120 million	Active; however performing under expectations	Yes	Yes (focus)	
Telia Business Innovation (4/15)	3 years of direct investing	No limit given	Shut down, company has reorganized	Yes	Yes (focus)	
Sonera Ventures (4/17)	6 of indirect investing and 2.5 years of direct investing	$85 million so far but not limit given at outset	Active but at the moment on hold. Now separate but affiliated program	Yes	Yes	
TDC Innovation (0/2)		$39 million	Ongoing, subsidiary	Yes		
Ericsson (5/25)	2 years	No limit at outset; now $300 million	Ongoing, subsidiary	Yes	Yes	
Philips (4/13)	20 years of investing on and off 4 years	$130 million	Ongoing, subsidiary	Yes	Yes	

has been widely cited as having returns that have exceeded those of independent venture capitalists; yet, the percentage of its investments having gone public or having been acquired is lower (24%) than the average for all the companies studied (28%).

Leveraging and Upgrading Competences

All of the respondents (100%) indicated how important it was for the corporation to leverage or upgrade their existing assets by adding new services or technologies. Furthermore, they stated how the start-ups could benefit by gaining access to substantial corporate resources, such as R&D, distribution, and sales. For example, one of the CVC units defined CVC as follows:

> A structure created within major industrial groups to invest in and consult with innovative new companies, which have, through limited dimensions, great potential for future growth, and, in any case, the potential to develop synergies with the core business of the group.

Nevertheless, we also found substantial differences among CVC programs in how these resource combinations and transfers were in fact realized. Based on our interviews, we found the following major obstacles for effecting resource combinations and transfers: lack of recognition, commitment and proper incentives of the business units to encourage resource transfers, and frictions between business units and the CVC organization.

To facilitate the emergence of a common understanding of the value creation benefits of the venture, we observed that a person or team from the business unit was involved in the due diligence process. The more stable CVC programs have developed a well-honed due diligence process, which typically includes such topics as financial, synergy (technical and commercial), and legal evaluations, and get the involvement from the business unit as early as possible. For example, in T-Ventures, after significant honing, the process was described as follows:

- Review the business plan of the venture.
- Bring people in to review it (experts within T-Ventures and Deutsche Telekom Corporate, typically R&D).
- Use contacts within Deutsche Telekom Business Units (e.g. mobile) to establish possible partnerships (approximately 60% of the due diligence time).

None of the business unit managers in the sample were remunerated specifically to encourage resource combinations or transfers with the start-up ventures. Yet, we found that more successful resource combinations and transfers occurred with investments beyond the seed and start-up phases, i.e. second and later rounds of financing. As some of the respondents mentioned, these ventures already had a prototype or a product that was ready for market introduction, reducing significantly the required time commitments and incubation services the business unit managers were willing to provide. For example, based on the immediately recognized payback, T-Ventures had successfully invested in a start-up called Intershop, a developer of a leading e-commerce engine that was quickly incorporated into their ISP (Internet Service Provider) business unit's e-commerce offering. Shaw Communications invested in Excite @Home, a leading portal for the broadband industry that was rapidly deployed in their cable broadband network.

Furthermore, many of the investment managers stated that the benefits for the business unit managers were simply too small for them to spend much time with these start-ups. However, we did find that they seemed to be more committed to the investments if they originated from the business units. In these investments, at least a relationship with the venture had already been established resulting in the recognition of the opportunity, the incentives, and commitment to work with the venture. In addition, we found that in a few of the CVC programs (25%), an informal agreement or a letter of intent from the business unit prior to the investment was made to ensure some form of commitment to working with the venture.

Finally, we observed that the credibility of the CVC unit staff was seen to be very important in initiating the resource combination and transfer process. Some CVC programs were considered "business development units" who consisted mainly of corporate staff either from mergers and acquisitions or from corporate strategy. In one program, the CVC unit was used more as a career stepping stone for fast trackers. In other CVC programs (19%), the VC professionals consisted of former business unit operating managers, where the positions were considered an end rather than another rung on the corporate ladder. As one of the respondents stated:

> This is a venture capital firm. The people are not here on a rotational basis. This is a career move for them.

We found that for resource-based investments, permanent staff which originally came from the business units carried more credibility with the business unit representatives, due to their previous personal ties as well as their commitment to the venture success, rather than to their next career move.

In summary, the more successful programs focusing on leveraging and/or upgrading competences used search processes which emphasized second-stage or later investments originating more often within the organization than outside. Through both of these mechanisms, the business units were more likely to see resource combination and transfer opportunities that could benefit not only the start-up, but more importantly, themselves. Furthermore, the value-creation potential for an investment was much higher if the business unit was involved in the due diligence process and was willing to sign a letter of sponsorship. Involvement also incorporated more frequent contacts with the venture, thus increasing the likelihood of trust building between the business unit and the venture. Finally, credibility and sustainability of the CVC unit were critical for the business units to engage at all. In total, despite the challenges, the success ratio of these programs is particularly high. Studies have shown that start-ups in CVC programs, which developed technology, customer, or distribution alliances with their corporate partners, are more likely to go public or be acquired than those that did not (Henderson & Leleux, 2003).

Reserving the Right to Play in Alternative Markets/Technologies

Many CVC organizations (87.5%) also stated that they invested in technologies and business models that were longer term and more speculative in nature or were potentially "disruptive" to the existing business units. However, not only did these investments exhibit a higher likelihood of failure, they were also harder to manage than those which leveraged or upgraded competences.

First, many of those CVC units (70%) mentioned that there were incentive issues with investments in disruptive technologies especially for those few programs which had implemented "carried interest," typical of independent venture capitalists. Even if the programs were asked to invest in disruptive technologies, they tended to focus on investments in ventures with complementary assets with the business units than in ventures with substitute technologies. As one respondent who did have carried interest stated,

> My hit rate is much higher and, as a result, I can earn substantially higher returns from those investments which can access the resources of the business units.

Indeed, even in those venture organizations that were independent but affiliated with the corporation, the incentives to develop ties with the corporation's business units were still very significant. For example, for the VC investments in the telecom sector (~70% of the sample), alliances either in the form of a customer, distribution, or technology agreement, were forged in approximately 60% of the cases (Henderson & Leleux, 2003).

Second, we found that in the few CVC units (13%), which focused primarily on hedging investments, significant relationship problems developed between the CVC operation and the business units. For example, one CVC unit developed an ex-post "opportunity recognition" mechanism to deal with the perceived tendency of business units to otherwise decline projects with the slightest potential for sales cannibalization.

> The board wanted to have the decision making process separated from the business units for fear that they would 'nix' [sic] each investment. This allowed us [the CVC arm] to invest in something that was clearly in competition with the business units. Indeed, one of the unwritten objectives of corporate venture capital unit was to create new business areas that were competing with the existing business units.

However, the reaction from the business units was not at all supportive. Indeed, one of the business units in turn started its own VC unit to invest in start-ups that were more complementary.

> The relationship with business units was not particularly good. They were supposed to be used as a vehicle to encourage internal and external ventures that were primarily not connected with the businesses but there were outbreaks within the company. For example, the head of the network division stated that he wanted to start his own CVC fund.

Furthermore, in another company, a formal organizational structure called "the convergence group," was established to focus on "the merging of markets, services, and technologies such as media and broadband, mobile and internet and IT and telecoms." This convergence group consisted of members from the portfolio companies, the R&D, and business units. The idea behind this group was to provide a location where these ventures were protected from the business units, but also where the business units could learn from them (a window on new technologies). The monitoring and management of these portfolio companies then rested with the VC organization rather than with the business units. Once again, given the potential relationship problems with the business units and the CVC unit, it is unsurprising that the unit's performance was under expectations.

Overall, for these two units that did focus primarily on hedging investments, the outcomes were not particularly encouraging. One unit was disbanded and the second was sold to a contract research organization focused on the telecommunications sector. In contrast, the more successful CVC organizations (14%) within this group created separate investment processes and organization structures. For example, at Intel Capital and Compaq

Ventures, a separate organization structure for each type of investment was created. For leveraging and upgrading core competency investments, the sponsoring business units were ultimately responsible for monitoring their progress. For reserving the right to play investments, which no business units were interested in sponsoring, the R&D function was responsible for monitoring developments. As these technologies tended to be more long term and speculative in nature, these investments were a good fit for the R&D function. In this way, the corporations could still participate in the development of the technology and also protect it from the potentially harmful actions of the business units.

In summary, based on our observations from the CVC programs, we found that the strategic objective of "reserving the right to play" was the hardest to execute for CVC units because of incentive issues, relationship problems with the business units, and organization structure issues.

Building an Ecosystem

In some cases, specific funds are set up to push the "house standard," create demand for the company's products and services, and build a network more valuable than the sum of the parts. Examples include the Intel 64 fund, the Intel Communications fund, the Microsoft .Net fund, SAP R/3 fund, and Sun's Java fund. Since we only found one company (Intel) that had engaged in formalized "ecosystem development," our observations are based on it, and more specifically, the Intel 64 fund.

The Intel 64 fund was created to support the adoption of Intel's Itanium chip, which was the basis of Intel's high-end server microprocessor platform. The strategy of Intel 64 fund was simple: to invest primarily in software companies that were creating enterprise solutions that were optimized for the Itanium processor (in effect a "business ecosystem" around the Itanium). Intel required a definite commitment from software vendors to create Itanium-based applications. This commitment was critical for Intel because existing software built to run on the prevalent RISC processor systems would not run on the Itanium architecture (EPIC) and because existing software vendors would have to undergo extra efforts to create or modify existing software to run on the new architecture.

The Intel 64 fund, unlike other CVC funds, brought in coinvestors. Many of the major server hardware manufacturers joined so as to benefit from added server sales if the Itanium were to be a success. These coinvestors include HP, Compaq, Dell, SGI, and NEC. A number of other companies also invested including: Bank of America, The Boeing Company, Circuit City, Enron, Ford Motor Co., General Electric, McKessonHBOC, Morgan Stanley Dean Witter, Reuters, Sabre, SmithKline Beecham, Sumitomo Corp., SunAmerica, and Telmex. The idea was that this secondary set of investors would not only help fund Itanium solutions, but they were also likely to buy IA-64-based solutions. In total, all members of the value system were coordinated by Intel to enable the development and growth of the Itanium processor.

Intel also incorporated investment process for the Intel 64 fund into its overall investment process. Each investment opportunity was passed through Intel Capital's normal due diligence. After passing these steps, if the start-up were involved with Itanium technology, it would be offered to the Intel 64 fund for consideration. The Investment Committee of the fund, consisting of one member from Intel, one from each of the server manufacturers, and two from the secondary investors then had to approve the deal. At least two members, Intel and another member had to approve the deal. Otherwise it would be sent back to Intel Capital for its own account. With this process, Intel managed to maintain the same basic investment process; yet, as with its hedging investments, the monitoring was left to R&D.

Intel also introduced a formal process to integrate and support its ecosystem ventures. Every venture has its own Intel strategic investment manager and a set of board observers to not only ensure the company's commitment to the Itanium, but also to serve as a conduit for knowledge transfer and best practices to help the ventures overcome business hurdles. Some of the services Intel provided the ventures included increased marketing and business development visibility. Intel gave the portfolio company executives introductions to other Fortune-500 executives to spur the sales of new ventures' products. Intel encouraged knowledge sharing both between itself and the ventures as well as among the portfolio companies themselves. Often times, this knowledge was in the form of Intel's functional expertise to help start-ups resolve marketing, sales, financial, or human resources issues. Intel also promoted the cross-pollination of products and services within its established network of companies and organized events geared toward a particular technology area. At the highest level of interaction, Intel often provided one-on-one services to the portfolio company executives after evaluating their needs. In return for all these services, the venture companies had to keep to their commitment to building software for the Itanium.

It is apparent that Intel has invested significant resources (human, capital, and processes) to make the Itanium a success through its Intel 64 fund.

Indeed, over 1,500 different applications have been developed specifically for the Itanium processor, many coming from the very companies that they invested in. However, other success measures are not particularly encouraging. Only 21% of its investments have either been acquired or gone public compared to 28% of the sample. Furthermore, the sales of Itanium chips have consistently missed their targets. Most observers agree that the logic of the fund cannot be faulted for the poor performance of the Itanium chip but rather the proprietary nature of chip itself.

DISCUSSION AND CONCLUSIONS

CVC programs have been for a long time characterized as short term, uncommitted, under funded, and unsuccessful as they often arise at the tail end of an IPO boom, only to be cancelled during the bust. "Mission incompatibility" of CVC objectives (e.g. strategic or financial) has been one of the main reasons cited in extant research for the below-standard performance and short-lived nature of many CVC efforts. However, since recent evidence has shown that CVC programs with a "strategic overlap" perform at least as well as independent VC funds, a deeper look into the notion of "strategic" CVC is warranted. Within strategic objectives, this chapter argues, using the resource-, real options-, and network-based perspectives, that a CVC unit can either (1) leverage or upgrade existing competences through resource combinations and transfers; (2) reserve the right to play in new technologies or markets; and (3) develop a business ecosystem of third-party implementers and complementors.

Yet, based on our observations, we find that even using only strategic objectives, CVC programs could still suffer from "mission incompatibility." We found that by far the most successful investments were the ones that leveraged or upgraded existing competences making them by definition more attractive to investment managers than the other two types. Yet, these findings are not surprising given that the first objective concerns exploiting the existing competences of the corporation, whereas the other two concern exploring new competences either through hedging or through shaping an industry's future. Regardless of the method, both involve significant uncertainty and risk of failure.

If our observations are supported through more formal empirical research, significant implications can be provided for management of CVC programs. First, to guide a CVC unit through multiple strategic objectives, a categorization can be developed on the basis of three fundamental drivers: (1) the level of market, business model, and technology uncertainty (x-axis; low to high); (2) the company's stock of competences (y-axis; poor to rich); and (3) the level of dependence on third parties for the development of new technologies or markets (z-axis; low to high). The categorization is presented graphically in Fig. 1.

At one extreme, where firms would have one-dimensional characterizations in this categorization, the resulting optimal portfolio of CVC investments could be weighed to that strategic objective. For example, a company with high stock of competences but low exposure to disruptive technologies and low dependence on third parties for new technologies or markets would more likely invest in only start-ups that leverage or upgrade its existing competences. Where corporations would have high scores on all three dimensions, they are likely to maintain a portfolio of all three types of investments (i.e. 33% of the total portfolio for each category). Yet, based on our observations strict fund and organization delimitations may be required to separate these three potentially incompatible objectives. For example, a firm like Intel, which scores high on all three dimensions, has created distinct sub-portfolios in Intel Capital to track these various strategic intents: Intel 64 fund and Intel Communications fund for ecosystem development, Intel Capital investments supported by existing business units to leverage and upgrade existing competences, and finally, Intel Capital investments supported by Intel R&D to reserve the right to play in alternative technologies or markets. Compaq Ventures has followed very much the same path. As Compaq Ventures scored high on two of these three strategic dimensions

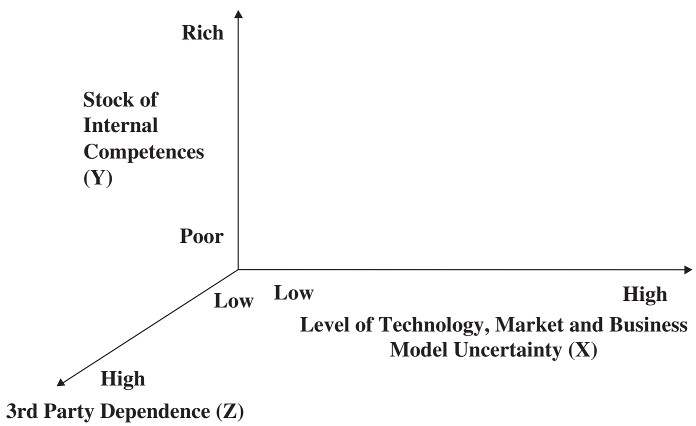

Fig. 1. Strategic CVC Programs: A Three-Dimensional Categorization.

(stock of competences and the level of market, technology, and business model uncertainty), it broke down its overall CVC portfolio into Sales Equity Investments to support the business units and Technology Investments, which were monitored by R&D.

Second, if the purpose of the program is indeed to "leverage or upgrade competences," then the search process may be better focused on second stage or later investments and to those that originate from the business units suggestions. Furthermore, the value creation potential for an investment would be much higher if the business unit were involved in the due diligence process and were willing to sign a letter of sponsorship. Involvement may also require more frequent contacts with the venture, thus increasing the level of trust between the business and/or CVC unit and the venture. As the business units see the benefits of that commitment (i.e. through ventures with marketable products and services), their understanding, support, and perceived sustainability of the program may increase, thus improving their relationship with the CVC unit. Incentives would most likely be related to both the performance of the venture (i.e. acquisition or IPO) and the impact on the implied business unit.

Third, if the purpose of the program is to "reserve the right to play in new technologies and markets" then the search process may be better focused on earlier staged investments and likely on those that originate outside the business units. Since the business units would by definition not be interested in these investments, they would require closer monitoring by the CVC unit or by R&D. Furthermore, significant communication and explanation would be required between the business units and the CVC program to remove any potential misinterpreted threats. Not all of these investments may be deemed "disruptive" to the existing business units. Rather, these investments are "real options" such that the failure in the technology or new market is limited to the cost of the option. Yet, often this concept is difficult to convey to others. In fact, other researchers have suggested that these investments be outsourced to independent venture capitalists (Hellman, 2001). Incentives would most likely be related to performance of the portfolio of ventures, since these investments more likely resemble those of a traditional venture capitalist. In other words, out of ten investments, one may be a substantial performer, two may outperform, three may break even, and the rest may fail.

Fourth, if the purpose of the program is to "build a market or technology ecosystem" then the search process may be focused on those investments (early- or later-stage investments) that support the market or technology and most likely those that originate outside the business units. Similar to the hedging investments, these ventures would require close monitoring and support by the R&D and more specifically the new business group responsible for the launch of the new technology or development of the new market. Since these programs also incorporate significant uncertainty, incentives in this case would most likely be related to not only the performance of the portfolio of ventures as in reserving the right to play investments, but also the development milestones of the market or the adoption curve of the new technology.

In conclusion, the chapter's main contribution is a better understanding of the strategic dimensions of CVC activities. A 2001 Bain & Co. survey of major managerial practices highlighted the fact that corporate venturing was the strategic activity generating the most dissatisfaction among respondents. We argue that an ambiguous definition of what constitutes a "strategic investment" contributes significantly to the frustration and provide avenues for an enlightened definition of CVC objectives, as well as implications for organizational aspects of CVC. Furthermore, based on our observations and findings, if a corporation were to engage in CVC investments, a good place to start to prevent frustration would likely be to leverage and upgrade its existing competences. These investments exhibit the greatest likelihood of success. Early successes could then result in greater sustainability of the program.

NOTES

1. This amount does not include corporate funds committed to independent venture capitalists.

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PART II:
INNOVATION

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CORPORATE ENTREPRENEURSHIP FROM A COMPETENCE-BASED MANAGEMENT PERSPECTIVE

Tino Michalski

ABSTRACT

Global corporations are competing to develop innovative businesses in the world's high-tech industries. Increasingly, they are trying to stimulate new business development through corporate entrepreneurship activities (e.g., internal and external corporate venturing activities) instead of traditional R&D efforts carried out by R&D departments. Applying a competence-based management perspective, this paper analyzes alternative forms of corporate innovation management arising from corporate entrepreneurship activities. It also proposes ways of improving the use of these alternative forms of corporate innovation management in the global innovation race, focusing especially on how to maximize innovation success through corporate venture portfolios.

BUSINESS DEVELOPMENT, INNOVATION, AND CORPORATE ENTREPRENEURSHIP

A competition to develop innovative businesses is underway between global corporations, especially in the information, communication, and electronics

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industries. This chapter focuses on technology-oriented global corporations in such high-tech industries. Such corporations are being increasingly challenged to make their business development and innovation management processes more productive, and to integrate them better into their corporate strategies and value management procedures. Technology-oriented global corporations must learn to react ever more quickly and effectively to create new customer value by bringing innovative product offers to hypercompetitive global markets.[1]

The question for managers today is how to create new businesses and innovative product offers fast. To answer this, it is necessary to examine how the strategic architectures of technology corporations could be altered to adopt a new innovation management architecture that can meet the requirements of hypercompetitive markets. New alternatives to the traditional "linear and incremental" business development and R&D processes must be found.

In many cases firms are trying to meet this challenge by revamping their business development departments and/or in-house R&D departments through various kinds of intrapreneurship, new forms of corporate development, internal and external corporate venturing activities, and systematic acquisitions of new ventures and start-ups. I refer here to such activities as a "corporate entrepreneurship" function within a company. In the following discussion, I will classify and analyze alternative forms of business development and innovation management arising from these corporate entrepreneurship activities, as well as new forms of internal-corporate organization, management instruments, and incentive systems used in such activities. Applying concepts from competence-based management, initiated by Sanchez and Heene,[2] I evaluate which type of corporate entrepreneurship is best suited for the challenges of hypercompetitive industries and its relevant success factors.

In the second section, I propose a competence-based framework for analyzing corporate entrepreneurship. In the third section, different types of corporate entrepreneurship are identified, based on their governance, and the special importance of corporate venturing for innovation success and competence building is highlighted. In the fourth section, common failures in corporate venturing are discussed, and in the fifth section, improved organizational structures and incentive mechanisms for corporate entrepreneurship are proposed. In the sixth section, types of governance for corporate entrepreneurship are evaluated for potential innovation success in hypercompetitve market conditions and a specific governance type is suggested as most appropriate. The success factors of this governance type are then analyzed using the competence-based framework and especially a strategic model introduced by Sanchez and Heene. In the seventh section, frictions that might occur between the corporate core and corporate ventures of a corporate venture portfolio are discussed, and based on that discussion options for better organizational integration of such corporate ventures – a key success factor – are proposed in the eighth section. Finally, I conclude with a summary of the success factors for the innovation success of corporate venture portfolios.

A COMPETENCE-BASED FRAMEWORK FOR CORPORATE ENTREPRENEURSHIP

Competence-based strategic management[3] is an approach to strategic management based on the competence-based view (CBV) of the firm,[4] which significantly extends the resource-based view (RBV) of the firm.[5] This chapter uses a combined resource and competence perspective on the firm, applying both theoretical concepts from the resource and competence views, as well as a competence-based strategic model.[6] Competences are seen here as based on specific forms of resources.[7]

In this perspective, profit differences between direct competitors result from comparative advantages in the building and leveraging of strategic resources and competences. Competitive advantages result from innovative resources and competences and from company-specific isolation mechanisms that act as market-entry barriers, making possible differential profit rates within a given group of direct competitors. Seen from a microeconomic perspective, distinctive competences and associated isolation mechanisms counteract the market mechanism and may create the basis for sustainable, long-term, above-average profits. A firm's successful competitive positioning thus reflects advantageous resource and competence positions.

Because of accelerating innovation rates and increasingly intense global competition, innovations are more and more essential to corporate success, especially for global information, communication, and electrotechnical companies. Unique resource and competence positions in such competitive markets may not only represent a superior adaptation to the competitive situation in a specific market; they may also influence the dominant logic for competing in a specific market,[8] especially in global high-tech markets. In markets with high innovation rates, new market segments are developed on a continuous basis, and new combinations of technologies, strategic logics,[9] and technological standards may fiercely compete for dominant market positions.

In turbulently evolving market situations, the fast development and appropriation of innovative resources and competences play a leading role in efforts to achieve a dominant market position. Corporate entrepreneurship has therefore become an important way to test the success potential of competing technologies and strategic logics and their underlying resources and competences. Through corporate entrepreneurship initiatives, new strategic logics can be tested faster and more flexibly than through traditional R&D and business development departments.

CORPORATE ENTREPRENEURSHIP AND CORPORATE VENTURING

The task of the "corporate entrepreneur" is to systematically generate innovations that lead to successful new products, services, technologies, and businesses within an established company. This task can be performed by designated persons or teams, by an entrepreneurially oriented division or business unit, or by various kinds of corporate venturing activities – for example, by the creation of innovative, independent, and mostly small-sized new business units, which I will refer to here as corporate ventures.

From the resource and competence perspective, corporate entrepreneurship intends to leverage or "activate" to their full extent those already existing resources and competences in a corporation that are seen as necessary for future innovation success within the markets and technology environments the company is operating in or wants to operate in.[10] Corporate entrepreneurship within a company can also try to build new internal or external resources and related competences.[11] In practice, corporate entrepreneurship typically consists of a "mixture" of competence leveraging and competence building.

Different types of corporate entrepreneurship can be differentiated along two dimensions. One dimension is the degree to which the corporate entrepreneurship function of a corporation is organizationally separated from the core business of the corporation. The other dimension is the degree to which the corporate entrepreneurship function of the corporation is institutionalized. Using these criteria, the corporate entrepreneurship function can be categorized into four main governance types. Governance types 1 (development of new products and services) and 2 (corporate development) mainly constitute competence leveraging, whereas governance types 3 (single corporate ventures) and 4 (corporate venture portfolios) mainly constitute competence building (see Fig. 1).

Thus, there are two basic options for improving a corporation's existing innovation management in adopting a corporate entrepreneurship function. On the one hand, there is the option of intensified competence leveraging of resources and competences that already exist in some form within the R&D department or other units of the corporation. On the other hand, there is the option of intensified competence building through the creation of new innovative resources and competences.

Competence leveraging may be fertile if R&D employees or other innovation-oriented employees ("intrapreneurs") are empowered to develop existing resources and competences into new products, services, or processes

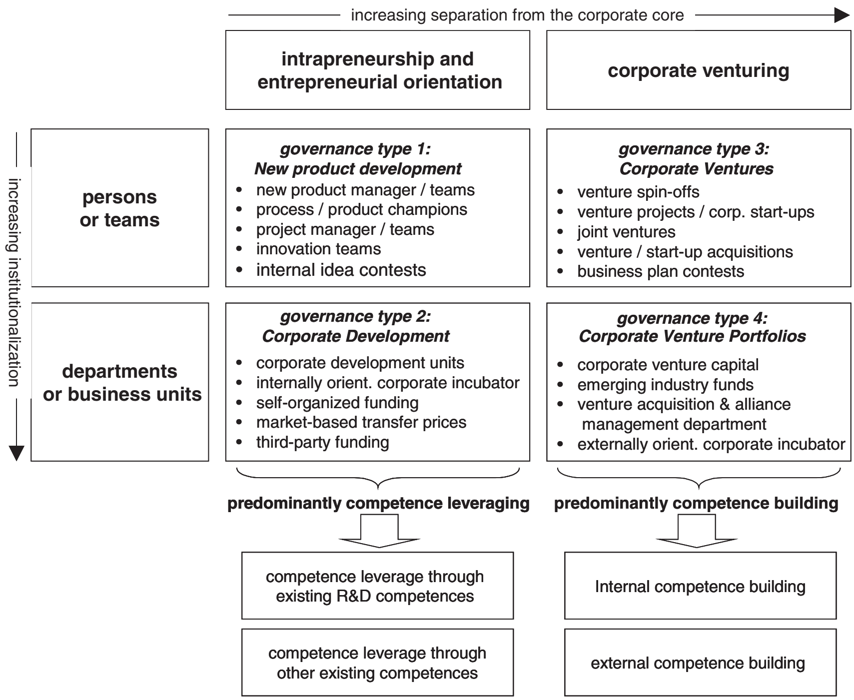

Fig. 1. Governance Types of Corporate Entrepreneurship from a RBV/CBV Perspective.

without being inhibited by line management and department boundaries. Additionally, intrapreneurs may be able to leverage resources and competences with the help of process or product-innovation teams or through internal venturing activities, especially if top management establishes appropriate incentives – for example in the form of idea competitions, internal business plan competitions, or job promotion opportunities for demonstrated intrapreneurs. Such incentives and the resulting emergence of intrapreneurs within a company, however, may often be accompanied by conflicts of interest with line managers and department heads. In many cases, this leads to reductions in intrapreneurs' motivation and scope of work. Such approaches are therefore likely to foster incremental innovations rather than radical innovations.

Another possibility for intensifying competence leveraging is the entrepreneurial "activation" of a whole R&D department or other departments, activities, and processes of a company. This entrepreneurial activation may be achieved through policies of self-financing that lead to the acquisition of third-party funds. In this case, the emphasis is not on individually oriented intrapreneurship, but on a collectively oriented entrepreneurship activated through the establishment of incentive mechanisms.

Competence building has also recently become more important in both the theory and practice of corporate entrepreneurship. It offers a promising opportunity to create new resources and competences to exploit evolving opportunities. Competence building becomes most effective, when opportunities to learn are explored through external corporate ventures or acquired corporate ventures. Furthermore, there are also several ways to provide support for developing intrapreneurs into entrepreneurs, e.g., through spin-offs.[12] However, innovation management based on corporate venturing could be limited by internal organizational barriers and conflicts that impede an entrepreneurial learning process.

FAILURES IN CORPORATE VENTURING

Studies of corporate venture initiatives have shown that corporations often achieve little or no innovation success through internal or external corporate ventures or by acquiring corporate ventures.[13] There are two major reasons for the failure of a corporation's business development and innovation management based on corporate venturing. First, corporate ventures that are dependent on the corporation's medium- and long-term strategic planning and management may be vulnerable internally. Within an established company, the strategic planning and management process is usually rooted in currently valid and successful value propositions, strategic logics, and configurations of strategic business units. Efforts to increase a corporation's value usually follow the established value appreciation logic of the company, and its people and processes may be inimical to exploration or new strategic logics.

Second, conflicts between corporate core businesses and corporate ventures often occur in the form of struggles over resource allocations, hierarchy, and incentives. Practical experience suggests that changing the strategic planning and management process of a corporation to include an expanding corporate venture portfolio may be less problematic than overcoming or at least significantly reducing possible areas of conflicts that often exist between the corporate core and the corporate ventures (see Section "Success factors for corporate venturing" for further discussion).

ORGANIZATIONAL STRUCTURES AND INCENTIVE MECHANISMS OF CORPORATE VENTURING

Business development and innovation management based on the guiding principle of active corporate entrepreneurship can today draw on a growing number of newly developed organizational structures, management tools, and incentive mechanisms for competence building and leveraging. These newly developed organizational structures and incentive mechanisms can help to implement a corporate entrepreneurship function more successfully (see Fig. 2).

Improved competence leveraging of existing R&D competences may be achieved by reducing R&D "slack" or by systematically making use of any "surplus" R&D resources and competences. R&D slack may usually be reduced through abolition of preallocated budgets or by demanding that R&D departments fund themselves from third-party resources by actively acquiring both internal and external R&D orders under market conditions (market-based prices).

Competence leveraging of surplus R&D resources and competences may be achieved through active patent portfolio and know-how management through spin-offs, and through the creation of an (internally oriented) corporate incubator.[14] Active patent portfolio and know-how management, however, may create conflicts with established corporate business units, which may fear that key knowledge could be revealed – for example,

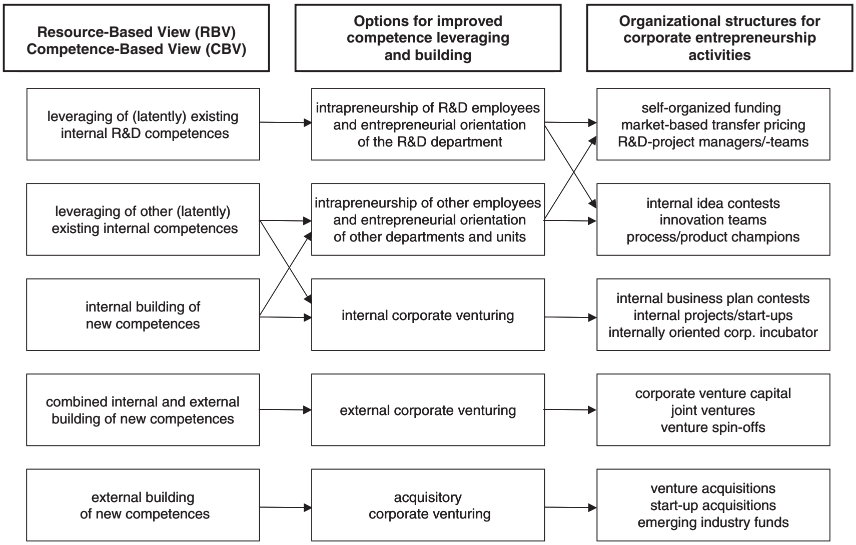

Fig. 2. Options for Competence Leveraging and Competence Building.

through sale of a "surplus" patent to a direct competitor in order to capitalize on such a patent. In addition, corporate incubators may incur the risk of diffusing codified and noncodified knowledge to third persons such as cooperating research institutes or consultants.

Building innovative resources and competences may be achieved internally or externally through different organizational forms of corporate venturing. Internal competence leveraging can be increased through business plan competitions, venture projects, and internally oriented corporate incubators. Combined internal and external competence building can be increased through corporate venture capital funds, joint ventures, venture spin-offs, and externally oriented corporate incubators. Finally, external competence building can be increased through acquisitions of ventures by corporate, divisional, or strategic business unit Mergers & Acquisitions departments. Emerging industry funds and capital-based engagements in external R&D clusters may also be pursued through third-party funding, establishment and financial support of institutes at universities, promotion of high-potential scientists, and engagements in internet-based "communities of creation."[15]

I next focus on competence building activities as especially promising means to achieve significant innovation leaps. I analyze this mode of corporate entrepreneurship in greater depth to identify its success factors and possible tensions between the corporate core and its ventures. In addition, approaches to organizational integration of corporate ventures with the corporate core will be suggested.

SUCCESS FACTORS FOR CORPORATE VENTURING

Since technology companies increasingly face hypercompetition,[16] the innovation race for new technologies, new forms of business transactions, and new strategic logics is accelerating.[17] Corporate entrepreneurship under hypercompetitive conditions should therefore become a continuous investment and innovation regime, characterized by real option analysis and a search for opportunities, engaging in reversible and opportunistic networks and alliances in order to capitalize on fast changing competitive advantages and innovations.[18] Under these conditions, the corporate entrepreneurship governance type "corporate venture portfolios" (governance type 4 in Fig. 1) is of particular importance, because it allows for more experiments with new technologies and strategic logics.[19] This leads to the essential question of how to increase the innovation success of a corporate venture portfolio – in other words, what are the critical success factors for innovation success in governance type 4? This question is now examined using a corporate entrepreneurship model, which incorporates elements of the open system model of Sanchez and Heene[20] (see Fig. 3). With this view of the corporation as an open system,[21] successful corporate venturing can be interpreted as a problem of resource and competence management, and success factors for corporate entrepreneurship governance type 4 can be deduced.

Corporate ventures may take the form of acquired subsidiaries, minority equity interests, or internally generated new business units within a corporate portfolio. Organizational integration may range from simple coordination with one or more existing core business units to fusion into one of the existing core business units. Corporate venture portfolios are often made up of a mixture of these organizational forms and modes of integration, and they may be named differently according to their strategic orientation and investment structure (e.g., corporate venture capital units, emerging industry funds, or externally oriented corporate incubators).

Whatever their form or name, corporate ventures must meet certain preconditions to achieve success. Companies' top managements have to provide the resources and capabilities for successful corporate venturing. According

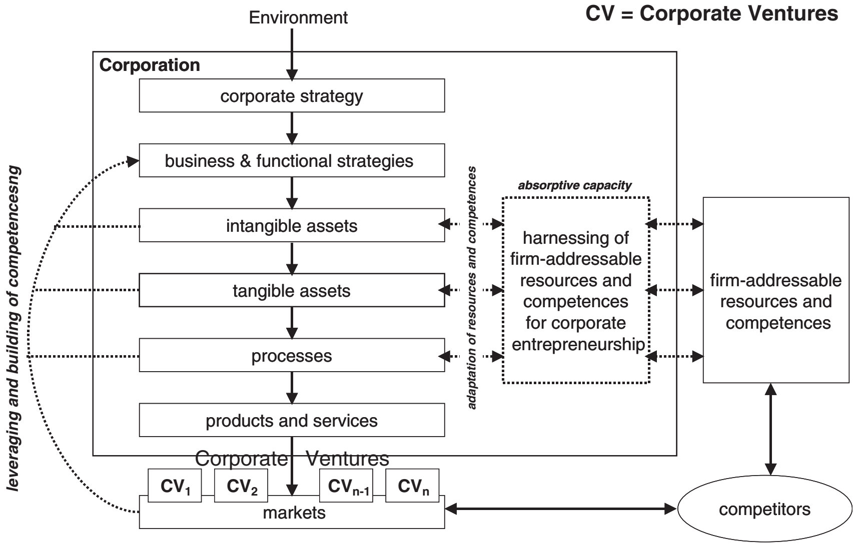

Fig. 3. Adapting the Model of Sanchez and Heene (1996) to Corporate Venturing.

to the open system model of Sanchez and Heene (1996), if the required resources and capabilities for successful corporate venturing do not exist to a sufficient extent within the company, company-specific resource and capability gaps have to be closed by accessing "firm-addressable" resources and capabilities outside the company[22] (precondition 1). Successful corporate entrepreneurship also requires adequate coordination of addressable external resources and capabilities in order to increase the competitiveness of existing or new corporate ventures in its corporate venture portfolio (precondition 2).

Corporate entrepreneurship activities in the context of a specific company are also subject to learning curves related to (a) the specific success factors for corporate ventures in the markets in which the company itself currently also operates (including alternate strategic logics) or in which it wants to operate in the future, and (b) viable approaches to organizing corporate entrepreneurship activities in the context of a specific corporate setting (precondition 3).

Preconditions 1 and 2 (accessing and coordinating firm-addressable resources and capabilities) largely determine a firm's "absorptive capacity."[23] As a critical success factor, absorptive capacity in turn consists of three interrelated capabilities. The first is the capability to identify appropriate external resources and capabilities (recognition). The second is the assimilation and coordination of targeted external resources and capabilities (assimilation). The third is the capability to apply external resources and capabilities well ("application") to generate a competitive edge.

The assimilation and application of external resources often requires a significant degree of resource and capability adaptation[24] – another success factor. These adaptations have to overcome any (initial) technological, social, or cultural misfits between internal and external resources and capabilities.

Precondition 3 (learning about critical success factors for corporate entrepreneuring in specific contexts) requires systematically creating specific routines and practices in a corporation over the course of time. These routines must lead to reproducible operational sequences within a purposeful structure for utilization of available resources.[25] The basis for the creation of such routines is the experience employees gain as they develop capabilities for making repetitive and structured use of corporate resources in ways that enable a firm to provide new solutions to new market demands.[26] The creation of venturing capabilities founded on such routines is a critical form of competence building and is a fundamental competence in corporate entrepreneurship. These capabilities can be applied to an already-existing portfolio of ventures or they can be applied to new ventures added to a corporate portfolio, resulting in competence leveraging that increases the chances of innovation success in an extended portfolio. Consequently, such competence leveraging can also be considered a success factor.

To summarize, the following are the success factors for innovating through corporate entrepreneurship with governance type 4:

- *Absorptive capacity*: Recognition, assimilation, and application of external, firm-addressable resources and capabilities in order to increase the innovation success of an existing corporate venture portfolio.
- *Adaptation of resources/competences*: Resource- and/or capability-specific processes for adapting external resources and capabilities.
- *Building of corporate venturing competences*: Building of organizational routines (based on experience and knowledge) for corporate venturing.
- *Leveraging of corporate venturing competences*: Using existing corporate venturing competences in recently acquired or created corporate ventures to increase the innovation success of those corporate ventures.

In order to increase the innovation success of corporate ventures, top management must develop and use these four "levers."

POTENTIAL FRICTIONS BETWEEN THE CORPORATE CORE AND CORPORATE VENTURES

There are a large number of possible areas of conflict between established corporate core business(es) and new corporate ventures within a corporation, which might lead to severe frictions.[27] These frictions can endanger or reduce the innovation success of corporate ventures in many ways (see Fig. 4). This section examines these possible areas of conflict between the management of the corporate core business and corporate ventures. I also consider how the root causes of these conflicts may arise from their diverging interests and motivations, from their different resource and capability positions, and from associated differences in management styles.

Existing business units generally try to protect and stabilize their established strategies, capabilities, and resources, whereas corporate ventures usually are developing different (innovative) strategies, capabilities, and resources. Top management of a corporation generally regard existing core business units as cash-flow generators that can be harvested, and often consider corporate ventures as real options to be invested in. This leads to significant differences in financing practices, with conventional financing schemes and low-risk management practices favored in established businesses, while corporate ventures (analogous to independent start-ups) use venture capital style arrangements that are more risk-oriented. Incentive and remuneration systems for existing strategic business units tend to favor fixed incomes for management and employees, promotions based on seniority, and long-term career paths. Incentives in corporate ventures, on the other hand, typically encourage managers to act as entrepreneurs and often make significant use of stock options in compensation schemes.

The management practices of established core business units are also often marked by hierarchical thinking and jealously guarded departmental boundaries, by vertical communication, and by a technocratic style of planning and reporting, while corporate ventures are marked by flexible team and process arrangements, horizontal communication, and improvisations of all types. The human resource management of established core business units is often oriented toward providing long employment in consistent career paths and a conservative personnel selection bias that seeks operative excellence in day-to-day business. Corporate ventures, however, often prefer (or at least tolerate) "unconventional" personalities with atypical biographies, as well as "thinkers and creators" who join the business "through the back door."

The revenue growth and profit objectives of established core business units typically aim at steady growth and profit stabilization, whereas the aim

established core business units	areas of conflict	corporate ventures
• protection of strategies and competences • stabilization of tried success patterns • harvesting of the resource basis	strategies, resources and competences	• giving up tried strategies and competences • securing a multitude of real options • creation of innovative resources&competences
• investments in core business segments • risk aversion / steady cash flow • conventional methods of financing	financing / investments	• investments in real options • high suitability for risk / risky cash flows • venture-based innovations
• high fixed salaries • value protection • seniority principle / corporate careers	incentive and payment systems	• employees as entrepreneurs • stock option models • unconventional career paths
• vertical communication (top-down) • hierarchy and department-based thinking • technocratic planning and reporting	leadership	• horizontal communication flow • flexible team- and process thinking • “structured“ improvisation
• senior experience before juvenile audacity • long company membership as career bonus • operational excellency in day-to-day business	human capital / personal management	• “revolutionary spirit “ • newcomers&ousiders as creative stimulus • maximizing the idea share
• core business as the main source of income • avoidance of risky strategies • concentric circles around core businesses	growth and profit politics	• creating future profit potentials • venturing as method for corporate rejuventation • opening up of new profit sources
• speed of the current business processes • flexiblity of the current business processes • stabilization /optimization of the status quo	flexibility / speed	• establishment of new processes • establishment of new business systems • organizational change as permanent task
• incremental innovations • not-invented-here-syndrome • “sedimental“ innovation regime	innovation management	• radical innovations • permanent opportunity search • radical innovation regime

Fig. 4. Areas of Conflict between the Corporate Core Businesses and Corporate Ventures.

of corporate ventures is to renew and rejuvenate the corporate business portfolio by opening new sources of growth and profits, with profits typically only expected in the medium or long run. The strategic logics of established core business units are often inflexible, while corporate ventures often have to evolve new strategic logics and processes with flexibility and speed.

Innovation management in established core business units is usually incremental and cautious. The syndrome of "not-invented-here" and the fear of "cannibalizing" one's current business through innovations often dominate the minds of top managers. Corporate ventures, however, often aim at more radical innovations and are searching for new opportunities. Their "innovation funnel" is considerably broader at the "front end," and a rather unstructured innovation regime may prevail as new strategic logics are constantly iterated. Corporate ventures may also be more ready to outsource "slices" of their own value chains to "best-in-class" companies.

Finally, corporate ventures are often characterized by their willingness to experiment and by their higher level of "openness," often expressed through a readiness to operate through networks. Thus, corporate ventures often try to balance the outflow and inflow of knowledge, ideas, and employees (a kind of "give and take"), while established business units tend to be more concerned about preventing outflows of knowledge, ideas, and employees. Skillful navigation within "communities of creation" is thus an important capability within corporate ventures and corporate entrepreneurship functions.[28]

OPTIONS FOR ORGANIZATIONAL INTEGRATION OF CORPORATE VENTURES

Possible conflicts and frictions between the core business and corporate ventures make selecting the right organizational form of integration another critical success factor in successfully innovating through corporate venturing. There are several options for organizational integration of corporate ventures into a core business. These range from a corporate venture that is managed relatively independently from the established business units (e.g., as an independent subsidiary or as a new business unit) to corporate ventures that are fused in various ways into an existing business unit.[29]

Which form should be chosen for the organizational integration of corporate ventures into the core business, and what factors are critical in deciding the optimal form of organizational integration for a new corporate venture? To answer this question, it is necessary to weigh the advantages to be realized by transferring competences between an existing business unit and a corporate venture against the potential conflict and friction between the established business units and the corporate venture.

The following approach to weighing benefits of integration against potential conflicts and frictions provides at least a first approximate answer to the question. This success factor will be referred to as "suitable organizational integration" or "core-venture-fit." "Organizational integration" is to be understood in this context as any form of organizational linkage between the corporate core and a given corporate venture ranging from very "loose" (e.g., basically, only performance monitoring of a minority/majority equity stake of the corporate core in a venture) to the very "tight" (e.g., fusing the corporate venture with the corporate core to the point of being indistinguishable).

If there is only limited potential for competence transfer between a core business and a new corporate venture and little likely friction, the best solution for the corporate venture is likely to be a form of organizational integration which allows for substantial independence from the core business, such considering the new venture to be a new business unit within the corporate portfolio.

If there is little potential for competence transfer between the core business and the corporate venture but a high degree of likely friction, the best form of integration for the corporate venture could be a minority/majority equity stake that keeps the corporate venture at some distance.

If there is substantial potential for competence transfer between a core business and a corporate venture and little potential friction, the best solution may be tight organizational integration of the venture into the existing organization. The corporate venture may even become a department or functional unit within an established business unit. (It may still retain its own customer interface, for example in the form of a service unit, an e-business center, or a call center.) The corporate venture may in the course of time become completely assimilated and indistinguishable within the established core business unit.

If there is substantial potential for competence transfer between the core business and a corporate venture and a high level of potential friction, the best solution may be establishing an "arm's length" approach to coordination of the corporate venture with an existing core business unit.

These choices of suitable organizational forms of integration for a corporate venture are presented in the decision matrix of Fig. 5. The choices

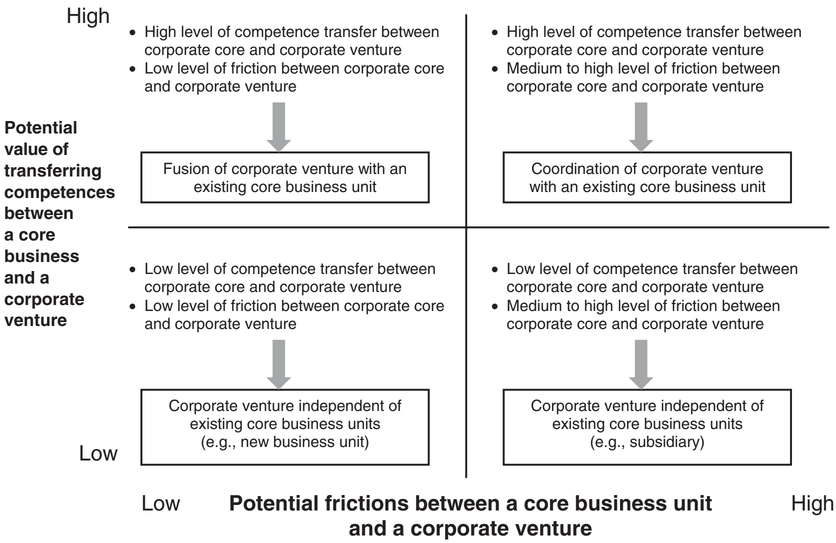

Fig. 5. Optimal Organizational Forms of Integration of the Corporate Venture into Existing Core Business Units.

presented in Fig. 5 should be qualified by noting that the potential for both competence transfers and friction can change significantly over the course of time and create a need to change the form of organizational integration of the corporate venture.

CONCLUSION

Drawing on the resource-based view and the competence perspective, and specifically on the Sanchez and Heene open system model of the firm, a total of five critical success factors can be identified for the innovation success of a corporate venture within a corporate venture portfolio. A company's top management must recognize and manage all five of these critical success factors in an active and conscious way in order to make a corporate venture portfolio successful.

Four success factors can be derived rather directly from the Sanchez and Heene model: absorptive capacity, resource adaptation, building of venturing competences, and leveraging of venturing competences. To increase innovation success of a given corporate venture or a corporate venture portfolio, top management of a company has four "adjusting levers": (1) increasing absorptive capacity, (2) improving resource adaptation, (3) systematically building venturing competences, and (4) leveraging venturing competences. A fifth success factor is achieving core-venture fit, which requires selecting a suitable organizational integration of a corporate venture. This constitutes a fifth "adjusting lever" available to top management. The most suitable organizational form of integration of a corporate venture has been characterized here as depending on the relationship between the potential for competence transfer and for friction between an existing core business and the corporate venture. A first proposal for choosing a suitable organizational form of integration has been presented in a decision matrix (albeit under restrictive assumptions). Top management of a company may increase the innovation success of its corporate venture portfolio by managing these five "adjusting levers" in an active and conscious way as the firm's competitive environment, its existing businesses, and its new ventures coevolve.

NOTES

1. D'Aveni (1999, p. 127); Bruhn (1997, p. 339).
2. Sanchez and Heene (2004); Sanchez and Heene (1997); Sanchez, Heene, and Thomas (1996).
3. Sanchez et al. (1996); Sanchez and Heene (1997).
4. Prahalad and Hamel (1990, p. 81); Freiling (2002, p. 18).
5. Freiling (2002, p. 8).
6. Sanchez et al. (1996, p. 13).
7. Rasche (1994, p. 143).
8. Freiling (2000, p. 183); Hinterhuber and Friedrich (1999, p. 990); Macharzina (1999, p. 55).
9. Strategic logics (Sanchez and Heene, 2004) are sometimes also referred to as "business models."
10. This process is called "competence leveraging" in competence terminology. In resource terminology, this is called "resource exploitation".
11. This is called "competence building" in competence terminology. In resource terminology, this is called "resource exploration".
12. Stringer (2000, p. 76); Dodt, Stein, and Strack (1999, p. 6).
13. Chesbrough (2000, p. 32); Brody and Ehrlich (1998, p. 50); Harned, Keay, and Schrader (1996, p. 155).
14. Hansen Chesbrough, Nohria, and Sull (2000, p. 78).
15. Sawhney and Prandelli (2000, p. 24); Inkpen, Sundaram, and Rockwood (2000, p. 55).
16. Bruhn (1997, p. 339); D'Aveni (1999, p. 127).
17. Michalski (1997, p. 358).

18. Michalski and Rasche (2000, p. 22).
19. Sawhney and Prandelli (2000, p. 24); Stringer (2000, p. 70).
20. Sanchez et al. (1996); Sanchez and Heene (1997).
21. Freiling (2000, p. 194).
22. Sanchez et al. (1996, p. 8); Sanchez and Heene (1997, p. 17).
23. Cohen and Levinthal (1990, p. 128).
24. Hakansson and Gadde (1997, p. 407).
25. Grant (1991, p. 114ff); Winter (1995, p. 147).
26. Prahalad and Hamel (1990, p. 79); Krogh and Roos (1992, p. 1).
27. Chesbrough (2000, p. 32); Brody and Ehrlich (1998, p. 50); Harned et al. (1996, p. 155).
28. Sawhney and Prandelli (2000, p. 70); Inkpen et al. (2000, p. 55); Neilson et al. (2001, p. 6).
29. Stringer (2000, p. 81); Freeland and Stirton (2000, p. 2).

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INNOVATION STRATEGIES IN SMALL FIRMS: A COMPETENCE-BASED MODEL FOR EMPIRICAL RESEARCH

Emilio Bellini

ABSTRACT

This chapter proposes a competence-based methodology to conduct empirical research on innovation strategies of small firms. We compare key concepts of current strategy schools, focusing on the relevance of emotional and intuitive energy in small firm management. In particular, the integration between emotional and creative elements (the strategic intent proposed by Prahalad and Hamel) and an operative rationale (the strategic logic proposed by Sanchez and Heene) overcomes the limits of the core competence perspective. The framework for empirical research identifies specific categories of resources and specific categories of capabilities and defines the innovation strategy as the result of competence and the small firm as fuzzy boundary system. The empirical research presents, as an operationalization of the methodology, findings from five case studies of small software firms, which maintain, during their organizational evolution, a clear focus on the initial key resource, often referring to previous professional experience. The common trait of the most competitive

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firms is linked to a higher common knowledge in integrating marketing resources and technological resources.

BACKGROUND

The past years have witnessed a growing and exceptional interest first to the resource-based approach and then to the knowledge-based (competence-based) approach (KBA) regarding the central crucial issues of theory of the firm: why firms exist, what determines their boundaries and scope, and how the evolution of organizational forms can be explained within the three ideal–typical mechanisms that are market/price, hierarchy/authority, and community/trust (Conner, 1991; Gohshal & Moran, 1996; Liebeskind, 1996; Foss, 1996; Grant, 2002; Adler, 2002). Both industrial economics and strategic management scholars oscillate between regarding the KBA as an alternative approach compared to traditional theories or integrating the KBA and traditional theories as complementary blocks.

In industrial economics, several authors have proposed the KBA as an evolutionary theory for technological change (Dosi and Marengo, 1994; Metcalfe, 1998; Calderini, Garrone, & Sobrero, 2003). In more radical approaches the KBA is viewed as an alternative to the traditional Structure–Conduct–Performance paradigm (SCP), since the firm is not an information processing agent but a holistic set of resources and capabilities bundled together by idiosyncratic routines (Fransman, 1994; Kogut & Zander, 1992). More heterodox approaches propose a cross-fertilization between elements stemming from traditional perspectives (e.g. the relevance of external relationships in Transaction Cost Economics) and the key concepts of the KBA (e.g. the evolution of internal knowledge stocks through learning mechanisms) (Conner & Prahalad, 1996; Foss, 1996; Noteboom, 1992). We argue that an eclectic framework based on the integration between Transaction Cost Economics and the KBA is acceptable, since they deal with two complementary aspects: "exchange" in the former and "production" in the latter. Moreover, this dialectic could strengthen the bridge between industrial economics and business strategy research. Despite their persistent tie with the SCP, these approaches could offer significant support in addressing microfoundations and empirical research based on the variety between firms operating in the same industry.

Strategic management literature has showed a similar debate between researchers who identify the KBA as a definitive overcoming of traditional

Harvard School frameworks (Prahalad & Hamel, 1990, 1994; Sanchez & Heene, 1996, 1997; Mintzberg, Ahlstrand, & Lampel, 1998), and those who sustain a complementarity (Amit & Schoemaker, 1993; Grant, 1996; Zack, 1999) or coexistence between resource-competence approaches and industry analysis frameworks (Teece, Pisano, & Shuen, 1997; Collis & Montgomery, 1995; Durand & Quélin, 2000). We argue that an eclectic approach based on the integration between knowledge and relational strategy could offer improvements with regard to the design of empirical research and be capable of operationalizing the dynamic, systemic, cognitive, and holistic properties of the competence concept proposed by Sanchez and Heene (1997). This integration takes a knowing view and regards knowledge not as something people have but as something people do (Blackler, 1993; Engeström, 1991; Choo, 1998). This view allows us to avoid the dichotomy between internal and external dimensions of strategic analysis and focus on the mechanisms for the integration of knowledge (Grant, 2002) that stem from firm-specific and firm-addressable resources located on the "fuzzy" and "blurry" boundaries of the firm (Bellini, Capaldo, Raffa, & Zollo, 2000; Davis & Meyer, 1999).

The challenges for the operationalization of the knowing view stem from the lack of empirical research capable of verifying the extraordinary competence theory building effort (Sanchez & Heene, 2000; Durand, 1997) and from the adoption of a strategizing view of micro-level phenomena (Johnson, Melin, & Whittington, 2003), which shapes the strategic nature of everyday "practices" and social interactions between several managerial actors in micro contexts (Jarzabkowski, 2003).

As pointed out by Pavitt, Bessant, and Tidd (1997), this challenge becomes crucial for those who study innovation strategies of small firms. For these researchers, the scientific discussion on small firms "…will necessarily be short, given the lack of systematic research…" The goal of a conceptual autonomy of the KBA to investigate innovative strategies of small firms seems to be well addressed (Jensen, 1996; Autio & Yli-Renko, 1998; Autio, Yli-Renko, & Sapienza, 2001; Rangone, 1999; Bellini et al., 2000), but it highlights some problems in this emerging stream, such as:

(i) the success of small firms, unlike that of large firms, is more closely linked to the interplay between intentional and incidental learning (Matlay, 2000), and more generally, to the vision of the entrepreneur (Filion, 1990) which could be identified as a particular form of the strategic intent fuelling the core-competence in Prahalad and Hamel's framework;

(ii) for the small firm, the renewal of its technological resources depends on its "networking capabilities" (Johannisson, 1991, 2000; Cooke, 1996; Fletcher, 2002) which could be identified as a higher ability in interacting with "firm-addressable resources," cornerstones of competence-based management (Sanchez et al., 1996); and
(iii) the need to extend empirical research to further industries, other countries, wider samples and more complex environments (Lau, Chan, & Man, 2000; Ylinenpaa, 2000; Casper & Whitley, 2002; Zapalska, 2002).

More recently, the urgent need for discussion regarding the boundaries of small firms was also reinforced by a new Recommendation (2003/361/EC) adopted by the European Commission on May 6, 2003 regarding the definition of Small Medium Enterprise (SME) (replacing the previous Recommendation 1996/280/EC). In particular, the new classification, recognizing the complexity of the relationship between firm-specific and firm-addressable human resources (e.g. the consistent presence in SME of stable consultants, apprentices, or students participating in professional training), distinguishes microfirms (<10 headcount, <€2 million turnover or balance sheet total), small firms (<50 headcount and <€5 million turnover or balance sheet total), and small–medium firms (<250 headcount and <€50 million turnover and/or <€43 million balance sheet total).

Adopting a configurational approach to the study of innovation strategies in small firms, this chapter addresses the following questions:

(i) how to develop an eclectic approach based on a cross-fertilization between concepts stemming from the KBA (knowledge strategy for resources, capabilities, and competences), from transaction cost economics, (relation strategy for the management of boundaries) and from the Bain-Porter framework (impact on competitive advantage);
(ii) how to extend the empirical research on innovation strategies in small firms while harmonizing the holistic property of the competence concept with operationalizing needs for detailed and verifiable categories of resources and capabilities; and
(iii) how to improve the simplification of the vocabulary for KBA empirical research using a definition of key concepts capable of harmonizing the conceptual rigor of the KBA vocabulary proposed by Sanchez and Heene (1997) with an easy interpretation for small firm owners/managers.

The discussion is presented as follows.

In the next section, we present the theoretical framework with a general review of small firm strategic management and four main schools of thought; the evolution from the limits of the core competence perspective to competence-based management; the proposal for a competence-based framework for empirical research on innovation strategies in small firms; and specific configurations of resources and capabilities. In subsequent sections, we discuss our methodology and results that emerge from an application of the framework to five cases of small software firms and conclude with specific hypotheses for further research.

THEORETICAL FRAMEWORK

The Relevance of Emotional and Intuitive Energy in Small Firm Management

The deep link between competence-based strategic management and boundary management is confirmed by the recognition of uncertainty as a basic element of business life. Indeed, in a precursor to the resource-based view (RBV), Frank Knight in his seminal work *Risk, Uncertainty and Profit* (Knight, 1921) identifies as a key factor in the existence of the firm the "higher wisdom ability" of the entrepreneur in allocating resources within a highly uncertain context. In the same work Knight discusses the evolution of a new business idea, an evolutionary "process of cephalization" leading from the initial idea to the hierarchical form of the firm as an advanced organizational form.

In each of the pre-RBV traditional theories (Conner, 1991), the firm was analyzed as an "information processor"; in those theories the firm, operating in a regime of bounded rationality (Simon, 1957, 1976), faces problems linked to imperfection and asymmetry of information. In those static perspectives, the learning process, when it is acknowledged, is automatic and without costs since it encompasses the assumption of a universally uniform and available information set (Marengo, 1994).

The split developing from the RBV becomes more evident if we compare the concept of the firm proposed by the Transaction Cost theory, where the firm is a set of contracts that economizes on transaction costs, with that of the RBV which views the firm as a rent-seeking institution established by a holistic set of resources and capabilities bundled together by idiosyncratic routines. Indeed, the contractual firm looks like a structure of incentives, bundling together economic agents in response to market failures. Consequently, this firm could not be studied as a proactive strategizing entity, but merely as a reactive one, aimed at optimizing behaviors (Foss, 1993).

In brief, the RBV realized three fundamental evolutions:

(i) the shift of focus from information, defined as a static and atomistic closed set of data relating to the state of the world and the state-contingent consequences that follow from events in the world, to knowledge, defined as dynamic and relational information developed within the cognitive network of the shared beliefs held by agents (Fransman, 1994);
(ii) the shift from a static to a dynamic perspective: the firm is studied in a context where technologies and preferences are transformed and thus, through learning, the firm acquires new knowledge and modifies the previous frame in order to face the change (Dosi, 1982; Teece & Pisano, 1994); and
(iii) the conceptual shift from "mechanical learning," intended as an increase of available information in a probabilistic logic, to "historical," collective, and path-dependent learning, linked in an inseparable way to the past experience of a firm that shapes its cognitive frames, belief systems, and evolutionary paths (Levinthal & March, 1993; Nooteboom, 1992; Crèmer, 1993).

A critical review on strategy schools of thought applied to the management of small firms (see Fig. 1) could reveal how these shifts have been assimilated in the literature on small firm management.

Moving from existing classifications (Whittington, 1993; Lauriol, 1996), we propose a division of the field more oriented to the peculiarity of strategic management in small firms. Consequently, we attempt to identify four schools, labeled using the metaphors of different schools of arts and crafts, and reference them to the 10 schools proposed by Mintzberg et al. (1998) in their "strategy safari":

(i) the School for Sculptors (Ansoff, 1965; Andrews, 1971; Porter, 1980, 1985) includes the Design, Planning, and Positioning Schools;
(ii) the School for Mystic Painters (Normann, 1977; Stacey, 1992; Bennis & Namus, 1985) includes the Entrepreneurial, Cultural, and partially the Cognitive Schools;
(iii) the School for Ceramist Craftsmen (Mintzberg, 1987, 1990; Quinn, 1980) includes the Power and partially the Learning Schools; and
(iv) the School for Polyhedric Architects/Artists School (Prahalad & Hamel 1990, 1994; Teece et al.,1997; Sanchez & Heene 1996, 1997; Grant 1996, 2002, Choo 1998) includes the competence-based part of the Learning and partially the Cognitive Schools.

We argue that the study of knowing processes in small firms could be supported by a configurational approach capable of identifying different kinds of stable combinations between resources, capabilities, and competences (Miller & Mintzberg, 1983; Snuif & Zwart, 1994; Capaldo et al., 2003). Indeed, as shown in Fig. 1, this integration of the Cognitive, Learning, and Configuration Schools seems more coherent with some of the fundamental characteristics of small firm organizational processes, such as:

– the assumption of an evolutionary perspective on the growth paths of new firms (Audretsch & Thurik, 2001);
– the centrality of personal traits and of the role of the entrepreneur/founder (Gibb & Scott, 1985; Scherer, 1991; Cooper & Dunkelberg, 1986; Marchini, 1995);
– the tendency for opportunistic behavior on the part of the entrepreneur (Smith, 1967; Kirzner, 1979; Aldrich & Kenworthy, 1999);
– less contrast between personal objectives of the entrepreneur and organizational objectives (Gervais, 1978; Haahti, 1989);
– the strength of the informational barriers for small firms (Capaldo et al., 2003);
– the adaptive and flexible nature of the small firm, stemming from its speed in decision-making processes, its ability to improvise when faced with a variety of tasks, and its more efficient communication (MacMillan, 1975; Nooteboom, 1994; Rothwell & Dodgson, 1993); and
– the higher ability of the small firm in particular sectors to take advantage of spillovers from corporate R&D departments and universities (Acs, Audretsch, & Feldman, 1991; Bellini & Zollo, 1997).

In particular, with regard to small firms, the key element for strategic management lies in the narrow path balancing the knowledge strategy for the development of internal competences and the relational strategy for the management of boundaries with the external environment. Indeed, the problems of small firms often stem from either an excess of closure (e.g. non-profitable market niches) or an excess of openness (e.g. lack of control on key competences).

We argue that the effectiveness of everyday decisions along this difficult dynamic path is supported by the emotional and intuitive energy of small firms. This energy could be related to several concepts described as vision (Normann, 1977; Filion, 1990), strategic intent (Prahalad & Hamel, 1994), intention and goal attainment (Sanchez & Heene, 1997), tenacity against doubt and suspicions (Christensen, 1997), and entrepreneurial enthusiasm (Stacey, 1992).

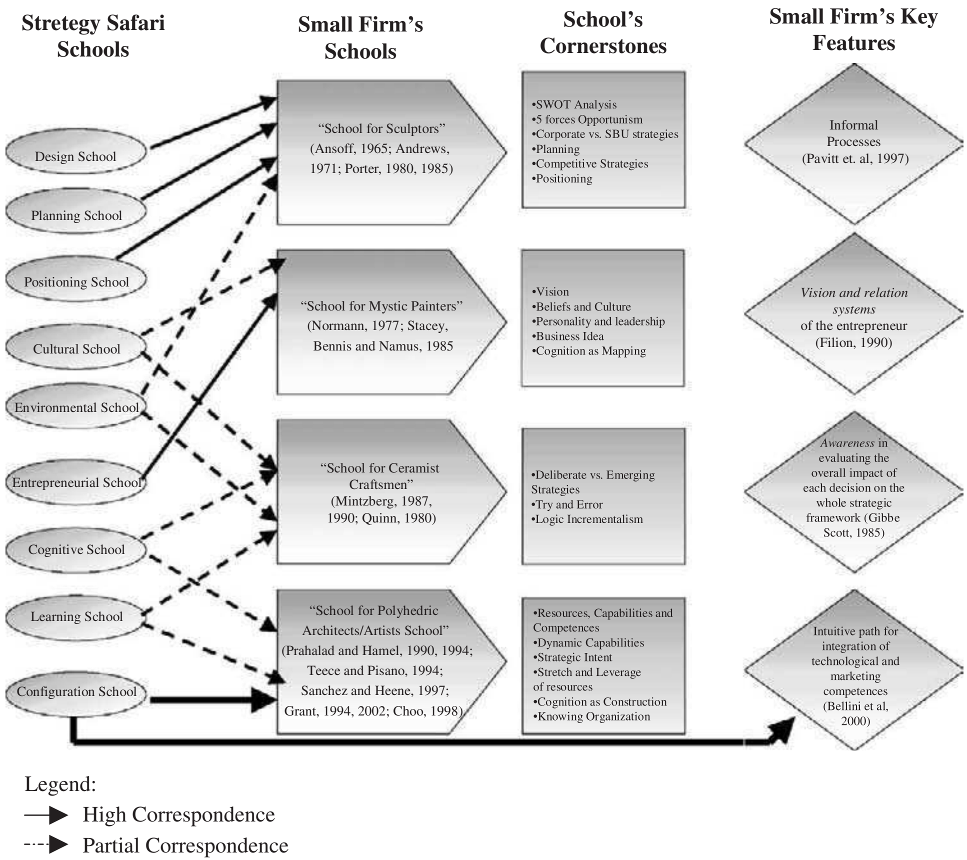

Fig. 1. Strategy Schools for Small Firm Research. *Source:* Mintzberg et al. (1998).

Indeed, with regard to the core competence perspective, the assumption of the firm as a portfolio of competences with a consequent holistic view of its products and business units is strictly linked to foresight, defined as a precise intuition on future trends in technology, demography, and politics that permits intellectual leadership and the building of core competence (Prahalad & Hamel, 1994). However, we emphasize the affinities between foresight and vision, defined as the intuitive idea regarding possible future states capable of orienting learning (Normann, 1977), even if Prahalad and Hamel themselves underscore their distinction which stems from the higher effectiveness of foresight in integrating creativity and solid feasibility. Foresight stems from the current products/markets combinations, analyzed through the innovative lenses of competences, functionality, and eclecticism. Therefore, strategic intent, intended as an energizing dream fueling emotional and intellectual energy that stretches the firm beyond its current resources and capabilities, emerges as a concept capable of synthesizing this strategic KBA approach in small firms. As pointed out by Normann himself, the links between vision, tensions, and knowledge development are key elements in the management for growth.

Beyond the Limits of the Core Competence Perspective: Competence-Based Strategic Management

Competence-based strategic management scholars (Hamel & Heene, 1994; Sanchez & Heene, 1997; Sanchez, Heene, & Thomas, 1996), have aimed at the ambitious "…challenge of building a new strategic management theory…," derived from the core competence perspective. More specifically, they distinguish capabilities from competences, proposing the adoption of a shared vocabulary both to identify competitive phenomena and to describe more precisely the underlying relationships. Their theoretical contribution tries to overcome some evident limits in current strategy theory that groups RBV, industrial organization, and core competence perspective together:

- the general terminological confusion between several researchers who during the 1990s often used the concepts of resources, knowledge, skill, capability, competence, and competency in a vague and overlapping way;
- the potential danger coming from core competence rigidities, and the consequent need for balancing competences and technological differentiation (Leonard Barton, 1992; Pavitt et al., 1997);

- a tautological problem stemming from the circularity of the RBV, where strategic resources generate higher profitability, while higher profitability permits the development of strategic resources (Porter, 1996; Mosakowski & McKelvey, 1997); and
- the weak connection between strategic theory and practice, stemming from the lack of operationalization capable of translating the powerful conceptual insights into managerial and organizational terms (Mahoney & Sanchez, 1997).

In response to these limits, Sanchez and Heene proposed an evolution toward a multidimensional concept of competence capable of incorporating the dynamic, cognitive, holistic, and systemic properties of competence (Sanchez, Heene, & Thomas, 1996; Sanchez & Heene, 1997). The dynamic dimension, stemming from the fundamental concept of dynamic capabilities (Teece et al., 1997), permits the analysis of the co-evolution of environmental and organizational changes, stemming from various relationship levels between a firm and external sources of resources (Roehl, 1996), between a firm and its customers (Lang, 1996; Wallin, 1997), between a firm and its competitors (Amit & Rotem, 1997), and between the firm and its local environment (Jensen, 1996). The cognitive dimension, stemming from managerial cognitions that shape choices of strategic objectives and permit distinguishing higher performances of the firm from luck or stochastic factors (Barney, 1986; Mosakowski & McKelvey, 1997). The holistic dimension leads to a vision of the firm as a "human-social-economic system" whose performance could be measured by tools which go beyond traditional financial and value effects (Sanchez & Heene, 1996) and are based on the specificity of goals followed by a single firm. Finally, the systemic dimension leads to the model of "the firm as a goal-seeking open system" that summarizes the key concepts of the competence school (Sanchez & Heene, 1996, 1997). This model has been applied with suitable adjustments both to internal analysis such as in the cases of dynamic corporate coherence (Christensen & Foss, 1997) and the competence development process (Black and Boal, 1997), and to external analysis such as in the case of the relationship between the firm and its customers (Wallin, 1997).

The model of the firm as a goal-seeking open system provides some responses to the above limits of the current strategy theory:

- the overcoming of a unidirectional and reductionist explanation of strategic management key concepts and identifying a multidirectional and circular causality which shows a higher comprehension of interdependences between the firm and its environment;

- the recognition that a focus on single defined variables (five forces, strategic resources, or core competences) is a necessary but not sufficient condition for explaining competitive dynamics, since competences are systemic in nature; and
- the relevance, even in strategic theory, of the firm's boundaries and the identification of more complex units of analysis, both in a micro sense (e.g. strategic groups or internal processes), and in a macro one (e.g. firm networks or territorial systems).

In this chapter, we propose that the adoption of an evolutionary view of the small firm phenomenon calls for greater attention to the links between individual skills, organizational competences, and firm-specific and firm-addressable resources belonging to the networked and local systems where the small firm develops its cognitive dynamics (Becattini & Rullani, 1996). In particular, we propose an operationalization for small firms based on the model of the firm as a goal-seeking open system and including the organizational principle of the "small firm as fuzzy boundary system."

Resources and Capabilities Categories within the "Small Firm as Fuzzy Boundary System"

Starting from the seminal work of Professor Williamson, the growing debate on firms' boundaries in a dynamic perspective (Colombo, 1998) has driven management scholars to constantly refer to the metaphor of indistinct boundaries, such as in the case of the "blur economy" (Davis & Meyer, 1999) and of the "doughnut principle" in which the center of the doughnut is the unmodifiable substance, while the outside assures flexibility and balance (Handy, 1994).

In the literature on small firms, the organizational principle of "small firm as fuzzy boundary system" had already been proposed by Raffa and Zollo in 1988. This principle comes from an organizational application of fuzzy set theory. As in fuzzy set theory, a single element could "belong," "not belong," or "partially belong" to a set, so the "small firm's fuzzy model" (see Fig. 2) was defined starting from the empirical evidence on the presence of resources with different "belonging degrees" and "control degrees" (e.g. increasing of atypical flexible employment forms, such as stable consultants or apprenticeships). This variety in employment relationships prevents, in many cases, the possibility of defining a clear-cut distinction between totally internal resources fully controlled by the small firm, and totally external

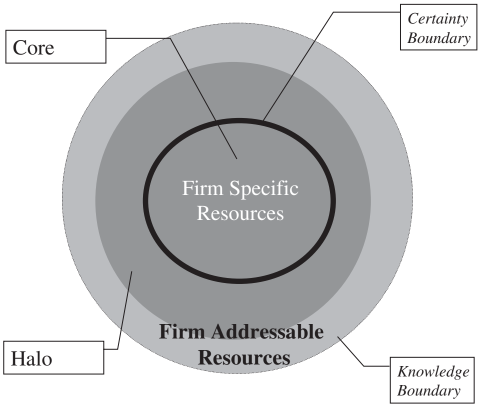

Fig. 2. *Small Firm as Fuzzy Boundaries System. Source*: Raffa and Zollo (1988).

resources which the small firm can only purchase as "black boxes" or firm-addressable resources placed on the fuzzy boundary which the small firm only partially controls by experimental activities or single projects from time to time. Small firms are incomplete entities and consequently, from a competence-based perspective, their "fuzzy nature" has a relevant implication for the development of innovation strategies: small firms are obliged to complete their firm-specific resources (tightly controlled) with firm-addressable resources that can be obtained, from time to time, by effective interaction with their own environment (Sanchez et al., 1996).

Starting from this principle, we use the rigorous vocabulary proposed by Sanchez and Heene (1997) to identify single typologies of resources and capabilities useful for individualizing configurations for systematic empirical research on small firm innovation strategies. The framework proposed in Fig. 3 aims at balancing the need for a decomposition necessary for conducting empirical research with the need to respect both the holistic dimension and circular multidirectional causality emerging from competence-based theory. This balance is obtained by means of:

(i) the concept of intention in the use of resources and the concept of goal attainment, which together identify the evolution from capability to the building of new competences; and
(ii) the circular relation between new competences and cognitive resources emerging from strategic intent which deploy the emotional and intuitive energy that, in a dynamic way, fuels the development and management of knowledge inside small firms.

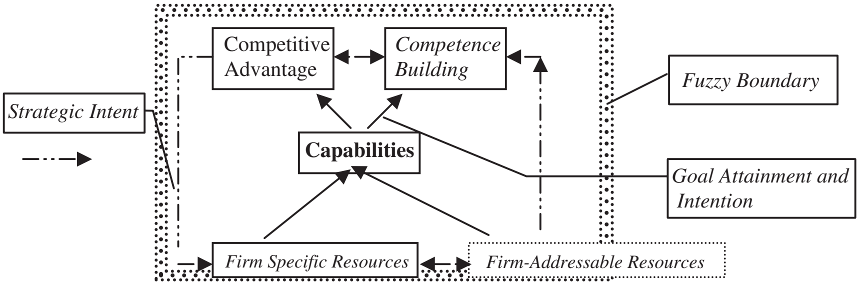

Fig. 3. Framework for Analysis of Small Firm Innovation Strategy.

Table 1. Categories of Resources in *Resource* and *Competence-Based Literature*.

Typologies	Authors
Firm-specific/Firm-addressable	Sanchez and Heene (1997)
Tangible/intangible, Visible/invisible, Material/immaterial	Itami (1987); Grant (1991)
Physical, financial, technological, human, reputation	Grant (1991)
Typologies of intangible resources: knowledge resources/boundary resources	Nanda (1996)
Typologies of intangible resources: knowledge (tacit/ explicit), capabilities, brands	Durand (1997)
Typologies of tangible resources: human, financial, technical typologies of intangible resources: competence, information, culture, imagery, brand loyalty	De Chiara (1998)
Entrepreneurial, staff professional degree, organizational structure, network resources, dimensional resources, technological resources	Raffa and Zollo (1998)

An operationalization of this framework in order to conduct empirical research on small firms requires the identification of specific typologies of resources and capabilities. Starting from nine contributions proposing various typologies of resources in strategic literature (see Table 1), we define five groups of resources for small firms: firm-addressable, cognitive, financial, technological, and image (the last four resources being firm-specific).

Table 2. Categories of Capabilities/Competencies in *Resource and Competence-Based Literature*.

Typologies	Authors
- Functional areas: general management, R&S, manufacturing, design, marketing, sales	Grant (1991)
- Reducing new product development cycle, infra-organizational knowledge transferring, multinational activities co-ordinating R&S, change management	Collis (1996)
- *Stand Alone*, cognitive, processes and *routines*, organizational structure, behaviors, culture	Durand (1997)
- Managerial, input management, transforming, innovative, cultural, entrepreneurial	Lado and Wilson (1994)
- Cognitive, innovative, flexible capabilities	De Chiara (1998)
- Technological competitiveness, product performances, market relationships, product diversification	Raffa and Zollo (1998)
- Technical skill, relational skill	Esposito (1996)

In the proposed framework, we carefully deal with paradoxes stemming from firm-addressable resources available in the external environment, especially in the vital relations with national and local innovation systems (Becattini, 1990; Johannisson, 1991; Kelley & Brooks, 1991; Cooke, 1996). However, the literature on innovation sources for small firms highlights a lower use of external sources (e.g. R&D, patents, and licenses) emerging from a limited absorptive capability (Pavitt et al., 1997; Baldwin et al., 1994). The apparent contradiction between these two approaches could be explained by the prevalence in small firms of "informal," "part-time," and "not measured" innovation and R&D activities (Rothwell & Dodgson, 1993).

Turning our attention to capabilities, we started from categories of capabilities from the RBV and competence literature (see Table 2) and defined four categories of capabilities to investigate further in our study on small firms: financial, technological, marketing, and relational.

Financial capabilities are linked to the presence in small firms of repeatable patterns for optimizing and balancing the investments for innovation. In particular, the focus is on the ability to manage innovative funds (e.g. venture capital, seed capital) and R&D public grants (e.g. regional, international projects). *Technological capabilities* emphasize the repeatable patterns of action for the innovative use of technical assets (e.g. existing equipment, adoption of new standards). *Marketing capabilities* synthesize an ability to integrate strategic (e.g. relationships with innovative customers, building of a strong image) and operational actions (e.g. innovative solutions for sales and delivery, trade agreements).

The repeatability of routines in managing the fuzzy boundary leads small firms to develop a *relational capability*, which is the basis of innovation performance. Using the framework presented in the previous sections, we can now define the ''small firm's relational capability'' as a repeatable pattern in integrating all potential relationships with local sources of innovation resources within an established strategic intent, sustaining an adequate endowment of firm-specific competences. In other words, relational capability allows small firms to negotiate some typical trade-offs in innovation activities, such as cooperation vs. competition in relationships with competitors during pre-competitive research steps, membership vs. non-membership in consortia and associations, and contractor vs. subcontractor roles in single R&D projects.

Fig. 4 presents the main relationships between the detailed categories of resources and capabilities. Using these multiple relations, we can identify a limited number of stable configurations that react as a holistic system to external events and permit an easier operationalization of the framework during empirical research.

METHODOLOGY FOR EMPIRICAL RESEARCH

The framework could be used within the four different categories of innovative small firms described by Pavitt et al. (1997): (i) superstars, in the case of a small software firm capable of realizing an exceptional growth pattern after it was listed on the stock exchange (Bellini & Panza, 2003); (ii) New Technology Based Firms (NTBFs), in the case of academic spin-offs (Bellini, 2000); (iii) supplier dominated, in the case of processed food located in a ''district area'' (Bellini, 1999); and (iv) specialized suppliers, in the case of small software firms presented in this chapter.

The choice of a case-study methodology was derived from several insights. First, several authors have highlighted that innovation in small firms is a complex phenomenon (Raffa & Zollo, 1998) that requires a direct investigation using individuals living in the organization (Eisenhardt, 1989). Gay and Diehl (1993) in their work on research methods argue that case study assures a greater comprehension of the firm and is capable of highlighting the influence of the external environment, background, and specific

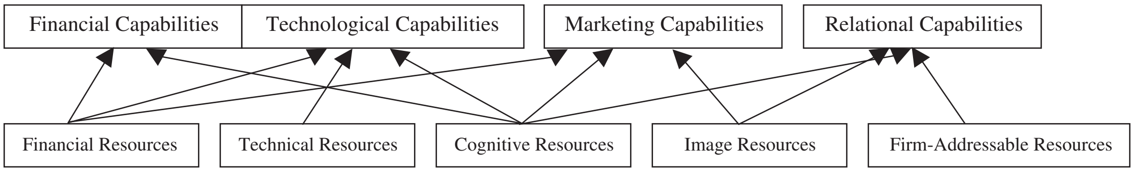

Fig. 4. Categories of Resources and Capabilities for Analysis of Small Firm Innovation Strategies.

problems faced by the firm. In particular, the case study becomes a fundamental method when the boundary between phenomenon and context is less defined (Yin, 1994). The choice of case study was also encouraged by its current use in competence-based strategic management research (Prahalad & Hamel, 1994; Grant, 1996; Rispoli, 1996; Chiesa & Manzini, 1997) and, overall, in research centered on small firm innovation strategies (Dodgson, 1990; Capaldo et al., 2003).

The empirical research was conducted in the period 1999–2001 and in the following phases:

1. a multidisciplinary panel between software entrepreneurs and managers, managerial researchers, and software engineering researchers defined the framework in specific formulations in order to design questionnaires and interviews;
2. researchers identified and telephoned the member of entrepreneurial group most suitable for the reconstruction of the historical paths of innovative strategies;
3. researchers collected information on products, markets, and technologies;
4. interviewers made a first informal visit to develop a shared interpretation with the subjects and ensure comprehension of the questions coming from the framework;
5. researchers collected and analyzed official and public documents (balance sheets, projects, etc.); and
6. interviewers made a second and third visit aimed at conducting in-depth interviews through semi-structured questionnaires.

During the empirical research, we determined the different configurations of resources and capabilities adopted during the innovation strategy and identified as a critical event the final result in terms of intentional pursuit and goal attainment. Data were collected according to the detailed variables depicted in Tables 3a and b. For each category of resources and capabilities, we investigated the dynamic evolution before and after the critical events.

RESULTS FROM THE EMPIRICAL RESEARCH

The five small software firms in this study operate in the Campania region in southern Italy. The Campania region could be considered as a "district area" of software technology firms as they are located together seven universities with two faculties of information engineering and one faculty of

Table 3a. Variables for Empirical Research on Small Software Firms: Structural Data.

General data	• Brands • Start-up year • Turnover • % turnover coming from software production • Financial liaisons
Entrepreneurial group	• Composition • Educational qualification of each component • Experience in software sector • *Technological skill and management skill* • Previous scientific and professional experiences
Combinations products/markets/ technologies	• Families of products and/or services • Technological level • Market segments • Distribution policies • Languages, platforms and tools for software development
Organizational evolution (starting from *critical events*)	• Incubating phase • Organizational structure evolution • Technological knowledge evolution • Management knowledge evolution • Personnel evolution
Innovation strategy	• Product innovations • Process innovations • Organizational innovations
Effectiveness of innovation strategy	• Innovation level • Initial motivations and goals • Impact on competitive advantage • Degree of goal attainment

computer science, the Italian Government Authority for Telecommunication, several sites of the most important Italian telecommunication and information companies and, above all, a consistent number of small software companies created by young graduates and spin-offs coming from industry and universities.

Table 4 summarizes the findings of the empirical research, following the methodology depicted in the previous section. For each of the cases the entrepreneurs identified the most important innovation realized during the life of the firm and expressed the focus of the innovation strategy in terms of financial relevance, organizational change, and the duration of the process. The innovation's impact on competitive advantage, and, more specifically, the degree of goal attainment was estimated and compared with initial

Table 3b. Variables for Empirical Research on Small Software Firms: Dynamics of Resources and Capabilities.

Categories of *Resources*	Specific Variables	Categories of *Capabilities*	Specific Variables
Cognitive resources	• Educational qualification • Technological skills • Management skills • Technical specialization • Technical skill updating • Impact of *cognitive resources* on Innovation strategy effectiveness	Financial capabilities	• Routines for financial management and control • Routines for relationship management with banks and financiers • Knowledge on public grants and innovative financiers • Routines for public grants attainment
Imagery resources	• Fidelity degree of customers • Brand recognizability • Suppliers trust • Financiers trust • Impact of *imagery resources* on innovation strategy	Marketing capabilities	• Routines for customer portfolio management • Routines for call for tender management • Management and promotion of brands • Effectiveness in promoting and negotiating sales • Additional services • Communication plans
Technical resources	• Hardware equipment • Software endowment • Operation systems • Software environments • Middleware • Programming languages • DBMS • Networking equipment	Technological capabilities	• Routines for technological monitoring • Routines for hardware and software maintenance • Development standards • Software engineering tools

Table 3b. (*Continued*)

Categories of *Resources*	Specific Variables	Categories of *Capabilities*	Specific Variables
	• Patents		
Financial resources	• Coverage composition of innovation investment: • % self financing • % short-term banking financing • % long-term banking financing • % innovative financing tools (e.g. venture capital) • % public grants for innovation projects (e.g. European and • National R&D Programs)	Relational capabilities	• Partnerships with universities and research centers • Partnerships with strategic suppliers • Partnerships with Innovative customers • Partnerships within subcontracting networks • Partnerships with local institutions • Partnerships within consortia with other software companies

Firm-Addressable Resources (identical for all the cases, given the same geographical and industrial position)

- Universities and Research Centers
- Infrastructures
- Technology and Services providers
- Strategic suppliers
- Innovative customers
- Sub-contracting networks
- Local bodies
- Financiers

Table 4. Innovation Strategies of Five Small Software Firms.

Case	Innovation Strategy	Impact on Competitive Advantage	Level on Attainment of Initial Goal	Key Resources and Key Capabilities for Goal Attainment	Dynamics in Resources and Capabilities Depending on Strategy	Development of New Competences
#1	Re-designing "Product portfolio"	Improvement cost advantage	High	Cognitive resources Technological capabilities Marketing capabilities	Attraction of high-skilled technicians coming from large firms Positioning evolution from "subcontractor" to "direct supplier"	Management of large customers Management of technology partnership with large customers
#2	Introducing new added value internet services	Low improvement in differentiation advantages	Scarce	Technological resources Financial resources Financial capabilities	Innovative use of existing hardware and software equipments New sales policies Reducing partnership	From "simple internet provider" to "software and advanced services company"
#3	New product for management control	Improvement in differentiation advantages	Full	Imagery resources Marketing capabilities	New Brands New technologies for software development	From "software house" to "organizational and information services provider"
#4	R&D Project for an Intranet/Extranet for multisite services company	Improvement in differentiation advantages	High	Firm-addressable resources Cognitive resources Marketing capabilities	Leadership in management of technology partnership Renewal of technical internal knowledge	Management of complex R&D Projects
#5	Transition of technology platform from UNIX to Windows	Improvement in differentiation advantages	High	Cognitive resources Financial capabilities	Flexibility of personnel for technical knowledge renewal Leveraging on public grants	Management of advanced hardware and software platforms

objectives. Analyzing the dynamics of organizational configurations, we highlighted the key resources and capabilities sustaining the goal attainment. In the last column we identified the eventual competence building coming from the innovation.

The results confirmed the propensity of software firms for incremental innovations (Hoch, Roeding, Purket, & Lindner, 2000). For each of the firms, emotional energy influenced its strategic path: in Case ♯1, sustaining the capability to attract qualified human resources in periods of skill shortage; in Case ♯2, helping the firm face the internet provider crisis coming from the revolution of the telecommunication market (free access, newcomers, etc.); in Case ♯3, dealing with the defection of most of its technical personnel; in Case ♯4, completing the evolution from hardware sales activity to software production; and in Case ♯5, fueling a deliberate strategy of growth.

Most of the firms (Cases ♯1, ♯4, and ♯5) based their own competitiveness on cognitive resources. This finding is congruent with the knowledge-based nature both of the software industry and of the Campania region as a "district area" for ICT. In Case ♯1, traditional technical skills were integrated with the introduction of new business and marketing competences. In Cases ♯4 and ♯5, the cognitive resources seemed to fuel two different capabilities: relational in Case ♯4 and financial in Case ♯5. The findings regarding relational capabilities require a specification: the five cases seem to show a low propensity for the use of firm-addressable resources; in Case ♯2, the entrepreneur actually negatively evaluated the initial strategy of high openness in participation in consortia with universities and science parks. However, we found that the small firms developed a skill in adjusting the intensity of relational and financial investments according to the degree of codifiability of knowledge coming from firm-addressable resources. Indeed, in Cases ♯1, #2, and #4 the firms shift from more distant to arm's length cooperation with R&D actors and pursue more direct forms of knowing integration for accessing scientific knowledge characterized by high tacitness and difficulty of absorption (e.g. joint R&D projects in university laboratories, funding academic spin-offs, grants for doctoral and master's candidates).

CONCLUSIONS AND FURTHER DEVELOPMENT

The results stemming from the case studies seem to confirm with regard to small firms the descriptive power of organizational configurations derived from key concepts of competence-based strategic management integrated in a knowing approach, with relevance to both the fuzzy boundary and to the impact of knowledge strategy and relational strategy on competitive advantage:

– All the cases maintained during their organizational evolution a clear focus on the initial key resource, often referring to previous professional experience;
– All the cases showed a good integration between emotional and creative elements (the strategic intent proposed by Prahalad and Hamel) and an operative rationale (the strategic logic proposed by Sanchez and Heene);
– The common trait of the most competitive Cases (♯1 and ♯5) is a higher ability in integrating (the common knowledge proposed by Grant, 2002) "marketing resources" (e.g. deep knowledge on customer behaviors and their specific needs) and "technological resources" (e.g. higher rate of graduates in personnel endowment).

The empirical research suggests some hypotheses that could be studied through deeper methodologies and wider samples:

- in crisis periods, the performance of small software firms seems linked to previous configurations focused on marketing capabilities (Case ♯2), while in the growth period they followed dynamics based on cognitive resources (Cases ♯1 and ♯4);
- within the 16 allowable combinations resulting from the proposed typologies of resources and capabilities, the best performance seems linked to the combination "cognitive resources-financial capabilities" (Cases ♯1 and ♯5); and
- the absence within the key capability of technological capability seems to suggest an overlapping between strategy and technology and, consequently, a different categorization of technological variables for empirical research.

The cases analyzed here concern only a particular less-developed area of Italy. Therefore, the results can be limited by the specific context. In other contexts the same methodological approach could give different results. Consequently, in the next step of our research, the same methodology will be applied to a different area to evaluate the incidence of environmental factors and to verify the generalizability of the results in this study.

From a methodological point of view, the work has been limited to a qualitative analysis of the variables, but the approach can be further developed to define analysis tools for the measurement of influences among resources, capabilities, and competences. Further development of our research will concern the definition of a more structured approach capable of identifying a *grammar of action* to study the cognitive and political dimensions shaping the knowing nature of organizational processes in small firms in order to follow more precisely their path of growth.

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APPENDIX. BOX SHORT DESCRIPTION OF THE CASE STUDIES

Case ♯1 – Spectacular Growth based on Cognitive Resources

The firm, created in 1992 by a technician coming from a large software firm, showed an exceptional trend both in the sales, from €2,500,000 in 1997 to €7,000,000 in 2000, and in the number of employees, from 80 to 150 in the same period. Those performances are strictly linked to the ability of the entrepreneur–founder to move from high involvement in technology processes to a managerial role. Indeed, in the initial stage of the firm the start-up was based both on technical skills inherited from the previous experience of the entrepreneur and the start-up's relationship with the mother company that was the first and main customer.

Afterward, the firm was able to move from the low competitive role of "subcontractor" to a well-established position of direct supplier of services and software for telecommunication systems. The attention of the entrepreneur to organizational aspects is confirmed by:

a strong and coherent investment in technicians turned out by large software firms during the crisis period of 1992–1995;

- a strong attention to the development of the internal configuration passed from an initial "simple structure" with informal tasks to a "Matrix Projects Structure" with a strong role for the marketing skills of a new manager coming from a large firm operating in the same market;
- the strong development of formal and well-documented routines both in software development processes and in management ones (ISO 9000).

The core of innovation strategy was the "Redesign of the whole products portfolio", that allowed the firm to realize a typical sequence of *competence leveraging-competence building*. Indeed with this strategy the firm moved to higher profitability product offers before using in an innovative combination the existing endowment of resources and capabilities (e.g. new way for on-site help assistance with technical skills usually external), later operating a qualitative change on that endowment (transition to new languages and environments for software development, development of new sales skills).

Case ♯ 2 – Reconfiguration of product offer starting from the Technological Resources

The firm was created in 1995 by a mixed entrepreneurial group (skills and previous experiences included both technical and financial-marketing ones), with the strategic goal of positioning in the emerging market of internet services. In the initial stage the firm developed a strong network with local technology actors (University, Science Park, Research Centers, Local Network of Small Internet Providers). The effect of these partnerships was largely lower than initial expectations and the partnerships were gradually reduced in recent years. The core of innovation strategy was a radical reconfiguration of the firm from simple *internet provider* to software and advanced services company. This choice was linked to the revolution in the Italian telecommunication market in recent years (removal of monopolies, proliferation of operators, offering of free access to internet basic services). In spite of this unfavorable scenario the firm was able to increase sales (from €200,000 in 1996 to €900,000 in 1998) and the percentage of employees in software development activities. The strategy was based on a conversion of powerful *Technological Resources* (router, network server, access to telecommunication dedicated lines) coming from its initial activity as internet provider. The *competence building* consisted in a qualitative change both in use of this existing resource and in introducing new technical skills coming from new employees.

Case ♯ 3 – New Organization based on Marketing Capabilities

The firm was created in 1988 by a young graduate in computer sciences coming from previous experiences in hardware sales. During its life the firm maintained a little configuration (the sales are €150,000 in 2000 with an annual growth rate of 5%). This limited dimension was based on a deliberate choice of the entrepreneur and influenced by previous bad experiences in business partnerships. This choice is confirmed by the chosen brand, which is based on the full name of the entrepreneur as software consultant. In the period 1992–1995, the firm faced a crisis deriving from the discharge of all the technicians that created a new company as direct competitor. The reaction to this event was an innovation strategy focused on the development of a new software product for existing customers. This strategy was based essentially on a strong endowment of *Image Resources*. Indeed the entrepreneur was well known in the local market and the firm benefits from the loyalty of its initial customers. Consequently, the firm was able to exploit those trusted relationships by designing new products strongly focused on the specific requests of innovative customers. This strategy was showing its positive effect also on the *Technological Capabilities*, as confirmed by the renewal of technical skills and the certification by ISO 9000 quality standards. Using the framework of our empirical research we are able to identify a Marketing Capability deriving from the repeatability in the management of different technology-product combinations in the same market segments.

Case ♯ 4 – Product Innovation based on Networking Capabilities

The firm was created in 1991 by an entrepreneurial group of three graduates in computer science coming from previous experiences in hardware and software sales activities. Those activities were perceived as not gratifying from a professional point of view. Integrating the technical skills coming from their university studies and the marketing skills coming from previous job experiences, the entrepreneurial group followed a gradual strategy based on a "customer-oriented" first stage and a "technology-oriented" second stage. The core of the innovation strategy was the development of a R&D Project for the designing, testing, and prototyping of a new software product for management of service companies with several sites in different towns in the region. This strategy was realized following a strong network of *firm-addressable resources*, especially participating in consortia with a university, formal partnerships with large software firms, and joint activities with other small software firms. Unlike the other cases the firm seems to develop a *Networking Capability*, because the performance of the network are not casual but they seem to depend on an intentional use of all the *firm-addressable resources* following a well arranged design of "…starting, as soon as possible, an our own R&D project to pass from sales activities to technological ones…".

Case ♯ 5 – Process Innovation based on Financial Capability

The firm was created in 1987 by a graduate in computer science with financial public support offered by the Italian government's policies for young entrepreneurs. This initial characteristic shaped the capability of the firm to develop a repeatable pattern for using all the opportunities coming from European, Italian, and regional programs for public financing of industrial and R&D investments. Starting from *competence leveraging* activities on this capability the firm was able to develop a *competence building* policy aimed at renewing all the technological bases of its product offerings. Particularly the innovation strategy was focused on the transition of the entire product platform from UNIX to Windows environment. This process innovation allowed the firm to exploit the same products–technology combination in different market segments (e.g. large software firms, manufacturing firms, public bodies), realizing a doubling of sales (from €200,000 in 1998 to €400,000 in 2000).

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BUILDING NEW COMPETENCES FOR NEW BUSINESS CREATION BASED ON BREAKTHROUGH TECHNOLOGICAL INNOVATIONS

Wim Vanhaverbeke and Robert Kirschbaum

ABSTRACT

This chapter focuses on the question how companies can build new capabilities or competences based on discontinuous technological innovations. In particular, we analyze how corporate ventures that are set up to develop and commercialize these radical innovations, can play a crucial role in the process of building new competences. New competences are in turn the basis to create a range of new businesses. Building and deploying competences are intrinsically related to new business development or other forms of corporate venturing and both co-evolve over time.

The chapter furthermore analyses what it takes to promote new business development (NBD) or corporate venturing (CV) as a trigger of corporate renewal. We argue that new competences can only be built through a sequence of CV-initiatives and that both competence building and NBD can only fully be understood in relation to corporate strategy making. On the one hand, existing competences and corporate strategy (i.e. vision, strategic intent or corporate purpose) serve to direct and select these NBD-efforts through which the firm can enter attractive

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businesses that fit corporate strategy and build new competences (required to operate successfully in these businesses). A corporate vision should stretch the company beyond its existing resources and knowledge base; it leads to a fruitful misfit between what the company is and what it intends to become. On the other, new competence building also drives and refines the cognition of corporate strategy.

INTRODUCTION

How firms can achieve, sustain and safeguard competitive advantage is a fundamental question in the field of strategic management. The resource-based view of the firm (RBV) is one of the most influential frameworks explaining how companies succeed in achieving that advantage and how they can manage to sustain it over longer periods of time (Barney, 1991; Peteraf, 1993; Prahalad & Hamel, 1990; Wernerfelt, 1994). More recently, the literature has spent a lot of attention to understand *how* firms build competitive advantage. The dynamic capabilities approach is considered to be a promising avenue to understand how competitive advantage is achieved (Helfat, 1997; Teece, Pisano, & Shuen, 1997; Eisenhardt & Martin, 2000),[1] and recent work on the interaction between corporate venturing and strategic management focuses explicitly on new competence building as a result of corporate entrepreneurship activities (Hitt, Ireland, Champ, & Sexton, 2002; Zahra, Nielsen, & Bogner, 1999).

As scholars have paid a lot of attention to the question how firms build and deploy capabilities, we expect to find in the literature various explanations of how companies get organized (or reorganized) and how management embarks on particular actions or projects to build new competences[2] or to lever[3] existing ones. More particularly, we are interested in corporate venturing or new business development[4] projects as drivers for competence development and deployment. Surprisingly, this has only recently been tackled as a research topic. Notable exceptions are Bakker, Jones, and Nichols (1994), Floyd and Wooldridge (1999), Helfat and Raubitschek (2000), Hoskisson and Busenitz (2002), Kazanjian, Drazin, and Glynn (2002) and Zahra et al. (1999). These contributions highlight the importance of new product development to the development and exploitation of capabilities and knowledge. In this way, they bring the role of product development, venturing initiatives and corporate entrepreneurship back into the (dynamic) analysis of resources, capabilities and knowledge.

They indicate how a firm can utilize its competence – competence leverage – to introduce sequences of new products that in turn may extend the competences of the company – competence building. Successful new product development and commercialization builds on but also augments the knowledge and capability base of the company. Hence, new product/business development or other types of corporate ventures – e.g. internationalization initiatives – are the organizational *carriers* to extend existing competences and to build new ones. Bakker et al. (1994), for instance argue that the concept of corporate competences increases the efficiency and effectiveness of the new business development (NBD) process, which in turn enables the company to build competitive advantage in new, attractive business areas.

In this chapter, we are primarily interested in the question how companies can achieve competitive advantage in new and attractive business areas, taken into account that their existing set of competences are inadequate. More specifically, we focus on radical innovations (or the emergence of new technologies) as enablers to set up new business development initiatives that, if successful, provide the company with new, profitable business units. Existing competences risk being inappropriate when a company starts up NBD projects where applications/markets and technologies are new to the NBD has been considered as a major route to corporate renewal and growth (Karol, Loeser, & Tait, 2002) and it can be an important organizational vehicle to build new competences. We argue in line with Beer, Eisenstat, and Spector (1990) that the migration from the existing set of competences to the required set is not to be organized as a 'change program' independently from the new business development efforts. On the contrary, building new competences is in almost all successful companies achieved through a structured and persistent approach to new business development initiatives. They are the two sides of the corporate renewal process: the internal business ventures are the carriers to build new competences and, as a result, organizational competences evolve over time in concert with the new business development efforts.

The co-evolution of organizational competences and new business development efforts can be described as a multi-layered change and learning process. It is multi-layered because different organizational and managerial aspects have to be taken into account simultaneously to effectively build new competences: the interaction between competence building and corporate strategy, strategic intent or vision; the organization and management of new business ventures; external technology acquisition strategy; etc.

The development of new competences is also an organizational learning process. Knowledge accumulation and capability building is in itself a learning process. As NBD is a long, uncertain and failure-laden activity where applications are ill-defined and the technology still fluid, the learning process should be characterized as 'learning by doing' or 'learning by using' (Badaracco, 1991; Dierickx & Cool, 1989; Reed & De Fillippi, 1990; Teece, Rumelt, Dosi, & Winter, 1992). Lynn, Mazzuca, and Morone (1998) call it a learn and probe process: companies develop their products by probing potential markets, learning from the probes and probing again. Probes are more experimental than analytical in nature and are designed for market learning rather than for market evaluation (Rice, Colarelli O'Connor, Peters, & Morone, 1998; Rice, Kelley, Peters, & Colarelli O'Connor, 2001). Lei, Hitt, and Battis (1996) emphasize that the development of new competences and organizational learning are mutually interdependent over time: organizational learning is a necessary condition to generate new business opportunities stemming from radical innovations or new technologies. Competences, in turn enable the company to refine and focus learning efforts (Lei et al., 1996).

In short, this chapter focuses on the question *how* companies can build new capabilities or competences based on discontinuous technological innovations. To formulate a response to that question, we first focus on the changing competitive landscape and the organizational and managerial challenges it entails, as companies may be forced to build new competences to stay competitive. In the following section, we analyze the relation between the development of new businesses and that of new competences. Next, we explore the dynamic relationship between new business development and corporate strategy: corporate strategy may activate and direct new business development and the accompanying competence building, while new competence building also drives and refines the cognition of corporate strategy. In the fifth section, we discuss how companies actually build new competences through new business development. This part of the chapter is an application of how dynamic capabilities work. The sixth section focuses on competence building in the wake of but also as a necessary condition for corporate ventures. The chapter concludes with some final observations and possible avenues for further research.

THE CHANGING COMPETITIVE LANDSCAPE AND INAPPROPRIATE ORGANIZATIONAL ANSWERS

The competitive landscape is changing rapidly. Significant discontinuities such as globalization, deregulation, blurring industry boundaries through new business models, technological convergence and disintermediation pose new managerial challenges forcing managers to create new competences (Prahalad, 2002). Similarly, discontinuous technological innovations (Tushman & Anderson, 1986; Christensen & Raynor, 2003) may threaten the strategic position of incumbents. But new technologies also enable companies to create competitive advantage in existing and new, yet unstructured industries.

Changes in the competitive landscape also diminish the market value of a company's existing business portfolio. New entrants, slowing industry growth, new substitutes and changing customer needs force companies to look for new business opportunities to stay competitive in the long run. As Hamel and Prahalad (1994) have argued, competition for the future is competition for opportunity share rather than market share. The search for these opportunities may for many (industrial) companies be related to technological opportunities. Many firms have found that the most interesting growth opportunities lie outside both their current technology base and markets they are serving. Firms with technological capabilities explore new technological areas in search for profitable business opportunities. The success of this explorative search depends on the technological distance between the existing technology base and the new technological field and on the absorptive capacity of the company (Cohen & Levinthal, 1990). Experimenting with novel technologies allows a company to value the potential of these technologies in a more accurate way.

There are companies that managed to grow profitably through new business development that required the building of new competences. Well-known cases are GE's successful entry in the CT scanner industry, Du Pont's biodegradable polymer (Biomax), Motorola's mobile telephone business, Hewlett-Packard's successful development of the ink jet and ink business and Corning's optical fiber business. However, many scholars have argued that most companies do not have good track records in managing discontinuous change and in turning breakthrough innovations into long-term growth and profit engines (Christensen, 1997; Christensen & Raynor, 2003; Prahalad, 2002; Prahalad & Hamel, 1990; Tushman & O'Reilly, 1996). Furthermore, large firms (or incumbents) are on average not adept to manage the challenges and reap the business opportunities related to the emergence of disruptive or discontinuous technologies (Bower & Christensen, 1995; Christensen, 1997; Dougherty, 1995; Dougherty & Heller, 1994; Dougherty & Hardy, 1996; Leifer et al., 2000). Finally, many companies with strong technological capabilities systematically have problems converting discontinuous technological innovations into competitive advantage in new industries, applications or markets.

So, while some firms manage to grow through a strategy of starting up new businesses, many other firms seem not to have the organizational and managerial capabilities to get that far. Why some firms are capable to profitably exploit non-traditional business opportunities – we look more specifically at opportunities based on radical technological innovations – and why others are bound to their existing and maturing set of businesses is an intriguing question further dealt with in the next section, where we focus on structuring the 'new business development'- process as one of the major routes to corporate growth and renewal.

LEARNING THROUGH INTERNAL AND EXTERNAL CORPORATE VENTURING: SELECTING AND NURTURING VALUABLE (TECHNOLOGY-BASED) BUSINESS OPPORTUNITIES

There are different reasons why the new business development process is crucial for the *rejuvenation* of technological capabilities and the long-term profitability of a company. First, many interesting (technological) ideas may not fit into the strategy of the existing business units or they may be too risky to undertake for the business units that operate as a profit center (Roberts & Berry, 1985; Chesbrough, 2003). Second, a systematic scanning of the available technologies and ideas inside the company and in the environment (technology and market scouting, consultants, customers, exhibitions, universities, patent inspection, etc.) is becoming a strategically important activity because of the increasing technological complexity of products or the emergence of disruptive technologies (Granstrand, Bohlin, Oskarsson, & Sjöberg, 1992; Bower & Christensen, 1995; Christensen & Raynor, 2003). These trends are forcing (even technologically leading) companies to acquire technology externally. Finally, top management may deliberately nurture promising technological innovations as carriers for the development of new businesses and competences.

Put differently: management of *technological innovations* and that of *technology-based NBD* is a key element in explaining why some companies successfully implement growth strategies. More specifically, the technological innovativeness of a company is significantly influenced by the way in which R&D activities are managed and how the interactions between central lab and business groups/divisions are structured. Central labs still play an important role in reshaping and rejuvenating a company's technological capabilities: the way how these labs are organized internally plays an important role in explaining the difference between successful and unsuccessful innovating companies (Iansiti, 1993). However, as technological pace and complexity are increasing, companies have to complement internal development with external acquisition of technology through alliances and acquisitions (Granstrand et al., 1992; Lambe & Spekman, 1997). Technological learning is more and more based on a combination of internal and external learning: internal learning by the in-house development of new products and processes as a result of internal R&D, external learning from the technology acquired externally through technology alliances, licensing, spin-ins, etc. (Chesbrough, 2003). Both types of learning are considered complements reinforcing each other's productivity (Cohen & Levinthal, 1990; Duysters & Hagedoorn, 2000).

Internal development and external acquisition of technology are important to build new technology-based competences but they have to be complemented by additional corporate initiatives to start-up and develop technology-enabled new business opportunities. Many multi-business companies have decentralized profit and loss responsibility to the business unit level in order to spur the market responsiveness and to reduce time-to-market when introducing new products into the market (Ghoshal & Bartlett, 1997). Decentralization of responsibility allowed business unit managers to apply their resources more efficiently to new market opportunities and technological developments that could add value for (potential) customers (Bartlett & Ghoshal, 1993). The backside of this trend towards decentralization is that business units with short-term profit responsibility will only approve R&D and product development that seeks to exploit existing or highly related technology-based competences and market intimacy. Business units will spontaneously overemphasize ongoing and incremental innovations – the shaded area in the lower left corner of Fig. 1 – because of the low risk involved, the relatively short development time and the opportunity to deepen the existing, in-house expertise.

This emphasis on ongoing innovations can be a valuable strategy as long as the competitive environment is stable and technological changes are competence enhancing. However, it is dysfunctional when a company faces a turbulent competitive environment or when disruptive technologies are emerging (Bower & Christensen, 1995; Christensen & Raynor, 2003; Lynn, Morone, & Paulson, 1996). When companies heavily invest in sustaining their current technologies and competences, they face considerable problems in redirecting the focus on emerging non-traditional technologies (Christensen, 1997). Corporate strategy can be redirected and new competences

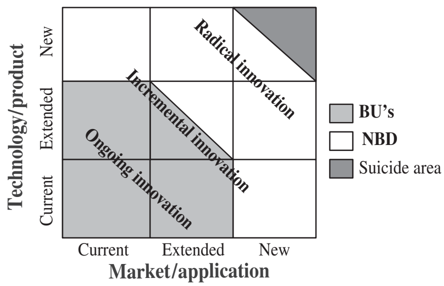

Fig. 1. New Business Development. *Source:* Adapted from Ansoff (1957, 1965) and Roberts and Berry (1985).

learned in anticipation or in response of the changing competitive context, but that requires companies invest in breakthrough ideas and in corporate entrepreneurship. As existing businesses are inherently inert, the development of radical innovations into new businesses has to be cultivated. If companies are not able or willing to do so, strategic inertia emerges in the face of innovative opportunities and their core competences might turn into core rigidities (Leonard-Barton, 1992, 1995).

A company faces considerable organizational challenges if the most attractive growth opportunities lie outside its current applications and technologies. As business units will stick to the well-known business areas and technologies, the upper right part in Fig. 1 remains unchallenged. This high-risk zone also represents the growth opportunities that cannot be realized by relying solely on the company's existing competences. In these cases, a company has to develop new competences to meet the technological and commercial requirements of the growth opportunities: the firm may subsequently engage in corporate venturing activities. We make a distinction between internal and external venturing, but both types of venturing are indispensable organizational instruments to acquire technology, build new competences and improve corporate entrepreneurship. We first have a look at internal ventures before explaining external ventures.

Internal corporate ventures can be structured in different ways, and its appropriateness depends on the balance between the need to learn new competences and to leverage the existing ones (Burgelman, 1984; Tidd & Taurins, 1999). One of the interesting internal corporate venture structures in this respect is the New Venture unit or what we call the NBD unit.[5] Large diversified companies usually develop a separate organization within the company to learn new competences and to acquire the required technologies

(Burgelman, 1995; Christensen, 1997; Christensen & Raynor, 2003; Lynn, 1998; Tidd et al., 2001). The unit aims to identify and advance promising new developments, which, although fall outside the scope and strategy of the existing business units or divisions, are related to the existing competences, culture and strategy (see next section). The unit is usually set up as a small team of dedicated people with different expertise. It is operating on a restricted budget but it can tap into the company's resources whenever necessary: the central R&D center plays a crucial role in technological problem-solving, while business units frequently share their know-how about markets, customers and manufacturing. The unit has full operational autonomy and is evaluated and controlled directly by top management.

The New Venture unit can be considered as a safe haven where risky but promising innovation projects are nurtured and developed for an extended period. A small, dedicated project team carefully analyzes and evaluates all the innovation projects, which are unfamiliar for the company concerning the technology/product characteristics or the market/application opportunities. Many companies use a stage-gate-like process to identify and select the most promising opportunities and to turn them into successful new businesses (Cooper, 1985, 1993; Cooper & Kleinschmidt, 1995). It is a long-term process in different phases, and top-management decides at each 'gate' whether or not a project can enter the next stage. Developing radical innovations is a high-risk venture and the main advantage of the stage-gate process is the stepwise reduction of uncertainty at low-investment costs in the initial stages. Large investments will only be poured into the venture when the risks have been lowered to an 'acceptable' level.

Large diversified companies complement internal corporate venturing with external venturing. External venturing has several advantages and will become even more important in the future for the following reasons. First, the number of radical innovations developed by small start-ups in emergent technologies and the number of spin-offs from universities is increasing. Next, external venturing allows a company to monitor, firsthand, new technologies and applications and to have a window on the latest technological developments. Finally, apparent time to market shortens when a company can spin-in a promising venture compared to the situation in which it has to commercialize an innovative idea from scratch. External venturing is valuable when radical innovations represent technological fields or applications that are completely new to the company (the so-called 'suicide area' in Fig. 1) and that have a low probability of success. Roberts and Berry (1985) argue that companies should avoid large-scale entry in this situation. They recommend companies to build familiarity with the new area through (inexpensive) venture capital or educational investments. Over time, the investing company will get a better understanding of the potential success of the new technology. It has the option to eventually spin-in the venture when familiarity with the technology is sufficiently strong and the venture proves to be promising.

In short, successful companies are continuously searching for new and profitable business opportunities based on radical innovations, which in many cases requires new competence building since the technologies and applications involved are new to the company. New competence building and NBD or corporate venturing are the two sides of the same coin. The decision to develop new businesses creates a fruitful misfit between the existing competences and those that are required, but NBD is at the same time the 'organizational carrier' through which new competences are developed or acquired. Furthermore, we have argued that new competence building also challenges companies to set up appropriate organizational structures – formally or informally – to spur corporate entrepreneurship because the existing business units or divisions are obviously biased towards ongoing and incremental innovations. Companies learning new, technology-enabled competences need not only a strong in-house technological infrastructure but also a strong external technology acquisition capability since companies, especially in fast-changing technological fields, have to complement internal R&D efforts with technology from outside the company (Kazanjian et al., 2002).

NEW BUSINESS DEVELOPMENT AND CORPORATE STRATEGY

In the previous section, we have argued that new competence building is inextricably knit up to new business development or corporate venturing. Since there are usually many interesting new business projects or external ventures in search for the corporate financial resources, we still have to answer the question, which projects get selected and developed into a new corporate venture.

There are of course different ways to select the most promising (projects for) new business ventures. Some companies emphasize the role of informal organizational channels of product and executive champions to explain how radical innovation projects get the support from top management and the required financial resources (Greene, Brush, & Hart, 1999; Maidique, 1980). Other companies are in favour of a more objective approach using a set of predetermined criteria to select among the interesting technological ideas (see also Elder & Shimanski, 1987). Financial criteria are of course decisive, but they focus only on performance requirements for each project; they do not indicate how well radical innovations fit into the overall corporate strategy and how they may be valuable in creating new competences (Burgelman & Doz, 2001; Venkatraman, MacMillan, & McGrath, 1992). Therefore, most companies include additional criteria to position radical innovation projects vis-à-vis their corporate strategy (Burgelman, 1986; Twiss, 1986; Strebel, 1992; Spender & Kessler, 1995; Dougherty & Hardy, 1996).

How is corporate venturing and new competence building linked to corporate strategy? Some authors have emphasized the need to establish a dynamic interaction between technology development and corporate strategy (Hamel & Prahalad, 1994; Itami & Numagami, 1992; Kazanjian et al., 2002).[6] Itami and Numagami (1992) distinguish three kinds of relationships that are conceivable between strategy and technology. We discuss them one by one focusing primarily on the question how corporate strategy can shape new technological capability building.

The first perspective focuses on the contemporaneous match between (current) strategy and (current) technology. The authors label the relationship 'strategy capitalizes on technology'. This perspective implicitly assumes that technology and technological capabilities are two variables that remain independent from each other. Therefore, this perspective is of no help in explaining how corporate strategy can shape new technological competence building and how the latter might also have an impact on future strategy making.

The two other approaches imply that there exists a dynamic interaction between corporate strategy making and technological competence learning. The second perspective is called 'strategy cultivates technology' and covers a range of strategic decisions that have long-term implications for technological competence accumulation. It ranges from strategies where companies decide to extend their technology base to strategies as 'stretch' (Hamel & Prahalad, 1994). Strategy as a willful 'misfit' or 'stretch' is a corporate strategy that intends to build new competences by overextending corporate goals beyond the current (technological) competences, and thus creates a tension that challenges managers and employees and stimulates corporate learning, accelerating in this way the building of new competences.

The third perspective is complementary to the second: it focuses on the impact of current technological capabilities on the future strategy of the company. The current technology-based competences of a company or the deepening or extension thereof may drive the cognition of (future) strategy.[7]

Many technology-driven companies only realize after some time that their current technology base or their peripheral technologies, which they are experimenting with, provide new opportunities for future strategy making. A strong commitment to and deep knowledge of a particular technology field allows 'a company to see a strategy that other firms fail to imagine' (Itami & Numagami, 1992, p. 127). However, these authors indicate that the technology involved should not be too close to or too far from the current technological capabilities of the company. When the new technology is too close to the current capabilities it has no potential to stretch the corporate strategy. When it is too far removed from current capabilities it will not be accepted or legitimized in the company to serve as the starting point for a new strategic direction. This also implies that companies can only learn when the learning distance between the current knowledge capabilities and the targeted technology is not too large. Knowledge-based diversification is always in some way an organic diversification around core competences, since companies will not be able to explore, value and integrate the knowledge when the required capabilities are too far removed from the current competences (Prahalad & Hamel, 1990; Hoskisson & Busenitz, 2002).

Itami and Numagami (1992) mention that in real business settings, the three perspectives occur at the same time and interact with each other. However, they do not elaborate on how these perspectives interact with each other. We argue that the two 'dynamic' relationships between technology and strategy are intrinsically related to each other and are complementary parts in the building of new (knowledge-based) competences. *Experimentation* and *strategic intent* are in our opinion two key concepts in explaining how companies successfully stretch their competences into new technology realms.

When companies experience that their existing technological capabilities are no longer adequate to compete successfully or when attractive business opportunities lie outside their current technology base, they may be tempted to empower engineers and managers to come up with new and radical innovations. Top management of large companies may hope that the legitimization of *idea generation* and *experimentation* with new technologies will lead to the 'cognition of the future strategy'. But this strategy-making process does not come automatically, even when the strategy is 'emergent' (Minzberg & Mchugh, 1985; Ghoshal & Bartlett, 1997). Empowerment and 'emergent strategy' only get translated into a successful corporate renewal, domain redefinition and/or the building of new competences, when there is at the same time a compelling sense of overall strategic direction in the firm. Releasing the entrepreneurial forces in a company does not automatically translate into the desired competence building that secures the firm's future revenue streams. If there is no sense of overall direction in the company, chaos is likely to emerge. Burgelman (1986) claims that a company needs to allow for initiatives that do not fit with its current strategy, but they always have to be screened in terms of appropriateness for the company's future strategy (Teece, Rumelt, Dosi, & Winter, 1994; Thornhill & Amit, 2001).

Companies need to keep a sense of overall strategic direction when they have the ambition to rejuvenate competences or to build new ones. Corporate strategy as stretch leads to a substantial 'misfit' between a company's extant competences and its ambitions (Hamel & Prahalad, 1994). This 'misfit' creates a tension between exploitation of current competences and the exploration of new ones (March, 1991), between control and stability on the one hand and flexibility and creativity on the other hand (Dess, Lumpkin, & Mcgee, 1997; Zahra et al., 1999). Strategy as 'stretch' provides a direction but also identifies the major competences to be built and is therefore a crucial part of strategic renewal processes (Bartlett & Ghoshal, 1994, 1995; Ghoshal & Bartlett, 1997; Volberda, Baden-Fuller, & Van Den Bosch, 2001). It is important to mention that strategic intent (strategy that cultivates future technology) ensures consistency in direction and identifies the major capabilities to be built, but remains silent about *how* to build these competences. That is where new business development or corporate venturing comes in. We distinguish two important roles for corporate venturing in relation to corporate strategy.

First, corporate venturing plays a crucial role in developing new competences. New competences are learned gradually by several new ventures each requiring the development of some new technology. Bakker et al. (1994, p. 15) formulate it as follows: 'NBD endeavors the need to overcome the misfit of the current organization with the desired organization by identifying, acquiring and developing competencies [sic]'. These ventures are developed sequentially with each subsequent project building on the experiences gained from the previous ones (see also section '**Closing the Gap: Internal Development and External Acquisition of Technology-Based Competences**'). Second, and even more important, internal and external corporate venturing based on unfamiliar or radical innovations play a crucial role in recognizing the potential of new technologies (or scientific disciplines) for future strategy making of the company. Too frequently, scholars do not question how the strategic vision of a company solidifies: it is the result of a strategy-formation process that is to an important extent facilitated by the corporate venturing process (and the related explorative technological research). With each new (internal *and* external) venture the company learns about new technologies, applications and markets, which in turn sharpen the recognition of new strategic opportunities.

In other words, the corporate strategy-making process is fostered by the ongoing technology-building process (technology drives the cognition of strategy). Hence, the continuous interaction between corporate strategy and NBD (approaches 2 and 3) leads to a co-evolution of both, where they mutually nurture each other in an iterative process.

AN EXAMPLE: CORPORATE STRATEGY AND NEW BUSINESS DEVELOPMENT ACTIVITIES AT DSM

We illustrate the mutual and dynamic relationship between corporate strategy and NBD-activities or corporate venturing by means of a case study[8] of DSM, a Dutch Specialty Chemicals and Materials company that transformed itself during the last two decades from a petrochemical to a specialties chemical company. DSM is active worldwide and in 2003 the group had annual sales of close to EUR 6.1 billion and employed about 26,000 people.

The firm distinguishes itself by the integrative approach it takes to NBD and new competence building: its new business development activities and external venturing are organized into a single business group, DSM 'Venturing & Business Development'. The business group is actively involved in new business development (internal corporate ventures), investments in Venture Capital Funds and in promising start-up companies (external venturing), and equity and non-equity alliances with universities and other businesses with complementary technologies or other intangible assets such as knowledge about and expertise in manufacturing.

Integration goes hand in hand with interaction: interaction between research and business is captured in the 'strategy dialogue process', whereby innovation is defined as a crucial value driver for the company over the long term, complementary to financial performance. That is, DSM explicitly incorporates innovation in the strategic contract with its Board of Directors, and long-term performance is defined both in terms of financial criteria and innovation initiatives to achieve sustainable corporate growth. These innovation initiatives – internal and external venturing – find their origin in early exploration of new scientific domains or novel technologies. They are the foundations for the building of new competences that hold the potential to direct the company's future strategy.

The principles of integration and interaction build on a mind-set of trust, and an inherent 'openness' of the firm to new developments in science and technology. These values permeate the corporate culture, and are building stones for the DSM's track record of innovation and change. Indeed, change, and the company's ability to change, is a constant factor in DSM's history. This was true of the DSM that rapidly transformed itself 30 years ago from a state-owned coal-mining company into a private chemical company; and it is still true of today's DSM, which is further developing into an integrated, global chemical concern focusing on high added value specialties. This most recent strategic reorientation of DSM will be our focus.

Until recently, DSM grouped its business portfolio into three clusters: 'Life Science Products', 'Performance Materials' and 'Industrial Chemicals' (mainly petrochemicals). Industrial chemicals are commodities (bulk chemicals) and their profitability is highly dependent on economic cycles. The other two clusters are R&D intensive and focus on high added value specialties (niche market strategies). This three-pillar strategy proved highly profitable in the period from 1995 to 2000. DSM managed to roughly double its sales (sales went up from EUR 4.5 billion in 1995 to 8 billion in 2000) and had a solid financial position. DSM nevertheless considerably changed its corporate strategy (again) in 2000. The new strategy concentrates on global leadership positions in high added value activities characterized by high growth and more stable profit levels. To this end, the company has transformed itself into a company specializing in advanced chemical and biochemical products and performance materials (specialties). The previous, three-pillar (cluster) corporate strategy was replaced by a two pillar strategy as DSM sold its petrochemicals business to the Saudi Arabian company SABIC in 2002. This new strategy aims to achieve sales of around EUR 10 billion by 2005: at least 80% of these sales will be accounted for by specialties (clusters 'Life Science Products' (LSP) and 'Performance Materials' (PM)).

This bold shift in DSM's corporate strategy is no radical break with the company's past: it is a next step in a long track record of continuously changing the company in response to new challenges of markets or technologies. The recent emphasis on LSP and PM is the logical consequence of DSM's strategic vision: according to DSM's management, trends in the chemical industry were leading towards a structure with three strategic groups (Porter, 1985) of chemical companies: First, large conglomerates (sales of over EUR 25 billion, e.g. Dow Chemical, DuPont, Bayer and BASF). Second, highly focused pure play specialists (sales usually not surpassing the EUR 3 billion mark, e.g. Lonza, Givaudan and Novozymes).

And finally, the global 'multi-specialty' players (size of roughly EUR 5–15 billion in annual sales, e.g. AKZO Nobel, CIBA, Clariant, Degussa, ICI, Rhodia and Rohm & Haas) offering a portfolio consisting predominantly of a set of chemical specialties.[9] DSM's management intended to become a leader in the strategic group of global 'multi-specialty' players by readjusting DSM's portfolio in terms of focus and size.

In order to be successful as a multi-specialty player, DSM identified a coherent portfolio as the most vital condition for success.[10] Through a coherent portfolio, a multi-specialty player can outperform pure play companies and generate added value over a simple clustering of separate business entities. DSM's technology-related growth strategy and its focus on end markets where the company has ample market expertise (business to business) and customer intimacy attribute to coherence in the firm's portfolio. The development of a coherent portfolio around a few technology-based competences and end markets is an ongoing process where technological developments and strategy changes mutually shape and drive each other. In this way, they combine the 'strategy cultivates technology' and 'technology drives the cognition of strategy' perspectives on the relation between technology and corporate strategy.

This mutual impact of technology on strategy and vice versa is apparent in DSM's recent strategic reorientation. Being highly involved in the petrochemicals in the 1970s and 1980s, the company decided to diversify into high value-added chemical products as an answer to the maturing petrochemical business. The R&D department started a major research program resulting in the early in-house development of a few radical innovations. These innovations, in turn, led to the cognition that the company could be an important player in some 'PM' industry branches. As the company developed technological capabilities and gained market experience in PM, it gradually expanded its efforts in this technological area and finally PM became one of the three clusters (divisions) in the company's strategy at the end of the millennium.

Similarly, the company became more and more interested in developing technological capabilities in biotechnology in the 1990s. It had already developed a few innovative products for the food and beverage industry (e.g. sweetener) and biotechnology was considered to be an interesting growth engine to compensate for the deteriorating prospects in petrochemicals and industrial chemicals. The company thus further embraced biotechnology, and in 2001 biotechnological products represented 15% of DSM's total sales, making the firm one of the leaders in this respect in the European chemical industry.

In line with its strategic vision to become global multi-specialty player, DSM defined biotechnology and PM as its two technological mainstays, but *the potential synergies at the intersection of these technologies* had been largely left *untapped*. DSM now identifies the combination of both technological fields as the key technological area to new innovative successes in extant and newly emerging markets and to give the company a competitive edge as a multi-specialty player.

The recognition of the strategic potential of the intersection between LSP and PM has been growing steadily in the company as a result of ongoing technology developments and acquisitions in these technological fields. The potential value of this strategic focus on the growing business opportunities at the juncture between biotechnology and chemical processes has recently been highlighted by industry watchers. Bachmann, Bastianelli, Riese, and Schlenzka (2000) mention that chemical companies that already have strong operational skills and customer relationships in these markets are best positioned to achieve profitable growth through biotech. There are clear advantages for first movers who can develop the technical leadership and the intellectual property reserves that might keep latecomers out.

Looking at the potential to combine biotechnology in relation to materials, chemical companies have hardly scratched the surface. Being aware of that potential, DSM management promoted the so-called 'bioterials' – a research field at the intersection of performance materials and biotechnology – as a top priority in the corporate vision. Bioterials can be defined as each material whose production has been realized through bio-based processes (e.g. biocatalysis (emzymes) or bioprocessing) instead of synthetic chemistry. The advantages are that traditional products are now produced based on renewable resources, some of these products are bio-degradable, or production costs are considerably lower. Take for instance the production of caprolactam (a raw material for the production of Nylon): the classical production requires a production process at high temperatures and is, as a result, expensive. Emzymes work at low temperatures reducing the cost of this product considerably. There are, of course, also new products that can only be produced through bioprocessing: e.g. different coatings could be applied on wood because of low-temperature applications.

Bioterials is typically a research field at the intersection of PM and biotechnology: it helps the PM-business units at DSM to make the transition to specialty materials with a higher added value making use of knowledge and competences shared with the company's LSP R&D. Building technological capabilities in that technology field is set forward as a stretching goal: in other words, the current strategy cultivates future technology. However, this focus on bioterials is in itself the result of an ongoing recognition process that is a 'byproduct' of the R&D efforts and technology acquisitions in the areas of biotechnology and materials science. Researchers and managers at DSM identified bioterials because of their acquaintance with and knowledge about both technologies (Cohen & Levinthal, 1990): in other words, current technology also drives the cognition of future strategy.

As we have argued, corporate strategy and technology-based competences mutually interact generating a process of continuous technological competence building and providing a direction for future competence building that is in line with the stretched strategic goal setting. The mutual interaction between corporate strategy and technology-based competences has several implications for the organization of R&D activities, the internal (new business development) and external venturing process (acquisition of and alliances with other companies and institutions), and the rejuvenation of existing and building of new technology-based competences. This is the topic of the next section.

CLOSING THE GAP: INTERNAL DEVELOPMENT AND EXTERNAL ACQUISITION OF TECHNOLOGY-BASED COMPETENCES

We have argued (in the third and fourth sections) that corporate entrepreneurship plays a key role in companies that are rejuvenating existing competences and building new ones to compete successfully in new and attractive markets. There are different ways to organize corporate venturing in a large, multi-business company, yet the effective and efficient organization of the different venturing activities proves to be one of the most difficult challenges for most companies because of the complexity of corporate venturing itself (McGrath, 1995).

First of all, organizing corporate venturing starts with the recognition that NBD is experimental in nature and entails many uncertainties. NBD is about exploring new and promising technological fields. When a company starts an NBD project the technology is still evolving, potential markets are ill-defined or nonexistent and timing is highly uncertain. Therefore, Lynn et al. (1996) argue that the logic in NBD is far more experimental than analytical. NBD is in the first place an experiment to maximize learning, it is 'a vehicle for gaining insight into what target markets to pursue, which technologies to use, and what features and benefits to incorporate' (Lynn et al., 1996, p. 28). As a consequence of the uncertain and experimental nature of NBD, most ideas get killed long before they enter the phase of a corporate venture. Only the most promising ideas become a corporate venture after they survived several, subsequent go/kill decisions of top management.

Second, entering new businesses and developing new technology-based competences implies that the company cannot exploit its current competences, but has to search for new technological knowledge and market information outside its own boundaries. Importing and absorbing external knowledge is a highly important activity in new business creation (Chesbrough, 2003). The imported knowledge can take various forms, 'including new employees, purchased equipment, licensed technologies or acquisitions of other companies. Sources of imported knowledge include customers (Von Hippel, 1988), suppliers (Leonard-Barton, 1995), alliance partners (Gomes-Casseres, 1989; Kogut, 1988), universities, government laboratories and consultants' (Kazanjian et al., 2002, p. 179).

Since importing knowledge is so important, corporate venturing intending to build new competences should be defined broadly. It comprises internal venturing, external venturing and alliance formation (or acquisition of small technology-based companies). Internal venturing is relevant only when the company already has some technological experience in a particular field. External venturing are interesting to get a window on emergent technologies in which the company has no expertise. Alliances (or acquisitions[11]) are interesting when the firm lacks part of the technology, the market know-how or the manufacturing facilities. Furthermore, these three activities should be managed in an integrative way. Some companies that create multiple new businesses therefore organize their NBD into a new venture division (Fast, 1978) or corporate incubators (Hansen, Chesbrough, Nohria, & Sull, 2000). The advantages of a separate unit – that usually reports only to senior management – are multiple. First, the ventures that are too risky for managers of existing business units get nurtured for a considerable time. Second, the small unit is also apt to explore new technologies and build new competences as it can hire dedicated front-line managers (project champions), can tap into the capabilities of the central R&D lab (and shape its explorative research), and can negotiate license agreements or establish alliances with companies that have (complementary) technology or market know-how (Leonard-Barton, 1995). Maybe the most important advantage is that experienced unit members become experts in detecting and evaluating new venture opportunities, in establishing a network outside the company, and in acquiring external technology from different sources. In this way, the unit becomes a valuable vehicle for knowledge building (Kazanjian et al., 2002).

Third, because corporate venturing plays a key role in a company's long-term strategy (see fourth section), NBD-projects have to be developed in constant dialogue with the firm's broader strategic framework. This can be achieved by carrying out a double-check: first, the targeted application or market should be attractive (Porter, 1980) and, second, the new business ventures should fit into the corporate vision or long-term strategy of the company. Because NBD-projects are high-risk ventures, it is of utmost importance to diminish uncertainties early on and to analyze how NBD can contribute to the corporate strategy and competence building process. The two dimensions – attractiveness and fit with the strategic context – provide a framework to evaluate different business opportunities in these respects. Assessing NBD-projects along these two dimensions at several times during the genesis of a new business is critical to the success of corporate entrepreneurship.

In doing so, most ideas can be positioned along these two dimensions, and might thus be spread all over the surface of the framework in Fig. 2. Depending on the location of a project in the framework, different actions have to be taken. Management should kill a project when the technology is no longer attractive and does not fit the corporate strategy. The company can license or sell the technology when the latter is attractive (i.e. when it can be

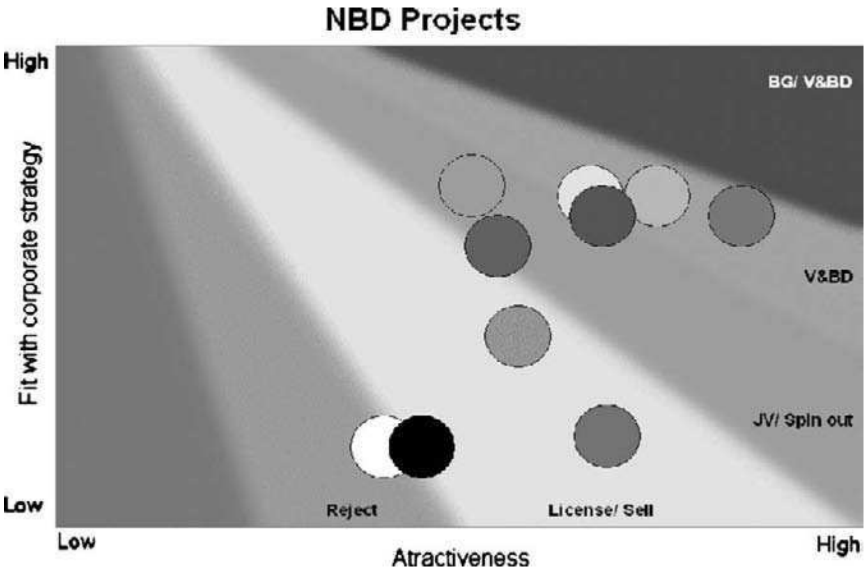

Fig. 2. Evaluation of Business Opportunities. *Source:* DSM.

translated in an interesting business opportunity) but does not fit the strategic context of the company. Conversely, a company can establish an alliance with another company with complementary technologies or assets when the business opportunity is extremely attractive even when the alignment with the company's strategy is unclear: because of the high attractiveness, the company bears no risks, as it can always sell the venture later on. Internal and external venturing takes care of projects that are highly attractive and have a moderate fit with the corporate strategy, since these projects are not exploiting the existing competences of the company, but are exploring new yet related technologies that can be translated into valuable business opportunities. Finally, when a project is attractive but is highly related to the current strategy of the company, corporate venturing can still play a role in nurturing the business project if the risks involved are too high to be taken on by an existing business unit.

In short, corporate venturing plays a crucial role in implementing the strategic renewal or the domain redefinition that is the immediate result of a corporate vision that stretches the company beyond its current businesses and competences. Corporate ventures explore new (but related) technologies that have the potential to generate attractive business opportunities. To realize these new business opportunities corporate venturing is central in new competence building and should therefore also be a major focal point in the study of the learning organization (Hitt et al., 1999, Dess, Lumpkin, & Mcgee, 1999; Zahra et al., 1999).

CONCLUSION

This chapter focuses on the question how companies can achieve competitive advantage in new and attractive business areas when this requires the development of new (technological) competences. Building new competences has been a hot topic in the literature during the last 5–10 years but only a few scholars have pointed at the crucial role of corporate venturing or new business development in competence building. We have argued that most successful companies build new competences through a sequence of corporate venturing initiatives. In other words, corporate venturing can be considered as a major organizational carrier to extend existing competences and to build new ones.

Furthermore, we have argued that both competence building and corporate venturing can only fully be understood in relation to corporate strategy making. The relationship between corporate venturing and corporate strategy is typically a dynamic one: corporate strategy may activate and direct new business development and the accompanying competence building, but the latter also drives and refines the former. On the one hand, corporate strategy serves to direct and select these CV-initiatives that propel the company into new but attractive businesses and urge the company to build new competences (required to operate successfully in these businesses). A 'corporate vision' or 'organizational purpose' communicated by the top management and translated into strategic objectives challenges the organization by creating a misfit between what the company is and what it intends to become, by showing the gap between the existing resources and knowledge base and those required to live up to its ambitions. On the other, new competence building also drives and refines the cognition of corporate strategy. This has been illustrated by means of the corporate renewal process within DSM.

New competence building and NBD based on radical innovations also demand reflection on the organizational context. The strategy-making process is no longer the privilege of top executives. Similarly, a strategic vision cannot be imposed as a grand design in a top-down fashion on the organization. When a company has the intention to enter new businesses and build new competences, senior managers cannot predict where the strategy-making process will lead. It is an open-ended process in which both managers at different levels and employees are involved in the search process for new business opportunities. The strategy-making process is a two-way process. On the one hand, the embedded strategic vision offers the legitimization of entrepreneurial activities throughout the company and also provides a selection criterion for new initiatives (i.e. fit with corporate strategy). On the other, as companies build new competences, managers (at different levels in the organization) also become aware of new strategy opportunities.

NOTES

1. Dynamic capabilities are defined as a '…firm's ability to integrate, build and reconfigure internal and external competencies [sic] to address rapidly changing environments' (Teece, Pisano, & Shuen, 1997) and are considered to be very valuable in regimes of rapid change or high-velocity markets.

2. Competences can be understood as 'the ability of an organization to sustain coordinated deployments of resources in ways that help the organization achieve its goals' (Sanchez & Heene, 2004, p. 7); competence building is 'any process by which an organization creates or accesses qualitatively new kinds of resources (including

new assets or new capabilities) or develops new abilities to coordinate and deploy new or existing resources in ways that help the organization achieve its goals for value creation and distribution' (*ibidem*).

3. Competence leverage is defined as the use of an organization's existing competences, i.e. currently available resources or quantitative increases in these resources. Leverage thus is "the exercise of one or more of an organization's current strategic options created by prior competence building activities" (Sanchez & Heene, 2004, p. 8).

4. New business development (Roberts & Berry, 1985) is used as synonym for corporate venturing (Von Hippel, 1988; Block & MacMillan, 1995), corporate incubators (Hansen et al., 2000) and corporate entrepreneurship (Ellis & Taylor, 1987; Zahra & Covin, 1995; Kuratko, Montagno, & Hornsby, 1990).

5. There are other strategic approaches that established companies use to spur corporate venturing. Frequently used alternatives are hiring creative people from outside the organization, creating an internal market for ideas, setting entrepreneurial activity as a strategic priority of the company, granting creative people some free time, etc. For an overview, see Stringer (2000).

6. The same need for a dynamic framework is echoed in the literature about technological capabilities, where technology-based companies face an apparent paradox: companies have to take advantage of the existing technical capabilities – competences – without being hampered by the technological trajectory they followed in the past (Helfat & Raubitschek, 2000; Leonard-Barton, 1992, 1995; Teece et al., 1997). The tension between leveraging existing competences and the creation of new ones through entrepreneurial activities is also at the core of the emergent literature on strategic entrepreneurship (Hitt et al., 2002).

7. Itami and Numagami (1992) emphasize that positive effect of cognitive processes. The literature has emphasized the negative effects focusing on the inability to unlearn (Hamel & Prahalad, 1994) the impact of technological trajectories and organizational inertia (Ahuja & Lampert, 2001; Cohen & Levinthal, 1990; Leonard-Barton, 1992, 1995; Levinthal & March, 1993).

8. Data are collected from internal documents and in-depth interviews with management and staff of DSM.

9. Somewhat outside this chemical spectrum are the large global oil companies, which are relevant for chemicals as they increasingly dominate the petrochemical business, and the group of large global pharmaceutical and food processing companies, which are also consolidating.

10. Other drivers identified are: leadership in every business segment, cost control, a non-supply-cyclical stable earnings profile, a solid financial structure and innovation.

11. The company can also opt for an acquisition when the uncertainty related to a venture is small (Hoskisson & Busenitz, 2002).

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PART III:
DIVERSIFICATION AND ALLIANCES

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COMPETENCE AT WORK: EMPIRICAL EVIDENCE FOR COMPETENCE-BASED DIVERSIFICATION IN THE WORLD AUTOMOTIVE SUPPLIER INDUSTRY

Michael Stephan and Eric Pfaffmann

ABSTRACT

In this chapter, we investigate the investment strategies of 20 non-German large multinational automotive supplier companies (MSCs) in the German market. In recent years, MSCs have acquired local German supplier companies worth $6.7 billion. We apply a conceptual framework to analyse the proposition that MSCs invest in Germany in order to complement their existing technological capabilities to be in a position to supply complete product systems to their German and international customers. The acquired knowledge is meant to serve the strategic intent of MSCs to complete their product portfolios and thus to be able to be first tier suppliers to Original Equipment Manufacturers (OEMs). As a prerequisite, we analyse if major MSCs tried to become first-tier suppliers of OEMs. For that reason, we first review the product portfolio strategies of these

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companies. We then examine the major acquisition activities of the MSCs in the German market. We find that all sample MSCs participate in the system and module business and that they all invested heavily in complementary knowledge by acquiring medium-sized German supplier companies. Almost all MSCs in the sample acquired at least one German company during the period of investigation. The results therefore correspond to the observation that MSCs increasingly supply complete systems, modules, and system-modules. With the purchase of German suppliers, MSCs indeed broaden and complement their product portfolios and respond to the increasing demand of OEMs to buy complete systems, modules, and system-modules.

INTRODUCTION

Recent trends towards globalisation and foreign direct investment (FDI) in the automotive industry have received considerable attention in international business research and in automotive industry studies. However, most of the existent literature deals only with the major automotive manufacturers, so called original equipment manufacturers (OEMs), while the adjacent automotive supplier industry is neglected, although the automotive supplier industry has undergone significant structural changes. In recent years, supplier companies have started to invest abroad and thereby also to diversify their activities over a broader range of products.

Our investigation attempts to shed light on competence-based diversification activities of parts suppliers as well as component suppliers in the automotive industry. These activities are stimulated by the globalisation and supply chain redesigns of major OEM customers. In particular, we attempt to find out whether there is empirical evidence for the proposition that multinational automotive supplier companies (MSCs) carry out competence-based diversification strategies. To do this, we analyse FDI strategies of large MSCs in the German market.

By screening the literature relevant to our field of analysis, one is confronted with two different strands of research. The first strand deals with corporate diversification and resides largely in the field of strategic management.[1] As a topic in strategic management research, diversification has a rich tradition. There is a large body of empirical research on related diversification, competences, and firm performance. Ramanujam and Varadarajan (1989), and Schuele (1992) provide comprehensive overviews of different perspectives to the concepts and processes of diversification. The term "(related) diversification" refers to the phenomenon that "...over time firms add activities that relate to some aspect of existing activities".[2] Firms add and grow on what they have already got. The overwhelming part of the empirical and theoretical studies examine whether and when related diversification strategies lead to enhanced firm performance and attempt to uncover the underlying success/failure determinants of diversification moves.[3] Chiesa and Manzini (1997) as well as Schuele (1992) differentiate between external and internal determinants of diversification. External determinants are, for instance, the markets or industries entered, while internal factors refer to decision and information channels, slack managerial and financial firm resources.[4]

Recently, related diversification has been seen as a means of firms to generate and exploit complementarities between stocks of knowledge and learning processes.[5] This literature adds to the internal view and treats firms from an explicitly dynamic perspective.[6] Here, firms are and diversify differently because they act in different environments, over time discover opportunities and learn differently. This perspective is embedded in the competence-based theory of the firm and is the theoretical foundation we take up in this chapter. Although a number of competence-based studies approach diversification and performance implications from a theoretical point of view,[7] there is only sparse empirical evidence of branch-specific motives of related diversification moves.[8]

For the purposes of this study, there is an important differentiation between related diversification and competence-based diversification to be highlighted: Competence-based diversification and related diversification are not identical. Rather, *competence-based diversification moves are a subset of related diversification moves*. In this study, related diversification activities are only classified as competence-based diversification, if these activities complement existing parts and component capabilities in order to complete existing product system competences of the diversifying companies. For instance, albeit the diversification of an airbag component manufacturer into the interior trim represents a related diversification activity, it is not a competence-based move.

The second strand of literature originates from the field of international management and FDI. Surprisingly, existing theoretical research and empirical evidence on globalisation and FDI in the automotive suppliers industry is weak, especially for Germany and Europe. We agree with Carr (1993), that in the automotive suppliers industry "internationalization has been well documented",[9] however, we criticise the lack of deeper analysis, which is common to most of the studies dealing with the topic.[10] Most of the work is simply deduced by research on automotive manufacturers. The organisation for economic co-operation and development (OECD, 1996), for instance, describes in its analysis of the globalisation of industrial activities the globalisation and foreign investment in the automotive parts production. The study concludes that foreign investment in auto parts has generally followed the pattern of FDI in the automotive manufactures industry.[11] For Germany, the study states that compared to other European countries, the inward investment position in the late 1980s remained relatively low.[12] Wells and Rawlinson (1994) have conducted a study on the process of globalisation of the European automotive industry and also refer to the suppliers industry. As part of the investigation, they shed light on inward FDI in East Germany and analyse acquisitions of formerly socialist businesses in specific automotive parts and component segments. In a more recent analysis of the internationalisation of competition in the automotive industry Freyssenet and Lung (1997) as well as Müller-Stewens and Gocke (1995) focus on the wave of M&A in the European suppliers industry since the beginning of the 1990s.[13] Their empirical data suggest that in this period Germany was at the centre of FDI activities in Europe.[14] Another group of studies deals with globalisation strategies of German-based suppliers. However, the focus of most of these studies is placed upon the difficulties in globalisation faced by small- and medium-sized suppliers.[15]

The present investigation is based on an earlier study that was aimed at closing the above-mentioned gap in the international management literature. In this study we analysed major trends behind the globalisation tendency of the world automotive supplier industry and examined the motivation for MSCs to invest in Germany.[16] For that purpose, we developed a conceptual framework with which we could describe and analyse recent developments and structural changes in the world automotive industry. In the present chapter, we adapt the conceptual framework and make use of it in order to inquire our main research question. Our proposition is that MSCs *invest in Germany in order to complement their existing technological capabilities to be in a position to supply complete product systems to their Germany-located and international customers.*

We have selected 20 non-German MSCs and investigated their investment activities in the German market, in other words, we have focused on their external diversification moves. Competence-based diversification activities can (only) be detected by analysing the acquisitions of domestic German companies that have been carried out during a certain period of time. However, this procedure covers the methodological problem that acquisitions must be classified as competence-based diversification moves and distinguished from other rationales behind acquisitions of domestic German companies. Other motives to acquire a domestic company are, for instance, to get access to the customer base of the acquired company or to incorporate entirely new technological assets and capabilities, i.e. to engage in unrelated diversification.

To control other possible motives of acquisition activities we applied several provisions. First, we exclusively examined large MSCs that already maintain a diversified technological basis as automotive supplier companies. Thereby, unrelated diversification moves, possibly stimulated by risk considerations, are excluded from the very beginning by the sample selection. Second, we compared the size and type of the acquired companies in relation to the acquiring ones. The larger the relative size of the acquiring company vis-à-vis to the acquired one, the greater the likelihood that other reasons, as for instance cost cutting, marketing, etc., are excluded. Third, we carefully examined whether the technology base of the acquired company does in fact deliver capabilities that complement the technology base of the acquiring company and allow them to complete their product portfolio and supply entire product systems. Although not a perfect indicator, this complementarity of the technology bases hints at the strategic importance and similarity of the underlying assets. Fourth, we concentrate on the German market as a target market that excludes motives such as low-cost production from the outset.

In the remainder of this chapter, we will discuss our data collection method and introduce the sample MSCs (in the second section). We then develop the conceptual framework (in the third section) and examine our proposition in more detail (in the fourth section).

DATA COLLECTION AND SAMPLE OF MULTINATIONAL SUPPLIERS

Data Collection Methodology

Data Sources

The company data in our study are drawn from secondary sources. All MSCs in our sample are subjected to national publicity law. Hence, we could collect and evaluate data provided by the annual reports of the respective companies as a starting point for our inquiry. All statements about financial measures like domestic and foreign turnover, R&D, assets, etc., and structural measures like employees, product ranges, etc., are drawn from the annual reports. We employed industry directories as well as the business databases of several news agencies (*Dpa*, *Iwa*) and *Reuters Business* for those financial and structural measures, which are not included in the annual reports. In addition, we utilised these databases for information about investment activities in Germany as far as corporations are not obliged to publish these activities in their annual reports. Furthermore, some of the bigger German subsidiaries of the MSCs in our sample are subjected to German publicity law and have to publish individual annual reports as well. Data concerning the product portfolios of the MSCs under investigation, unless not included in other data sources, are collected from several issues of the journals *Automobil-Produktion*, *Automotive News*, *Ward's Automotive International* and *Ward's Auto World*. All financial and structural measures refer to the fiscal year 1997.[17] All currency used is the US$. We applied the corresponding IMF-exchange rates to convert the different currency values into US$.[18]

Methodological Problems

The top 50 automotive suppliers companies worldwide serve as the parent population for the selection of the 20 companies in our sample. However, the selection from the parent population was not made without bias. We excluded affiliated supplier companies of OEMs as well as suppliers of raw materials (aluminium and steel) and rubber, because we assume that these companies, albeit competing in the same industry, have to comply with different conditions and competitive pressures. Obviously, we also had to exclude German supplier companies from the parent population. On the basis of this biased selection, a neutral test of "hypotheses" would not make sense. But the formal test of hypotheses is not the purpose of this chapter. Rather, our intention is to get insights into the rationale behind the diversification and investment activities of foreign MSCs in the German market. Although we believe that our findings can be seen as an *indication* of developments in the German automobile industry, a statistical generalisation from our sample is not possible.

We did not conduct a primary data collection except for a number of expert interviews with executives of the MSCs. Thus, analysis of our data is limited to the quality of the data in the original sources mentioned above. Data records of the sample companies consist of data from different sources. To minimise the extent of errors, we use a record-linkage procedure. The procedure is applied at three levels: First, each company data record is composed of several categories comprising data from different sources. This form of data heterogeneity is not problematic, but, on the contrary, can be advantageous for the reliability of the results.[19] Second, in a few cases data of equivalent categories across company records have been extracted from different sources. This may cause marginal distortions in cross company comparisons within the categories in question. Third, on the level of individual data records, data within the same category may themselves be composed of several sources. Therefore, redundancies cannot be completely excluded.

Characterisation of the Sample Companies

The sample of our study comprises 20 MSCs with headquarters in North America (twelve companies), Europe (six companies), Japan (one company), and Canada (one company). In 1997, these companies generated total sales of $212.5 billion and employed about 1.186 million people (Table 1). Ranked by total sales and employment, the largest company is Delphi Automotive Systems with an annual turnover of $26.9 billion and 178,000 employees. Delphi Automotive is an independent subsidiary of General Motors since 1994. The smallest company in our sample is the French supplier Bertrand Faure with an annual turnover of $2.5 billion and 14,898 employees. In 1997, the companies in our sample generated about 11% of their turnover ($23 billion) in Germany and employed 23,070 people in the country. German assets amounted to $15.6 billion. These measures suggest that operations in Germany account for a significant portion of the value added of the sample companies.

In recent years, almost all MSCs achieved notable growth in their businesses, and evolved to big multinational operating companies. The Lear Corporation experienced one of the most significant rates of growth in their businesses. Annual revenues of this company almost quintupled during the last 5 years. Other companies pursued considerable growth strategies as well. For example, total sales of the U.S.-based Johnson Controls and the Canadian-based Magna International Inc. almost doubled. Remarkable in this respect is also the merger of the British supplier Lucas plc with the U.S. American Varity Corporation. Together they formed Lucas Varity Plc with a joint turnover of nearly $7 billion. This move to a larger size reflects the overall trend to consolidation in the industry.[20]

Only six companies concentrate their activities exclusively in the automotive industry. These are Delphi Automotive Systems Inc., Denso

Table 1. Sample Companies Ranked by Automotive Sales, 1997.

Rank	Company	Home Country	Total Sales (dollars in million)	Auto-motive sales (dollars in million)	German Sales (dollars in million)	Total Employees	Employees Germany	Total Assets (dollars in million)	German Assets (dollars in million)	R&D (dollars in million)
1	Delphi Automotive Sys. Inc.	USA	26,900.0	26,900.0	2,300.0	178,000	7,444	25,300.0	1,020.0	1,300.0
2	Denso Corporation	J	13,446.1	13,446.1	400.0	56,300	84	12,654.7	74.0	830.6
3	Lear Corporation[a]	USA	6,900.0	6,900.0	821.0	46,000	3,700	4,200.0	700.0	700.0
4	TRW Inc.	USA	10,172.0	6,468.0	1,302.3	65,218	9,852	5,890.0	2,361.0	1,963.0
5	Johnson Controls Inc.	USA	10,009.4	6,100.0	1,459.0	65,800	5,400	3,945.3	760.0	273.0
6	LucasVarity Plc	UK/USA	7,086.4	6,090.0	603.8	57,000	2,620	5,198.9	440.0	308.0
7	Dana Inc.	USA	7,686.3	6,070.0	445.0	46,100	670	6,160.0	320.0	149.0
8	Magna International Inc.	CAN	5,850.0	5,850.0	1,100.0	24,000	3,200	3,234.2	600.0	315.0
9	ITT Industries Inc.	USA	8,910.0	5,613.0	3,458.0	59,000	20,251	5,879.0	1,884.9	182.0
10	Allied Signal Inc.[b]	USA	14,346.0	5,549.0	1,040.7	87,500	5,000	12,465.0	520.0	310.0
11	Valeo S.A.	F	5,517.1	5,517.1	1,151.4	32,600	2,670	4,718.3	1,406.6	301.7
12	Magnetti Marelli S.p.a.	I	4,166.0	4,166.0	380.0	25,000	1,300	N.A.	200.0	199.9
13	Eaton Corporation	USA	9,961.0	4,119.0	252.3	54,000	1,065	5,307.0	150.0	267.0

14	GKN Plc	UK	5,669.6	3,762.0	1,292.4	31,100	4,606	N.A.	920.0	N.A.
15	Rockwell International Corp.[c]	USA	10,373.0	3,140.0	850.0	58,639	1,800	10,065.0	400.0	518.0
16	Motorola Inc.	USA	27,973.0	3,122.8	2,058.1	14,200	2,773	22,801.0	1,203.3	2,394.0
17	United Technologies Corp.	USA	22,624.0	3,100.0	1,530.0	170,600	5,300	15,958.0	650.0	963.0
18	T&N Plc	UK	3,122.8	3,000.0	1,207.8	40,941	4,500	3,500.0	800.0	N.A.
19	Bertrand Faure S.A.	F	2,511.4	2,240.0	728.3	14,898	5,992	N.A.	650.0	N.A.
20	Textron Inc.	USA	9,274.0	1,854.0	690.0	59,000	2,915	18,235.0	600.0	576.0
	Total:		212,498.1	123,007.0	23,070.1	1185,896	125,350	165,511.4	15,659.8	11,550.2

Sources: Annual reports; Automotive News, Automobil Produktion, various issues; Dpa, Iwa, Reuters.

[a]Figures include operations of Keiper Car Seating, acquired in early 1997.

[b]Sales figures include brake system operations, which were sold to Robert Bosch GmbH in 1997.

[c]On September 30, 1997, Rockwell spun off its automotive business and established a separately traded, public company - Meritor Automotive, Inc.

Corporation, Lear Corporation, Valeo Inc., Magna International and Magnetti Marelli S.p.a. The other 14 sample MSCs maintain diversified business activities in other industry sectors. Most frequently, other business activities are carried out in the aerospace and electronics segment (10 MSCs). In addition, a few MSCs are engaged in industrial services, plant engineering and construction, and consumer electronics. On average, the companies make almost 60% of their turnover in the automotive suppliers business. Exceptions, with automotive sales amounting to considerably less than 50%, are the electronic companies Motorola Inc. (11%) and Rockwell Inc. (40%), as well as UTC (14%), Textron (20%) and Allied Signal (39%), which concentrate their activities in the aerospace industry. As mentioned above, all sample companies rank among the 50 largest automotive supplier companies in the world. If we exclude German suppliers as well as suppliers of rubber and other raw materials, the sample MSCs rank among the 35 largest non-German automotive suppliers worldwide. Table 2 gives an overview of the 50 largest automotive suppliers.

A RATIONALE FOR COMPETENCE-BASED DIVERSIFICATION OF MULTINATIONAL AUTOMOTIVE SUPPLIER COMPANIES

A Brief Sketch of the Attractiveness of and Developments in the German Automotive (Supplier) Market

The discussion in this section serves as a prerequisite for the subsequent analysis of the diversification moves of the MSCs in the target market. The attractiveness of the German automotive market is mainly determined by the characteristics of the upstream automotive supplier market that consists of desirable acquisition targets. In the following, we concentrate on two aspects: on the structure of the automotive suppliers industry and on the technological sophistication of the suppliers in Germany.

Germany is the home country of more than 3,000 automotive supplier companies.[21] On the whole, these suppliers had sales of approximately $50 billion in 1997. Apart from a few large multinational suppliers with sales amounting to more than $2,000 million, the local supplier base in Germany is characterised by a large number of independent small- and medium-sized parts and components supplier companies.[22] About 50% of the 3,000 automotive suppliers employ between 50 and 500 people.[23] On average, each German automotive supplier generated revenues of $20 million.

Table 2. Top 50 MSCs Ranked by Automotive Sales. (Sample Companies are in Bold).

Rank	Company	Home country	Automotive Sales (dollars in millions)	Business Classification
1	**Delphi Automotive Systems Inc.**	**USA**	**26,900.0**	**System**
2	Ford Automotive Products Operations[a]	USA	16,400.0	System
3	Robert Bosch GmbH	GER	16,300.0	System
4	**Denso Corporation**	**JP**	**13,446.1**	**System**
5	Aisen Corporation	JP	11,614.0	System
6	Continental AG	GER	6,708.6	Rubber
7	**Lear Corporation**[b]	**U.S.**	**6,900.0**	**System**
8	**TRW Inc.**	**U.S.**	**6,468.0**	**System**
9	**Johnson Controls Inc.**	**U.S.**	**6,100.0**	**System**
10	**LucasVarity Plc**	**UK/U.S.**	**6,090.0**	**System**
11	**Dana Inc.**	**U.S.**	**6,070.0**	**System**
12	Yazaki	JP	6,000.0	System
13	**Magna International Inc.**	**CAN**	**5,850.0**	**System**
14	Bridgestone	JP	5,787.0	Rubber
15	**ITT Industries Inc.**	**U.S.**	**5,613.0**	**System**
16	**Allied Signal Inc.**[c]	**U.S.**	**5,549.0**	**System**
17	**Valeo S.A.**	**F**	**5,517.1**	**System**
18	NV Philips	NL	5,482.3	System
19	Michelin S.A.	F	5,480.0	Rubber
20	Delco Electronics Corporation[d]	U.S.	5,350.0	System
21	Thyssen/Budd	GER	5,000.0	Steel/System
22	Mannesmann AG	GER	4,500.0	System
23	**Magnetti Marelli S.p.a.**	**ITA**	**4,166.0**	**System**
24	**Eaton Inc.**	**U.S.**	**4,119.0**	**System**
25	ZF Friedrichshafen	GER	4,056.0	System
26	BASF AG	GER	4,000.0	Finishes/Coatings
27	**GKN Plc**	**UK**	**3,762.0**	**System**
28	Du Pont Inc.	U.S.	3,747.4	Polymers/Lubricants
29	G.E. Automotive[e]	U.S.	3,600.0	System/Polymers
30	Sumitomo Electric Industry	JP	3,344.8	System
31	Pirelli Spa	ITA	3,200.0	Rubber
32	**Rockwell Inc.**	**U.S.**	**3,140.0**	**System**
33	**Motorola Inc.**	**U.S.**	**3,122.8**	**System**
34	**United Technologies Corporation**	**U.S.**	**3,100.0**	**System**
35	**T&N Plc**	**UK**	**3,000.0**	**System**
36	Zexel Corp.	JP	2,879.0	System
37	Arvin Industries	U.S.	2,863.0	System
38	Chrysler Component Operations	U.S.	2,700.0	System
39	Calsonic	JP	2,553.7	System

Table 2. (*Continued*)

Rank	Company	Home country	Automotive Sales (dollars in millions)	Business Classification
40	Usinor Sacilor	F	2,366.4	System
41	PPG Industries Inc.	U.S.	2,304.0	Glass/Coatings
42	Toyoda Gosel	JP	2,241.5	System
43	**Bertrand Faure S.A.**	**F**	**2,240.0**	**System**
44	NHK Spring	JP	2,192.9	System
45	Unisia JECS	JP	2,190.0	System
46	Goodyear Inc.	U.S.	2,100.0	Rubber
47	Koito Manufacturing	JP	2,082.0	Steel/Raw Materials
48	American Axle Inc.	U.S.	2,020.0	System
49	Krupp Hoesch AG	GER	1,982.0	System
50	**Textron Inc.**	**U.S.**	**1,854.0**	**System**

Sources: Annual reports; Automative News, 1997 Market Data Book; Automobil Produktion various issues.
[a]Company changed name into Visteon in January 1998.
[b]Sales figure includes operations of Keiper Car Seating, acquired in early 1997.
[c]Sales figures include brake system operations, which were sold to Robert Bosch GmbH in 1997.
[d]Became part of Delphi Automotive Systems, late 1997.
[e]Sales figures include financial services.

To determine the technological sophistication is a more complex task, and to develop the corresponding concept would probably require a separate study. Therefore, as a rough proxy for technical sophistication, we compared R&D activities in the German automotive supplier industry with activities in other countries.[24] More precisely, we use R&D expenditures as an input measure and patent intensity as the corresponding output measure. A major limitation of the data at hand is the fact, that these measures of the innovative activities are only available for the German automotive industry as a whole. No reliable, disaggregated data is available for the automotive supplier sector. However, evidence from a number of studies on innovative activities of German supplier companies, all based on extensive industry surveys, suggest that these general automotive industry figures are also representative for the supplier industry.[25]

On the average, the German-based automotive industry invests 5.4% of their turnover in R&D. Compared to the R&D expenditures of the automotive industry in other OECD countries, Germany ranks second, only the Swedish automobile industry spends more, 6.2%, for R&D. The intensities of the United States and Japan are 4.6 and 2.9%, respectively, significantly lower.[26] The output of these investments can be measured in terms of patent intensities. The patent intensity stands for the amount of filed applications for world market relevant patents per country and product category per million persons in dependent employment.[27] There is a tight correspondence between the R&D-intensity and patent intensity, and the German automobile industry takes the first place in the patent-intensity ranking, before Japan and the U.S.[28] On the whole, anecdotal and statistical evidence indicates that German automotive suppliers are, in principle, attractive acquisition targets for MSCs, because of their digestive size and technological sophistication.

Besides the characteristics of the automotive supplier sector, the attractiveness of the German automotive market is, at least in part, also determined by the characteristics of the customers in the German market. The customers of the MSCs in the German market are predominantly large OEMs. High volume in demand and technological sophistication of OEM together offer the opportunity for suppliers to generate cash flow with technologically sophisticated products. Germany is the home country of four car manufacturers (BMW AG, DaimlerChrysler AG, Porsche AG and VW AG) and host country of two multinational car companies (Ford AG, Adam Opel AG). In addition, six truck manufacturers and several specialised off-road manufacturers are located within German borders. The total turnover of the German-based automotive manufacturers amounts to $104 billion. On the whole, the German automotive industry generated sales of $376 billion in 1997.[29] Germany is the largest producer country of automobiles in Europe, and ranks third in the world (by volume as well as by turnover) following the United States and Japan (see Table 3).

Apart from pure volume considerations, German OEMs also prove to be attractive customers in terms of technical responsiveness and sophistication. We define technical responsiveness in terms of stimulation and estimation of technological innovations generated by supplier companies. The general industry figures presented above and anecdotal evidence from numerous studies suggests that German OEMs are leading edge customers which do not only honour but rather demand and stimulate technological innovation developed by their suppliers.[30]

Pressures for Competence-based Diversification Created by New Sourcing Strategies

At the outset of this section we sketch the consequences of new sourcing patterns of OEMs in Germany and show how MSCs respond to these strategic challenges. Various studies on the manufacturing penetration in

Table 3. Global Car Production by Region.

Global production by region	Cars 1996	Trucks 1996	Total 1996
Africa	279,900	206,000	485,900
Middle East	319,400	91,800	411,200
Asia-Pacific	11,952,400	5,510,500	17,462,900
Japan	7,605,000	2,494,400	10,099,400
South Korea	2,264,600	547,400	2,812,000
Central & South America	1,860,700	520,800	2,381,500
Brazil	1,468,100	350,800	1,818,900
North America	8,142,295	7,181,461	15,323,756
Canada	1,288,676	1,109,034	2,391,090
United States	6,055,939	5,658,812	11,714,751
Central & Eastern Europe	1,980,500	375,900	2,356,400
Western Europe	14,577,200	2,037,000	16,614,200
Belgium	1,153,000	101,800	1,254,800
France	3,147,600	449,100	3,596,700
Germany	4,539,000	304,000	4,843,000
Italy	1,318,000	229,300	1,547,300
Spain	1,942,000	479,300	2,421,300
United Kingdom	1,686,000	243,800	1,929,800
Total	39,112,395	15,923,461	55,035,856

Source: Automotive News.

the automotive industry in the Triad countries indicate that OEMs have externalised a significant proportion of production since the beginning of the 1990s.[31] A carefully developed and consequently implemented outsourcing strategy marks the end of the traditional in-house development and production of most product components and parts. On the contrary, sourcing strategies focus on the entire value chain where suppliers and OEMs cooperate and possess distinct and complementary competences.[32]

An automobile is a complex product that consists of several thousand parts and components, which are combined to form larger *systems* and/or *modules*. From the perspective of the OEM, all systems, components or parts of the automobile that are not considered strategic can principally be sourced out to supplier companies in order to achieve an optimal distribution of labour along the value chain.[33] Thus, the general goal behind outsourcing strategies is the equilibration of optimal degrees of vertical integration across firms along a particular value chain.[34] This is assumed to be the way to simultaneously achieve innovative products, short development times, competitive prices and high-quality standards or, in short, dynamic efficiency.[35]

For instance, faster development cycles can be accomplished by outsourcing product development activities to suppliers, since in this case the OEM is required to develop a feasible modular system design in early stages of the product development process. The system design defines the functions of the systems and the interfaces among the physical chunks of the systems.[36] This procedure enforces a certain discipline on the part of the OEM with regard to timing and concept development. Furthermore, a lot of detailed development processes are transferred from OEMs to specialised suppliers, which leads to a considerable reduction in the co-ordination of complex development processes. Hence, the development process as a whole is structured in a higher order, and freed capacities can be used to produce new ideas and novel concepts.[37] Increased outsourcing (as well as single sourcing[38]) implies that OEMs must redefine the value-added they buy from suppliers. OEMs have to delegate to suppliers the responsibility for developing and producing entire systems and modules in order to maintain an efficient inter-organisational value-chain management. In the following, we shall examine in more detail the resulting systems and modules that direct suppliers of OEMs have to deliver.

As a consequence of increased outsourcing, OEMs source an increased volume of value-added from a reduced number of direct suppliers. System sourcing contains two defining elements: (1) The integration of constituting parts and components to a coherent system in order to develop a solution to a specific customer problem and (2) the implementation of this solution by a single supplier.[39] For the automobile industry, this translates into value-added activities of developing and manufacturing entire systems and modules, which are assembled to the final car. Autonomous development, production and assembly activities require the identity of functional and assembled car units, that is, a high degree of independence among functional elements and interacting physical components, that is, a modular product architecture.[40] But a one-to-one mapping of functional elements and physical components which indicates a high degree of independence, and thus, marks a modular architecture, is just a special case of a complex *n*:*m* mapping with rather low-degrees of independencies. For example, a functional element is sometimes executed by several physical components, as is the case for the brake system in a car. The physical components of the system are located at the front and rear axle corners (brake calipers, pads, discs, hubs, bearings, ABS sensors, etc.), in the engine compartment (ABS system, brake valves and boosters) and in the cockpit (brake pedal, hand-brake lever).

In the case of a *n*:*m* mapping, a sourcing package has to be defined according to functional elements *or* to spatial aspects of assembled components.

If a definition is made according to *functional* elements, this shall be called a *system*, and hence, system sourcing, if *spatial* assembly aspects constitute the defining principle, then the parts shall be called *modules*, and modular sourcing. Task interdependencies occur during the development phase and the assembly phase of the product.[41] The higher the task interdependency the more difficult is the specification of interfaces among interacting parts of functional elements and assembled units. Hence, it is beneficial to keep task interdependencies at a low level. If the interdependencies of development processes relative to the assembly processes are lower, then system sourcing is more valuable than modular sourcing and vice versa. Fig. 1 visualises the concept of system sourcing and distinguishes between modules, systems, and system-modules. System-modules are the special cases where the defining criteria for systems and modules equally apply.

Since the beginning of the 1990s, system sourcing has become a major trend in automotive manufacturing.[42] Wolters (1995) has conducted a study on purchasing strategies of European-based OEMs and predicts that by the year 2000 more than 50% of the total sourcing volume will consist of systems, modules, and system-modules.[43] For several parts of the automobile, system sourcing has already become the exclusive sourcing modality – prominent modules are doors, seats, and interior trim, whereas typical examples for systems are the safety and thermal system. Lately, the trend towards the definition of system-modules has increased. For example, suppliers tend to integrate main components of the chassis and brake systems into axle corners system-modules. A similar trend occurs with regard to cockpit system-modules. Suppliers of cockpits are becoming responsible for the development, manufacturing and assembly of complete cockpits comprising the instrument panel, the steering unit and basic parts of the electric/electronic system.

The changes in the sourcing behaviour sketched above lead to a profound restructuring of the supply chain in the automotive industry. Automotive supplier companies face new challenges in competition and have to respond to the developments with a redefinition of corporate strategies. Suppliers have to decide, whether they should be able to supply complete systems or modules and thereby remain in direct contact with the OEM and become responsible for an increased portion of value-added, or whether they can accept to lose direct contacts to OEMs and become second- or third-tier subcontractors of single components. If they decide to stay in direct interaction with OEMs as first-tier suppliers, their strategies must be designed to meet the requirements of the OEMs. Suppliers must possess the *competence* to deliver complete systems and modules. In other words, suppliers must engage in growth strategies and invest in system competences.

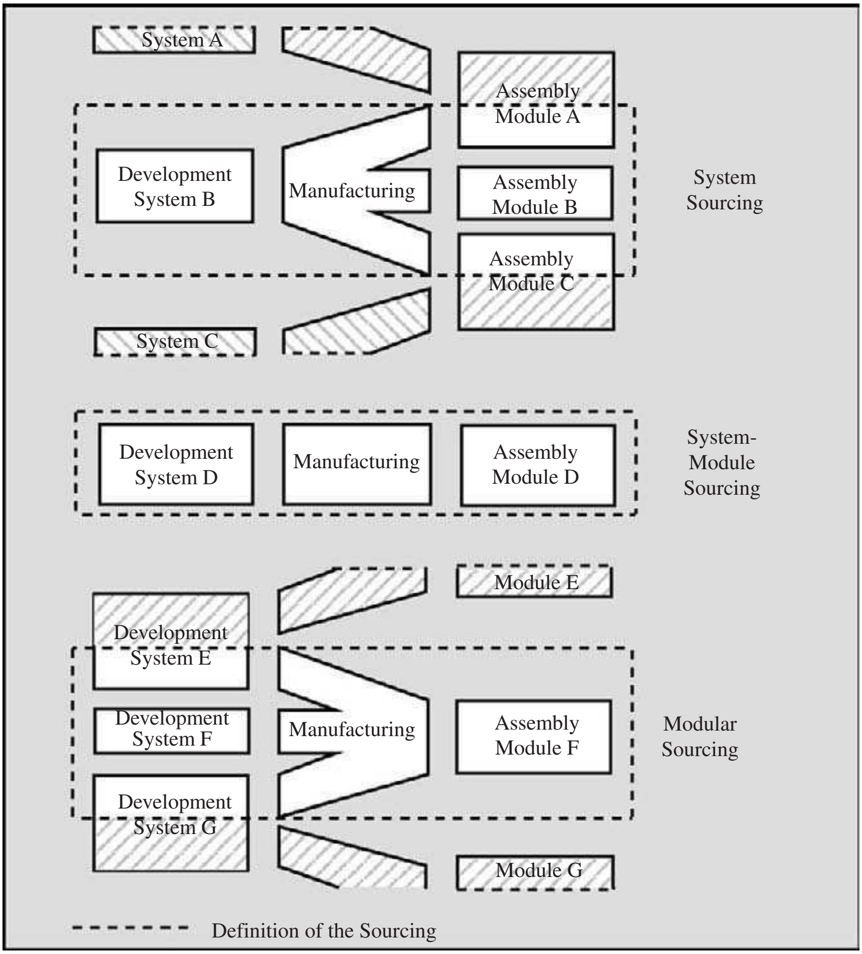

Fig. 1. System Sourcing – Definition of Sourcing Units. *Source*: Stephan, Pfaffmann (1999, 2001).

STRATEGIC RETURN OF MSCS: COMPETENCE-BASED DIVERSIFICATION-ACTIVITIES

In this section, we examine the strategic responses of our sample MSCs to modified sourcing strategies laid out in the preceding section. To build up system competences and to become system suppliers, supplier companies must invest in new capacities and capabilities. However, faced with limited resources, supplier companies will not attempt to become system suppliers across their full product range. Companies have to decide carefully in which product segments they invest sparse financial resources in the formation of system capabilities. According to our hypothesis, suppliers invest in product segments in which they already possess advanced competences. To further upgrade these product segments, MSCs – as a dominant strategy – diversify and acquire companies, which deliver capabilities that complement the existing technology base and allow them to complete their product portfolio and supply entire product systems.[44]

We focus on two major aspects of MSCs behaviour. First, we review the product portfolio strategies of MSCs in order to analyse how major MSCs diversify to become a system and/or module supplier of German OEMs. Second, we examine the major *acquisition* activities of the MSCs in the target market. This will help us to find out whether MSCs have invested in the knowledge they need to realise their product portfolio strategies. The required knowledge is incorporated in small- and medium-sized domestic supplier companies.

Product Portfolio Strategies of Multinational Suppliers

In principle, MSCs can position themselves as modules and systems suppliers or components and parts suppliers. We can only speak of a strategic response if they predominantly engage in the system and modules business, because only then they seek to benefit from supply chain redesign of OEMs.

In order to examine the product portfolio strategies of MSCs, we had to rely on company information. This does not appear to be a problem on first sight because we simply collected data about their products. However, this information may include the pitfall that firms label their products "systems" or "modules" without referring to the defining criteria. Hence, systems and modules may turn out to qualify simply as parts and components. In principle, wrong labels can result from two reasons. (1) A company deliberately issues wrong information because it intents to move into the systems and module business but does not yet control the necessary resources and capabilities to implement this strategy. (2) A company unconsciously issues wrong information by defining parts and components as modules and systems without having a precise idea about the profile a system and module supplier must possess. The first case is probably difficult to identify, but, on the other hand, may not have far-reaching consequences since the supplier firm signals that it is on the way to become a system/module supplier. While the second case is easier to detect, it produces more serious distortions because this supplier does not pursue system and module strategies at all. In our study, we tried to resolve these problems by analysing whether the products, which were classified as modules and systems by the MSCs do in fact comprise the defining parts, components and subsystems necessary to execute the functions of a system or module. In cases where it was obvious that products had been mislabelled, we downgraded the products to components and excluded them from our study. As an example, we did not accept isolated tail lights as a lighting system, nor did we include airbag-covers in the vehicle interior as a security system. In addition, we spot checked company data with the help of automobile journals and economic data bases, respectively.

Fig. 2 provides an overview of the product portfolios of our sample MSCs. We distinguish among systems, modules and system-modules. As one can see, all MSCs of our sample participate in the system and module

	AS	BF	DA	DE	DN	EA	GK	IT	JO	LE	LV	MA	MM	MO	RO	TN	TE	TR	UT	VA
Systems																				
• Lighting system				●				●					●						●	
• Thermal system					●								●							●
• Safety system	●											●		●			●	●		●
• Other electrical systems				●		●		●			●		●	●				●	●	●
System-modules																				
• Seats		●							●	●										
• Cockpit & instruments				●	●				●	●			●							
• Exterior trim				●								●					●			
• Fuel delivery					●								●				●			
• Chassis-/Brake system*	●		●			●		●			●				●			●		
• Exhaust unit													●							
Modules																				
• Doors												●			●					
• Back-end/Trunk																				
• Front-end					●															●
• Axles/Gearing			●			●	●													
• Interior trim		●		●					●	●		●			●		●		●	
• Other modules															●	●				

Abbr.: AS: Allied Signal, BF: Bertrand Faure, DA: Dana, DE: Delphi Automotive, DN: Denso, EA: Eaton, GK: GKN, IT: ITT Industries, JO: Johnson Controls, LE: Lear Corporation, LV: LucasVarity, MA: Magna International, MM: Magnetti Marelli, MO: Motorola, RA: Raytheon, RO: Rockwell, TN: T&N, TE: Textron, TR: TRW, UT: United Technologies, VA: Valeo.

*) Suppliers tend to integrate the main components of the chassis system and of the brake system into axle corner system-modules.

Fig. 2. Product Portfolios of Selected MSCs.

business. The number of offered products varies between one (T&N Plc) and six (Magnetti Marelli Spa.). On the average, the portfolios of our sample MSCs contain almost 3 (2,7) different systems, modules and system-modules, respectively.

As can be seen, there is also a tendency towards the supply of system-modules, which can be explained by the attempt of MSCs to realise synergy in their product portfolio strategies for several markets. As mentioned above, 10 MSCs in our sample not only serve as suppliers in the automobile industry but are also engaged in the aerospace industry. Very often, the underpinning product and process technologies are similar. Furthermore, even products of their portfolios are sometimes similar with regard to functions, materials and design. Hence, one can conclude that it constitutes a competitive advantage of MSCs over small-sized national supplier companies to utilise technologies across several industries and thereby realise economies of scope. For example, Bertrand Faure S.A. sells seat modules and interior trim in the automobile as well as the aerospace industry. GKN Plc offers cardan shafts for the rotor gear unit of helicopters as well as for automobile gearings.

Acquisition-Activities of Multinational Suppliers in the Target Market

We proposed that a major motivation for MSCs to invest heavily in the German market is to buy knowledge incorporated in national supplier companies. This knowledge is meant to serve the strategic intent of MSCs to complete their product portfolios with respect to the supply of entire systems and modules. Clearly, knowledge can only be bought by acquiring a company or some parts of a company. Hence, the implementation of portfolio strategies requires the acquisition of national suppliers. Of course, apart from knowledge the acquisition of German suppliers also provides the MSCs with new customer ties to German OEMs. However, we believe that knowledge matters more than contacts since the latter has already been established by all sample MSCs prior to their acquisition activities in the German market.

However, in order to complete system and modules product portfolios of MSCs, the acquired knowledge *must* complement their existing competence profile. Thus, to examine our hypothesis, we investigated (1) which German suppliers have been acquired by which MSCs and (2) in which way the technological capabilities of the acquired firm complemented the technology portfolio of the purchasing company.

Table 4 provides a list of acquisitions executed by the sample MSCs in the German market. From 1987 till January 1997 we have identified a total number of 61 German suppliers that have been purchased for the sum of approximately \$6.7 billion.[45] These acquisitions stand for 43% of the sample MSCs' investments in the German market.[46] Within the investigated period, all sample MSCs undertook at least one acquisition, except for the Japanese Denso Corp and the U.S.-based Eaton Corporation.[47] Several companies exceeded the threshold of \$500 billion, namely, GKN plc, Johnson Controls Inc., Magna International, T&N plc, Textron Inc., TRW Inc. and Valeo S.A. In the course of the investigated period, the investment intensity reached its peak in the middle of the 1990s. While between 1987 and 1990 only nine acquisitions can be noticed, the number reached its peak in 1992, and then dropped slightly fluctuating around an average of seven acquisitions per year.

When examining more closely the *type* of investment targets, we found that with the exception of four cases, the core businesses of the acquired companies correspond to the main area of technological capabilities of the investing MSCs. In Table 4, we compared the core businesses of the acquired companies with the corresponding businesses of the investors and the exceptions are indicated . Of course, in a few cases the classification of the acquired companies is not unequivocal, especially with products and technological capabilities that can also be used for the aerospace business of the investor. Nevertheless, we find our hypothesis on competence-based diversification and investment strategies to be heavily supported by the results: *MSCs acquire small- and medium-sized German suppliers to complement their technological portfolio*. In the following we analyse the investments in more detail.

The results correspond to the previous observation that MSCs increasingly supply complete systems, modules and system-modules. With the purchase of German suppliers the investors enlarge and complement their product portfolios and respond to the increasing demand of OEMs to buy complete systems, modules and system-modules. In the field of modules, the preferred objects of purchase were suppliers of power transmission modules, that is, axles and gearing components. GKN Plc alone acquired four German suppliers of gearing systems and components. Further stress of the purchasing activities focused on seat manufacturers. In the beginning of the 1990s, the largest supplier of vehicle seats, Johnson Controls Inc., purchased Lahnwerke GmbH in and the Naue GmbH, both manufacturer of seat components comprising textiles and seat metal frames. In 1995, the MSC overtook control of the Roth Frères group, a large French seat producer, located in Strasbourg, close to the French–German border, including its German subsidiary. Additional acquisitions of automobile modules took place in the domain of

Table 4. Acquisitions of Selected MSCs in Germany between 1987 and 1997.

Investor	Acquired Company	Year	Size of Investment	Core Business of the Acquired Company	Corresponding Business of the Investor
Allied Signal Inc.	Jurid GmbH	1989	⩽100	Brake linings	Brake system
	Energit GmbH	1991	⩽100	Brake components	Brake system
	Polymer u. Filament GmbH	1995	⩽250	Fibres/New materials	Brake system
Bertrand Faure S.A.	Rentrop, Hubbert Wagner & GmbH & Co. KG	1990	⩽500	Interior trim, Seat components	Interior trim, Seats
Dana Corporation	Stieber Antriebselemente GmbH	1990	⩽50	Gearing parts	Axles/Gearing
	Euro Reinz GmbH	1993	⩽50	Sealings	Motor components
	Reinz Dichtungs GmbH	1993	⩽250	Cylinder head sealings	Motor components
	Friesen GmbH	1995	⩽10	Electrical components	Chassis system
Delphi Automotive Syst.	Kabelwerke Reinshagen	1995	⩽500	Cockpit/Other electrical systems	Cockpit/Other electrical systems
	Merit GmbH	1995	⩽100	Cockpit/Other electrical systems	Cockpit/Other electrical systems
Eaton Corporation	Franz Kirsten KG	1992		Electro-mechanical parts	Other electrical systems
	Klifa Fahrzeugteile GmbH	1991	⩽50	Plastic parts	Cockpit/Other electrical systems
GKN Plc	Walterscheid GmbH	1987	⩽250	Gearing parts	Axles/Gearing
	Walterscheid Presswerk GmbH	1987	⩽100	Gearing parts	Axles/Gearing
	Walterscheid Getriebe GmbH	1987	⩽100	Gearing parts	Axles/Gearing
	IFA Gelenkwellenwerk Mosel GmbH	1991	⩽10	Cardan shafts	Axles/Gearing
	IFA Gelenkwellenbau GmbH	1992	⩽50	Cardan shafts	Axles/Gearing
ITT Industries Inc.	Flygt Pumpen GmbH, Langenhagen	1992	⩽250	Brake components	Brake system
	Flygt Werk GmbH, Pforzheim	1992		Brake components	Brake system
	IFA Renak	1991		Brake components	Brake system
	KWK Kraftfahrzeug-Werkstatt-Konzept GmbH & Co. KG	1993	⩽50	Repairs/Services	Automotive services[a]
	J. Reiert GmbH & Co. KG	1995	⩽100	Brake hoses/Fluid technology	Brake system
	Mintec Maschinen- und Industrietechnik GmbH	1995	⩽100	Wheel suspensions	Chassis system
	ProSTEP Produktdaten Technologie GmbH	1995	⩽10	Automotive software	Software[a]
Johnson Controls Inc.	Lahnwerk GmbH & Co. KG	1991	⩽100	Metal frames for seats	Seats
	Naue Werke GmbH & Co. KG	1992	⩽500	Seat components	Seats
	Roth Freres Deutschland GmbH	1995	⩽50	Seat components	Seats
Lear Corporation	Keiper GmbH	1997	⩽500	Seats	Seats
	Plastifol Holding GmbH	1996	⩽500	Interior trim	Interior trim
LucasVarity Plc	Pacoma Hydraulik GmbH	1992	⩽50	Hydraulic power transmision	Axles/Gearing
	Perkins Motoren GmbH	1993	⩽10	Turbo charger, motor components	Motor components

Magna International Inc.	Zippex GmbH	1993	⩽250	Exterior trim	Exterior trim
	Zipperle GmbH	1993	⩽50	Exterior trim	Exterior trim
	MATAG Automobiltechnik AG	1994	⩽100	Exterior trim	Exterior trim
	Gesellschaft für Innenhochdruckerfahren GmbH & Co. KG	1994	⩽50	Exterior trim	Exterior trim
	KS Automobil-Sicherheitstechnik GmbH	1995	⩽50	Safety systems	Safety systems
	Eybl GmbH	1994	⩽250	Interior trim	Interior trim
	Pebra GmbH	1994	⩽50	Exterior trim	Exterior trim
Magnetti Marelli S.p.a	FL Schmierstoffe	1993	⩽50	Lubricants	Lubricants[a]
Motorola Inc.	Iridium GmbH	1990	⩽50	Communication systems	Communication systems[a]
Rockwell International	Golde GmbH	1987	⩽250	Roof systems	Roof systems
T & N Plc	AE Goetze GmbH	1992	>500	Piston rings	Motor components (pistons)
	Goetze Technologie-Vertriebs- und Service GmbH	1992		Piston components	Motor components (pistons)
	Goetze Motorenteile GmbH	1992		Piston rings	Motor components (pistons)
	Goetze Elastomere GmbH	1992		Sealings	Motor components (sealings)
	Goetze-Payen GmbH	1992		Pistons	Motor components (pistons)
	AE Motorenteile GmbH	1992	⩽50	Cylinders	Motor components (cylinders)
Textron Inc.	Atlantic GmbH	1988	⩽50	Motor components	Motor components
	ORAG Deutschland GmbH	1992	⩽100	Motor components	Motor components
	Friedr. Boesner GmbH	1995	⩽50	Safety systems	Safety systems
	Kautex Werke Reinhold Hagen AG, Bonn	1996	⩽500	Fuel delivery systems	Fuel delivery systems
	Kautex Werke Reinhold Hagen AG, Waldkirch	1996	⩽50	Fuel delivery systems	Fuel delivery systems
	Klauke GmbH & Co. KG	1996	⩽50	Electrical components	Safety systems
TRW Inc.	Presswerk Krefeld GmbH & Co. KG	1991	⩽50	Chassis system	Brake system
	Nelson Bolzenschweiss-Technik GmbH & Co. KG	1992	⩽50	Fixing devices	Motor components
	United-Carr GmbH & Co. KG	1995	⩽50	Chassis system	Brake system
	Temic Bayern-Chemie Airbag GmbH	1996	⩽250	Airbag systems	Safety systems
	MST Sicherheitstechnik GmbH	1996	⩽250	Airbag systems	Safety systems
United Technologies Corp.	Loewe Opta GmbH	1997	⩽50	Electrical components	Other electrical systems
Valeo S.A.	Tibbe Kupplungen GmbH	1993	⩽10	Clutch components	Axles/Gearing
	Borg Instruments GmbH	1994	⩽50	Electrical components	Other electrical systems
	Thermal Werke GmbH	1995	⩽500	Thermal systems	Thermal systems
	Ymos AG, Unternehmensbereich Schließssysteme	1996	⩽100	Car lock systems	Car lock systems
	Siemens Klimatechnik	1996	⩽250	Thermal systems	Thermal systems

[a]Exceptions.

interior and exterior trim. The Canadian MSC Magna, International Inc., acquired five independent German companies of exterior cover parts and the French MSC, Bertrand Faure S.A., acquired the German Rentrop, Hubbert & Wagner GmbH & Co. KG, a producer of interior trim.

In the system supply business, a field of main acquisition effort was safety systems. The U.S.-based TRW Inc. serves as example, which bought two suppliers of airbag components and safety system electronics in 1996. Besides safety systems, most of the acquisitions took place with suppliers of chassis and brake components. ITT Industries Inc., for instance, increased its brake systems and chassis capabilities by purchasing three suppliers of brake components. Furthermore, ITT purchased Mintec Maschinen- und Industrietechnik GmbH, a company that develops and manufactures chassis components (wheel suspensions). These investments parallel the increasing willingness of German OEMs to source integrated system-modules, which for this particular case means the integration of chassis and braking systems. The disposition of OEMs to source system-modules has also led the cockpit area to become a field of strategic acquisitions. System-module suppliers integrate additional systems into the cockpit module, which increasingly moulds into a unit of air condition system (thermal systems), control panels, steering column, electronic components, pedals and audio system. In fact, our sample MSCs purchase companies that possess the required complementary technological capabilities. Delphi Automotive Systems and Valeo S.A., for example, have done so as they purchased Kabelwerke Reinshagen GmbH, Merit GmbH as well as Borg Instruments GmbH and the thermal and heating technology branch of Siemens, respectively.

CONCLUSION

In this chapter, we investigated the investment strategies of 20 non-German large MSCs in the German market. In recent years, MSCs have invested heavily in the German market. Between 1987 and 1997, these companies have acquired local German supplier companies worth \$6.7 billion. The use of our conceptual framework served to develop a more complete understanding of the motives behind the investment activities of the MSCs.

The target of our study was to elucidate the proposition that MSCs invest in Germany in order to complement their existing technological capabilities to be in a position to supply complete product systems to their German and international customers. The acquired knowledge is meant to serve the strategic intent of MSCs to complete their product portfolios and thus to be able to supply complete systems to OEMs. The need to acquire knowledge and to enlarge the product portfolios arose from the changing sourcing strategies of OEMs. The redesign of supply chains represents a unique chance for MSCs to become first-tier system/module suppliers and therefore is a fundamental strategic challenge for these companies.

In order to analyse how major MSCs tried to become first-tier suppliers of OEMs, we first reviewed the product portfolio strategies of these companies. Subsequently we examined the major acquisition activities of the MSCs in the German market. We found that all sample MSCs participate in the system and module business and that they all invested heavily in complementary knowledge by acquiring medium-sized German supplier companies. Almost all MSCs in the sample acquired at least one German company during the period of investigation. The results therefore correspond to the observation that MSCs increasingly supply complete systems, modules and system-modules. With the purchase of German suppliers, MSCs indeed broaden and complement their product portfolios and respond to the increasing demand of OEMs to buy complete systems, modules and system-modules.

A potential jeopardy is, that in consideration of the small size of some German acquisition targets, the investment motives were merely to provide existing competences and businesses with complementary assets rather than to enhance and enlarge the competence base of the MSCs. Although we cannot exclude such "minor motives", especially in the case of isolated investment moves of smaller size, empirical evidence collected in the course of additional personal interviews with executives of the MSCs suggests that the acquired German suppliers are of strategic importance for most of the investor companies. In a number of cases, the acquired German businesses were assigned a world product mandate, that is, assigning the subsidiary total responsibility for all aspects of R&D, production and international marketing on a worldwide basis with respect to the module or system. The transfer of global product mandates to a foreign market serves as a clear indication that the acquired German subsidiaries possess technological capabilities and organisational competences, which enhance and enlarge the competence base rather than simply to complement and round off the asset base.

In our study, we concentrated exclusively on acquisitions as an external way of technology and competence sourcing. We completely neglected internal diversification modes (in-house development) and mixed modes, such as licensing or joint ventures, to access new competences. In fact, no account was taken in this study on the question of how new businesses *should* in fact be entered and the effect that entry mechanisms have on subsequent corporate performance. Nevertheless, we agree with Markides and Williamson (1996) that these assets which have been quickly and/or cheaply accessed through the acquisition moves can only provide short- and medium-term competitive advantage for the automotive supplier companies. In the long run, internal accumulation is likely to be the most significant source of imperfectly imitable and substitutable assets.[48] This is because most assets will be subject to erosion over time, for example, the value of a stock of technical know-how will tend to erode in the face of innovation by competitors. Moreover, even if an asset can be accessed through acquisition, it is probable that the existing assets available may not perfectly fit the requirements of the market they will be used to serve. Existing assets generally need some adaptation to a specific market context and integration with existing asset bundles.

Our study contains elements to enrich the theory of competence-based diversification. Although a statistical generalisation from our study is not possible, we provided some evidence that competence-based diversification moves are triggered by customer behaviour patterns. The redesign of value-chains and increased outsourcing by automotive OEMs opened up new business opportunities for supplier companies that have already reached a critical mass and have been diversified to a certain extent. These opportunities induced our sample companies to invest heavily in complementary technological know-how by acquiring specialised medium- and small-sized supplier companies. Thus, a more generalised hypothesis to be studied is that competence-based diversification moves of upstream supplier companies can be explained to a large extent by customer behaviour.

Moreover, by analysing in more detail the value chain of OEMs and the products suppliers deliver, we included system theory in our perspective by introducing the product architecture concept. As far as it came to our attention, this concept has not been used in the study of diversification, yet. Since value-chain redesign and outsourcing complete systems, modules and system-modules is only possible if the architecture of the product is defined appropriately, we hypothesise that the product architecture exerts a strong influence on competence-based diversification activities. The more modular an architecture is, the more competence-based diversification can be detected within a population of supplier companies.

NOTES

1. Other disciplines that deal with diversification include finance and industrial economics. See Ramanujam and Varadarajan (1989, pp. 523–524).

2. Teece, Rumelt, Dosi, and Winter (1994). In the present study we exclude unrelated diversification from the discussion and concentrate exclusively on related diversification strategies.

3. See Ramanujam and Varadarajan (1989), Very (1993) and Markides and Williamson (1994, 1996).

4. A precursor of this view is the seminal work of Penrose (1959).

5. See Foss and Christensen (1996).

6. See also Markides and Williamson (1996).

7. See Very (1993), Chiesa and Manzini (1997) and Markides and Williamson (1994, 1996).

8. For example, Freiling (1995) discusses diversification strategies of automotive supplier companies as an option to reduce their dependence on OEMs. See Freiling (1995, pp. 177–179). Bishop (1995) analyses the motives behind related diversification moves in the defence industry; Luber (1990) investigates diversification into related service segments. A major obstacle to investigations into related diversification is caused by methodological problems. The traditional way of measuring relatedness between two businesses is incomplete because it ignores the "strategic importance" and similarity of the underlying assets.

9. See Carr (1993, p. 554).

10. One exception proves to be the investment activities of Japanese suppliers in the United States. Several studies have analysed the internationalisation strategies of Japanese automotive suppliers following the major Japanese OEMs as part of the keiretsu transfer abroad. See, e.g., Banerji and Sambharya (1996).

11. See OECD (1996, p. 38).

12. See OECD (1996, p. 39).

13. Freyssenet and Lung focus on M&A activities for the years 1995 and 1996. See Freyssenet and Lung (1997, pp. 15–20). Müller-Stewens and Gocke list selected acquisitions of the period 1990–1995 in Germany and Europe. See Müller-Stewens and Gocke (1995, pp. 165–172).

14. See also Sadler (1996).

15. See, e.g., Fieten, Friedrich, and Lageman (1997), Bleyer (1995), GWZ (1995), Müller-Stewens and Gocke (1995) and Fieten (1991).

16. See Pfaffmann and Stephan (1998).

17. In case of a deviation between the fiscal year and the calendar year, our statements refer to the fiscal year that ends in 1997.

18. See IMF (1998).

19. See Schnell, Hill, and Esser (1993, p. 271).

20. See, e.g., Rosegger (1996, p. 707).

21. See Peters (1996, p. 1).

22. See Müller-Stewens and Gocke (1995), Wolters (1995) and Freiling (1995, pp. 3–4).

23. See Peters (1996).

24. The proxy has also been used by the NIW (1996) and ISI (1996) in their assessment of the technological performance and capacity of the German industry.

25. See, e.g., Peters (1996) and Becker and Peters (1998).

26. See NIW (1996).

27. See ISI (1996).

28. See NIW (1996) for details.
29. See VDA (1998).
30. See, e.g., Pfaffmann and Bensaou (1998) and Peters (1996) and Gerybadze Meyer-Krahmer, and Reger (1997).
31. See, e.g., Freyssenet and Lung (1997) and Bossard Consultants (1996); Müller-Stewens and Gocke (1995, p. 12), Wolters (1995, pp. 25–30) and von Eicke and Femerling (1991, pp. 7–24).
32. Outsourcing is part of the ‘‘lean production’’-approach that was worked out during the intercultural comparison of Japanese and American management styles. See Womack Jones, and Roos (1990).
33. See Müller-Stewens and Gocke (1995, p. 12).
34. See Pfaffmann (2000).
35. See Pisano (1996); Clark and Fujimoto (1991).
36. This is what Ulrich (1995) calls a modular product architecture.
37. See Penrose (1959).
38. For a discussion of single sourcing strategies see Pfaffmann and Stephan (1998) and Müller-Stewens and Gocke (1995).
39. See Murray (1964, p. 51).
40. See Ulrich (1995), Sanchez and Mahoney (1996) and Göpfert (1998).
41. See Ulrich and Eppinger (1995, p. 15).
42. See Bossard Consultants (1996), Mapleston (1996, p. 26) and Von Eicke and Femerling (1991, pp. 38–54).
43. See Wolters (1995, p. 81).
44. Alternative strategies to build up system competences are not discussed further in these contexts. Possible alternatives include in-house development (greenfield investment) of the required competences or co-operative strategies.
45. In the table we only included the approximate size category of each investment for reasons of disclosure.
46. If one considers that at least 30% of the total investment expenditures were used to expand existing capacities, it becomes obvious that the acquisition of national supplier companies is the preferred market entry mode.
47. See Payne (1992, p. 3), for distinctive features of Japanese supplier companies investment strategies in Germany.
48. See Dierickx and Cool (1989).

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TECHNOLOGY-BASED DIVERSIFICATION: DECISION-MAKING PROCESS CHARACTERISTICS

Marika Osterloff and Tomi Laamanen

ABSTRACT

This chapter examines large firms' technology-based diversification decision-making processes. A model of a technology-based diversification decision-making process is put forward and tested with a survey of 63 large firms' technology-based diversification initiatives. The empirical analysis provides new knowledge of the relative importance of the differing roles of three managerial levels in technology-based diversification. Top management participation is positively related to both growth expectation setting and realized growth. Middle management participation is also positively related to growth expectation setting, but it is not related to realized growth. Operative management participation is negatively related to growth expectation setting and positively related to realized growth. Direct applicability of the existing technology-driven competences in the new markets entered was found to reduce deviation from growth expectations. Technological learning during the diversification process contributed positively to realized growth.

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INTRODUCTION

Entries into new product markets based on existing technology represent a major source of growth for technology-based firms. There are a number of examples of successful companies that have grown on the basis of their existing technology-driven competences by gradually extending into several product markets. These firms have often learned in an evolutionary manner new supporting technologies as a by-product of an entry into a new product market. Later, they have utilized the newly learned technologies again to enter other product markets. Well-known examples of this kind of companies include General Electric (Abetti, 1995), Texas Instruments (Frantz, 1998), DuPont (O'Brien & Fadem, 1999), HewlettPackard (Barnholt, 1997), Eastman Kodak (Peteraf, 1993), Canon (Markides & Williamson, 1994), Toray Carbon Fibers (Abetti, 1995), and 3M (Goold, Campbell, & Alexander, 1997).

There is extensive research on diversification. Both traditional diversification research (Ansoff, 1957; Berry, 1975; Wolf, 1977; Rugman, 1979; Geringer, Beaish, & Dacosta, 1989) and technology diversification research (Kodama, 1986; Pavitt, Robson, & Townsend, 1989; Granstrand & Sjölander, 1990; Granstrand, 1998; Jaffe, 1989) have examined growth paths of firms in new product and geographical markets. Research on technology leveraging has concentrated on organizational characteristics, strategies, and other success factors in leveraging technology-driven competences (Teece, 1996; Sanchez & Heene, 1997; Sanchez, Heene, & Thomas, 1996). New product development research has discovered many antecedents to product development outcomes, thereby informing the research of technology-based product-market entries (Montoya-Weiss & Calantone, 1994; Brown & Eisenhardt, 1995; Hultink, Griffin, Hart, & Robben, 1997; Krishnan & Ulrich, 2001; Tatikonda & Montoya-Weiss, 2001). Research on the effectiveness of research and development investments highlights the importance of having a strategy for leveraging technology (Hoskisson & Hitt, 1988; Baysinger & Hoskisson, 1989; Hitt, Hoskisson, Johnson, & Moesel, 1996; Hitt, Hosskison, & Hicheon, 1997; Hitt, Ireland, & Lee, 2000).

These streams of research have clarified many aspects of technology-based product-market entries, yet they also leave important questions unanswered. Internal organizational factors as antecedents to diversification choices and success have not yet received much attention. Research on technology leveraging has developed in this direction, but has until now been scarcely empirically validated. As of now, research clarifying the role of managerial resources, operational capabilities, and decision-making process characteristics in technology-based diversification has been limited.

This chapter aims at providing an internal perspective to technology-based diversification processes by addressing four research questions. The main research question is: Which levers does the management have to promote technology-based growth into new product markets? This question is further broken down into the following three questions covering three hypothesized management levers: Do the quality and quantity of managerial resources invested in generating technology-based growth affect realized growth in technology-intensive firms? What is the impact of operational capabilities on the success of individual technology-based product-market entries? What is the impact of decision-making process characteristics on the success of individual technology-based product-market entries?

A model of a technology-based diversification decision-making process is put forward and tested with a survey of 63 large firms' technology-based diversification initiatives. The empirical analysis provides new knowledge of the relative importance of the differing roles of three managerial levels in technology-based diversification. The analysis shows that top management participation is positively related to both growth expectation setting and realized growth. Middle management participation is also positively related to growth expectation setting, but it is not related to realized growth. Operative management participation is negatively related to growth expectation setting and positively related to realized growth. Direct applicability of the existing technology-driven competences in the new markets entered was found to reduce deviation from growth expectations. Technological learning during the diversification process contributed positively to realized growth.

The chapter proceeds as follows: the second section reviews the literature relevant for addressing the four research questions: Resource-based view on managerial resources and role of market familiarity in entries into new markets as well as literature on organizational decision making. The third section describes the sample and the measures used. The fourth section provides the results of the empirical study followed by the conclusion.

LITERATURE AND HYPOTHESES

According to Penrose, the availability of managerial services for growth is the most important constraint to firm growth (Penrose, 1959). Managerial services set the limit to how much growth can be planned as all growth plans absorb some of the managerial services available. Managerial services can be increased only at a restricted phase because the "managerial resource" providing the services is not just a sum of individual managers. Management has to work as a team. The members of this team must be able to trust each other and coordinate activities efficiently with each other. The limits of learning and integration are more pronounced for management than for any other resource (Penrose, 1959).

Since Penrose, several streams of research within the resource-based view have examined different aspects of managerial resources. Strategic planning (Michalisin, Smith, & Kline, 1997; Powell, 1992), administrative skills (Powell, 1993), and management skills (Castanias & Helfat, 1991) have been examined as resources potentially providing a firm sustainable competitive advantage. A related research stream also emphasizing the importance of managerial resources concentrates on dynamic capabilities (Grant, 1996; Eisenhardt & Martin, 2000). Eisenhardt and Martin define dynamic capabilities as specific and identifiable processes, such as product development, strategic decision making and alliancing. According to them, long-term competitive advantage can be gained by firms that use dynamic capabilities "sooner, more astutely, or more fortuitously" (Eisenhardt & Martin, 2000) than the competition to create resource re-combinations with long-term competitive advantage. Powell (1992) discusses "strategic planning" from a resource-based perspective. According to Powell (1993), administrative skills provide an important source of competitive advantage.

The managerial component has also been elaborated in research examining the effectiveness of research and development investments. Researchers have investigated technology strategy as matching research and development to market needs (Bean, 1995; Bean, Einolf, & Russo, 1999; Bean, Russo, & Whiteley, 2000), "overall R&D managerial capability" (Roberts, 1995a,b), organizational forms and control and incentive systems (Hoskisson & Hitt, 1988; Hoskisson, Hitt, & Hill, 1993; Hitt et al., 1996). It has been suggested that the management of technological learning and knowledge of growth represents an important next step in clarifying the relationship between research and development investments, technology-driven competences, and firm growth (Hitt et al., 2000). This relationship has been theoretically explored, but no cohesive empirical evidence seems to exist yet (Hitt et al., 2000).

Also, research on corporate entrepreneurship highlights the importance of the availability of managerial services for growth by turning the attention to the need of searching for growth opportunities, choosing from them, and making plans for their implementation (Block & MacMillan, 1993; Stopford & Baden-Fuller, 1994; Zahra & Covin, 1995; Franko, 1989).

Our hypotheses examine the performance implications of three key aspects of managerial service in a new market entry situation. These include familiarity of the markets entered, the extensiveness of organizational participation in the new entry decision making and the analytical quality of the process.

Familiarity of the Markets Entered

In addition to the availability of managerial services, risk and uncertainty of individual growth projects may restrict the expansion plans of a firm (Penrose, 1959). More information and better planning can reduce this uncertainty, but information gathering and planning also require managerial resources. Usually, the limit for an acceptable risk level is set by firm-specific determinants. The more unfamiliar the new market, and the greater the need for investments, the higher is the perceived risk and uncertainty. The more risky a project is, the greater is the need for managerial services to deal with uncertainty. Perceived risk and uncertainty of growth projects lead to a pronounced need for managerial resources for planning, analysis, and implementation. The perceived risk and uncertainty can also make managers more hesitant in becoming involved in growth projects.

Applicability of the existing operational capabilities in new markets may reduce the need for managerial resources at least for two reasons. First, applicability of the existing capabilities in a new market reduces the managerial resources needed for acquiring or building the necessary operational capabilities. Second, entering a similar market is likely to require less managerial resources for planning the entry, as more assumptions about the market can be made without an extensive information search. New knowledge is also easier to acquire in a familiar area. Unrelated knowledge is difficult to acquire and may even have limited value due to the lack of a common language (Inkpen, 1998). Also, the overall risk and uncertainty related to a growth project is likely to be smaller for projects in markets similar to the original market.

Overall, the applicability of existing operational capabilities in a new market is likely to reduce the risk and uncertainty of a new market entry (Chandler & Hanks, 1993; Dierickx & Cool, 1989; Milgrom & Roberts, 1995; Stein, 1997). Our first hypothesis concerns the impact of the applicability of existing operational capabilities in the market entered on the deviation of growth expectations in individual projects. The deviation is used as a proxy for project risk and uncertainty. We acknowledge that random, non-predictable events during the execution of a project can cause deviations from a project's goals, but since surprises can be equally expected to occur both to negative and positive directions, this noise is expected to cancel itself out in a sample of sufficient size.

> **Hypothesis 1.** Applicability of the existing operational capabilities in the market entered reduces deviation from expectations in an individual technology-leveraging project.

Decision-Making Process

Strategic decision-making processes incorporate the results of important components of managerial services, such as analysis, preparation, thinking, intuition, and motivation. Therefore, decision-making processes reflect managerial services that are essential for growth. Strategy can be seen as a pattern in a stream of such decisions (Mintzberg & Waters, 1982). Therefore, the way decisions are made, or the structure of the decision process itself, mould decision outcomes and strategies of organizations (Cray, Butler, Hickson, Mallory, & Wilson, 1986).

Participation in decision making increases the commitment to implementing plans (Child, 1976). Consideration of an individual's input and influence on a decision is likely to affect the perceptions of fairness of a decision-making process, commitment to decisions, attachment to the group, and trust in its leader (Korsgaard, Schweiger, & Sapienza, 1995). The normative rational model of strategic decision making has focused on the production of high-quality decisions as a means of enhancing organization performance (Hitt & Tyler, 1991; Porter, 1980). The value of these decisions depends on the willingness of managers to cooperate in implementing them (Guth & MacMillan, 1986; Maier, 1970; Woolridge & Floyd, 1990). Therefore, the persons who are operatively responsible for implementing the projects would seem likely to be among the most important ones to participate in the decision-making process. The extent to which team members agree and cooperate can significantly affect the leader's ability to implement a decision (Hitt & Tyler, 1991).

Decision-making research proposes that the involvement of the organization, adequacy and skill of planning staff, and the amount of communication are important factors impacting success of growth projects (Bryson & Bromiley, 1993). Thus, it would seem that the quality of plans for growth projects could be increased by a wide participation of the personnel knowledgeable of, and responsible for, implementing them (Dean & Sharfman, 1990, 1993; Lyles & Mitroff, 1980; Miller, 1987). The second hypothesis concerns the impact of participation in the decision-making process on the deviation of project outcomes from expectations.

> **Hypothesis 2.** Wide participation of different managerial levels in the decision-making process reduces deviation from expectations in an individual technology-leveraging project.

Another reason why management is operatively responsible for implementing the decisions should be involved in the decision-making process is that they have an incentive to assure that all relevant information that helps in correctly setting the targets for which they will be responsible is taken into consideration. Managers at higher organizational levels, not directly responsible for implementing the project, may be more prone to setting high "stretch" targets. In general, using more, rather than less, information to support decision making should enhance the quality of decisions (Eisenhardt, 1989). Therefore, wide participation in the decision-making process should not only increase commitment to the implementation, but also improve the quality of decisions by increasing the information available for decision making.

An organization's ability to adapt to changing environmental contingencies depends on the organization's perceptual and information-processing capacities (Terreberry, 1968). Decision comprehensiveness, defined as the extent to which an organization or an individual attempts to be exhaustive or inclusive in making and integrating strategic decisions, has been found positively related to organizational performance (Fredrickson & Mitchell, 1984). As decision comprehensiveness declines, so does organizational performance (Smith, Gannon, Grimm, & Mitchell, 1988). Consistently, positive relationships have been reported in particular between analytic and integrative comprehensiveness in decision making and organizational effectiveness (Jones, Jacobs, & Spijker, 1992). Controversy surrounds the appropriateness of adopting a comprehensive decision-making mode when the external environment is complex and dynamic.

Procedural rationality has been defined as an attempt to collect the information necessary to form expectations about alternatives and the use of this information in a final decision (Dean & Sharfman, 1990). It has been empirically operationalized as the degree of information focus, search and analysis, and the extent to which quantitative measures are used (Dean & Sharfman, 1990). A positive relationship between rationality and performance has been found for firms facing dynamic environments. At least three studies lend empirical support to this relationship: Priem, Rasheed, and Kotulic (1995) conducted a survey of 101 middle-sized and large firms. Miller and Friesen (1983) studied changes in environmental dynamism and process rationality, and their impact on firm performance for a sample of large Canadian and American firms. Eisenhardt (1989) analyzed decision making in eight firms in the microcomputer industry. Supporting the importance of extensive information use for decision quality, Eisenhardt concluded that speed of decision making is enhanced by extensive information use, by extensive analysis in the form of considering many alternatives, and by making tactical plans.

Conflict in decision making has a potentially complex impact on decision quality and commitment to implementing a decision. On the one hand, conflict improves decision quality, but on the other, it may weaken the ability of a group to work together (Schweiger, Sandberg, & Ragan, 1986). Perceptions of loyalty within teams strengthen the positive relationship between conflict and decision quality (Dooley & Fryxell, 1999). When conflict is functional, it is generally task oriented and focused on judgmental differences about how to achieve best common objectives (Priem & Price, 1991). This type of cognitive conflict (Amason & Schweiger, 1994) is common in top management teams because the perceptions of the environment differ (Mitroff, 1982). Perceptual diversity may lead to conflict over how to best accomplish an organization's objectives (Astley, Axelsson, Butler, Hickson, & Wilson, 1982; Wiersema & Bantel, 1993). A reason why cognitive conflict may in some situations contribute to decision quality is that the synthesis that emerges from the diverse perspectives is generally superior to the individual perspectives themselves (Mason & Mitroff, 1981; Schweiger et al., 1986; Schweiger & Sandberg, 1989; Schwenk, 1990). Conflict may also have negative implications for decision making. Cognitive conflict can reduce decision makers' general satisfaction (Schweiger et al., 1986) and, when misunderstood, it can cause affective conflict, which is detrimental to decision commitment.

Summarizing the above, the quality of plans for growth projects can potentially be increased by increasing the level of rationality in the decision-making process and the comprehensiveness of information utilized (Langley, 1990; Lyles, 1987; Dean & Sharfman, 1993; Mintzberg, Raisinghani, & Theoret, 1976; Wally & Baum, 1994). Also, the role of conflict has to be recognized. Thus, it is expected that information comprehensiveness, decision-making process formalization, and cognitive conflict reduce the deviation of outcomes from plans in individual technology-leveraging projects.

Hypothesis 3. High analytical quality of the decision-making process reduces deviation from expectations in an individual technology-leveraging project.

Model of Factors Affecting Technology-Based Product-Market Entries

Our analysis of technology-based diversification processes is based on a nested view of firm's opportunity spaces. The boundaries are set by the nature of technologies in question and firms' operational capabilities for entering new markets, as illustrated in Fig. 1. Further boundaries are set by managements' understanding of the opportunities for leveraging, as well as managerial resources available for translating the recognized business opportunities into plans for growth projects. This understanding is enhanced through a proactive management of technology-based opportunities.

In this chapter, both the boundaries of the opportunities understood by a company and the boundaries of the opportunities that can be exploited by the company are important. Both can have a significant impact on the degree to which the technology-driven competences of a certain company are leveraged. The boundary of the opportunities that can be exploited externally, for example, through licensing has been examined in previous research (Silverman, 1999).

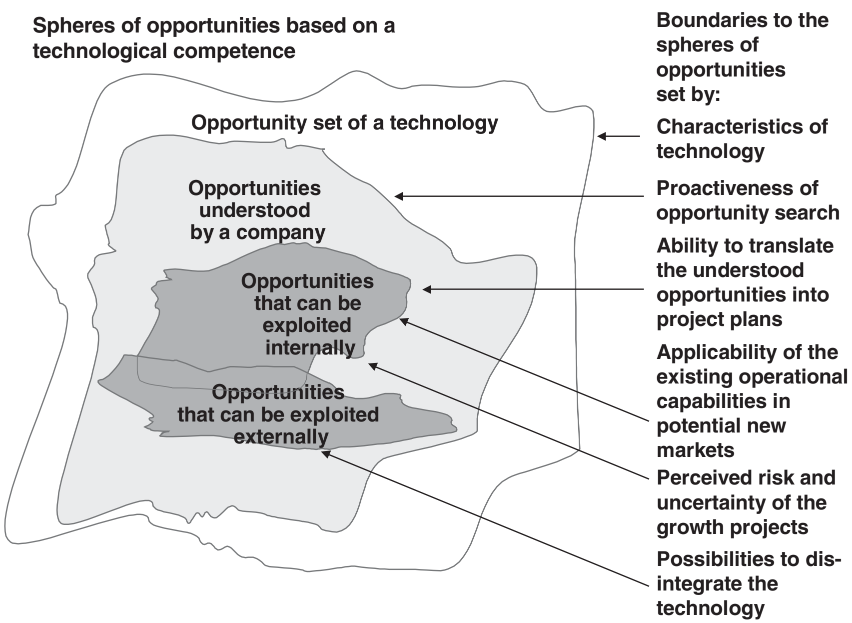

Fig. 1. Different Spheres of Opportunity and Factors Setting their Boundaries.

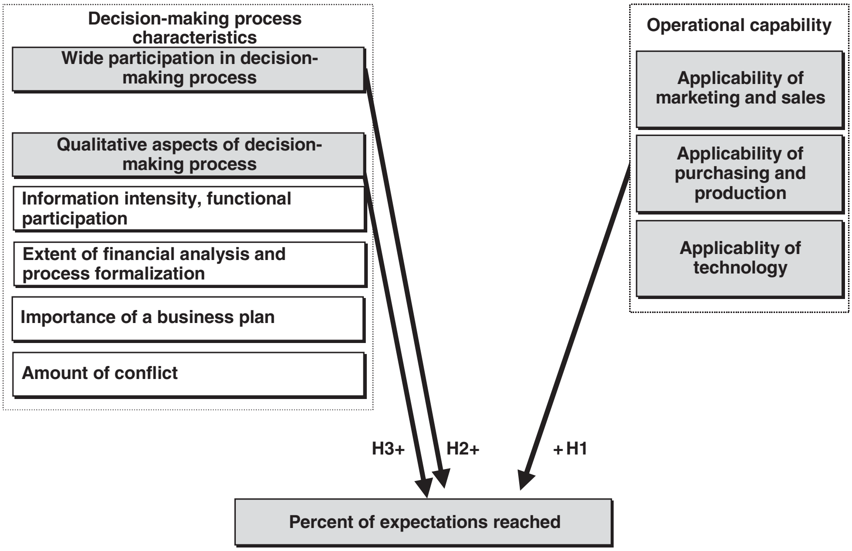

Fig. 2. Model of the Relationships between the Studied Variables.

The relationships of the hypotheses are shown in Fig. 2. According to the resource-based view, managerial services available for growth are the most important determinant of firm growth. Managerial services available for growth are not studied directly, however. Instead, they are examined though decision-making process characteristics and the applicability of existing competences in the new market.

SAMPLE AND MEASURES USED

Target Population, Sample, and Methodology

The target population of this chapter comprises established Finnish and Swedish technology-based firms engaged in technology-based diversification. Firms less than 5 years old were excluded to ensure that the firms had stabilized their core operations. The primary industry sectors included in the sample were electronics, chemicals, pharmaceuticals, specialty materials, cable, software, and metal sectors. Firms in the target population were contacted in order to find out whether they had, during the past 10 years, entered new product markets on the basis of technology-driven competences that they possessed prior to entry.

The initial screening process yielded a total of 93 companies each promising to return a survey questionnaire. However, only 63 companies actually returned it. The person who responded to the questions in most cases had been the leader of the project, the chief of the leader, or the present manager of a business that had been created through the project. The main reasons for not agreeing to participate in the study were, in order of importance, not knowing the case well enough or not having the time to participate.

The questionnaire was carefully tested prior to the survey with representative technology-leveraging projects chosen from the sample. Operationalizations were adopted from previous studies as far as possible. Where no previously used operationalizations were available, new ones were constructed. All statement items were measured on a 7-point Likert scale. The items can be found in Appendix A.

Confirmatory factor analysis was used for assessing the reliability and validity (McKinnon) of the constructs. As to the reliability, factor analysis confirmed that the respective sets of observed variables each define a construct (Bollen, 1989). A minimum coefficient value of 0.40, which has been suggested (Ford, MacCallum, & Tait, 1986) for social sciences, was used for determining whether an item can be considered a part of the construct. The validity of the constructs was assessed by exploring both convergent and discriminant validity. Convergent validity was achieved as measures of constructs that theoretically should be related to each other were observed to be related to each other. Discriminant validity was achieved as measures of constructs that theoretically should not be related to each other were observed not to be related to each other. (Ford et al., 1986). The method of factor extraction that we used was the maximum likelihood method. The rotation method used was Varimax rotation, which is most commonly used. Varimax is an orthogonal rotation algorithm, which means that it does not allow the factors to correlate with each other. It thereby finds a solution where each measurement item loads as much as possible on one factor, and as little as possible on the others (Heck, 1998).

Additionally, five deepening case analyses were also conducted after the survey to validate the constructs. These technology diversification projects were chosen from among the 63 projects. A cluster analysis was conducted of the 63 projects to identify clusters that would be internally as similar as possible, but, respective to each other, as dissimilar as possible. Altogether three clusters were formed.

Deviation of Realized Growth from Projected Growth

The primary-dependent variable in the model is the deviation of realized growth from projected growth. An intermediate-dependent variable is the growth expectations from the new markets at the time of entry. Reliable measurement of growth expectations from several years back in time is not easy. Distortions in answers may be due to remembering expectations inexactly or purposefully misreporting them. Due to the importance of the chosen projects it can be, however, assumed that the growth expectations have been thoroughly researched, widely discussed and documented, and that the likelihood of expectations being remembered incorrectly or purposely misreported is low. In order to be able to control the quality of the answers concerning the growth expectations, qualitative control questions were asked. These control questions concerned how important the project was for the firm as a source of growth. These answers correlated well with the numerically stated growth expectations.

Decision-Making Process Characteristics

The decision-making process characteristics hypothesized to impact the success of individual technology-leveraging projects include (1) participation of different levels of management in the decision-making process, (2) participation of different functions in the process, (3) information intensity of the process, (4) existence of formalized rules and process for diversification decision-making process, (5) use of business plans and financial analysis to support the process, and (6) the degree of conflict experienced in the process.

The operationalization of the decision-making process characteristics has mainly been adopted from Papadakis, Lioukas, and Chambers (1998), who applied the constructs in a study of 78 corporate investment decisions a few years after they were made. Their operationalizations rely on an extensive literature search in which previously used operationalizations were gathered together and the best of them merged into exhaustive measurement instruments. With minor modifications, in order to make the wording of the questions more clearly applicable to technology-leveraging projects, the operationalization of the decision-making process characteristics in this study was developed on the basis of the measurement items of Papadakis and co-workers.

Operational Capability

Operational capabilities were measured using measures similar to Teece (1980, 1986, 1988, 1998), Steensma (1996), Davis, Robinson, Pearce, and Park (1992), Woo, Willard, and Daellenbach (1992), and Sorrentino and Williams (1995), who studied production complementarities. Marketing and distribution complementarities have been studied using similar measures. In our questionnaire respondents were first asked to what extent the leveraging project in question was able to use the existing operational functions and capabilities or knowledge within its first year of operation. This was measured with variables named ''marketing and sales fit'', ''technology fit'', and ''operations fit''. Second, the respondents were asked, whether significant investments were made within the first year of operation in these areas. This was measured with variables named ''marketing and sales investments'' and ''technology investments''.

Marketing and sales fit was assessed by asking to what extent the project was able to use the existing sales and marketing department, distribution and after-sales networks, knowledge of customer groups, and knowledge of sales methods. Technology fit was assessed by asking to what extent the project was able to use the existing research and development department and technology-driven competences of the firm. Operations fit was assessed by asking to what extent the project was able to use the existing production plants, purchasing or sourcing department, knowledge of production technology, and knowledge of purchasing or sourcing. Marketing and sales investments were assessed by asking how large investments were made in sales and marketing and in distribution and after-sales networks. Technology investments were assessed by asking how large investments were made in research and development and in technology-driven competences acquired from outside the firm.

Control Variables

The firm's growth aspiration, size, research and development intensity, industry sector, country, and project size were included as control variables. Also, firm's knowledge related to growth opportunities and level of technological competence were controlled. In addition, technological learning over the course of the project was included as a control variable.

RESULTS

The correlations between the variables of the model are shown in Appendix B. The three dependent variables, expected growth, percent of expectations reached, and reached growth, are correlated with each other. Higher growth expectations and a higher percentage of expectations reached are positively associated with higher reached growth. Growth expectations and percentage reached are negatively associated with each other.

The results of multiple regression analyses are shown in Table 1. Despite correlations between some of the independent variables, all tolerance values were clearly above 0.1 and all VIF values clearly below 5. Therefore, multicollinearity should not cause major statistical problems in the regression.

The applicability of the existing operational capabilities in the new market was hypothesized to reduce deviation from expectations set to a technology-leveraging project. This Hypothesis 1 is supported for the part of technological competence, but not for marketing and sales, and operative capabilities. Additionally, investments in technology, marketing, and sales are positively related to deviation from expectations, providing further support for Hypothesis 1.

Wide participation in the decision-making process by the management was hypothesized to reduce deviation from expectations. This hypothesis was supported for CEO and other top management and for junior management, but not for middle management. The participation of CEO and other top management as well as middle management was related to high growth expectations from a technology-leveraging project. The opposite seemed to be the case for junior management participation.

High analytical quality of the decision-making process was hypothesized to reduce deviation from expectations related to an individual technology-leveraging project due to better quality plans. This hypothesis was not supported with regard to any of the six variables used to measure different aspects of analytical quality. In fact, the opposite seemed to be true with regard to functional participation. With regard to analytical quality and growth expectations, two of the six variables had statistically significant relationships. High levels of conflict seem to reduce growth expectations, presumably because of restricting overoptimism in planning. High levels of financial analysis seemed to increase growth expectations, pointing toward a practice of doing more financial analysis in larger projects.

Overall, wide participation in the decision-making process would seem to assure that the goals of the project are set correctly and that the

Table 1. Regression Analysis with Project Outcome Variables as the Dependent – Hypotheses 1–3.

	Growth Expectations		Percent Reached		Reached Growth	
	Base	B.E.	Base	B.E.	Base	B.E.
Dependent variables						
Hypothesis 1						
Technology fit	−0.304*	−0.324**	0.274†	0.244*	0.14	
Marketing and sales fit	−0.233†	−0.179†	−0.028		0.063	
Operations fit	−0.095		0.048		−0.03	
Technology investments	0.123		−0.324*	−0.312*	−0.227*	−0.190*
Marketing and sales investments	0.084		−0.261†	−0.222*	−0.172*	−0.126†
Hypothesis 2						
CEO and top management	0.187	0.178†	0.263†	0.236†	0.146†	0.177*
Junior management	−0.182	−0.187†	0.415*	0.297*	0.325**	0.216**
Middle management	0.167	0.229*	−0.051		0.022	
Hypothesis 3						
Information intensity	0.125		−0.203		−0.17	
Functional participation	−0.124		−0.198	−0.246*	−0.14	−0.201**
Financial analysis	0.192	0.313**	0.232		0.198*	0.163*
Existing process	0.178		0.030		0.002	
Business plan	−0.035		−0.064		0.043	
Conflict	−0.194	−0.192†	0.105		0.068	
Control variables						
Technological learning	0.038		0.300†	0.243†	0.253*	0.171*
Firm size	−0.171	−0.319**	−0.197		−0.230*	−0.262*
Growth aspiration	0.114		0.202	0.214†	0.105	
R&D intensity	0.065		−0.130		−0.005	
Firm growth	0.218	0.234*	−0.075		0.019	
Expected growth			−0.229	−0.263*	0.655***	0.592***
Model						
R^2	0.583	0.510	0.473	0.395	0.808	0.773
Adjusted R^2	0.399	0.426	0.221	0.292	0.716	0.735
F	3.166***	6.122***	1.882*	3.846***	8.828***	20.090***

Note: Coefficients are standardized β coefficients. Missing values replaced with means ($N = 63$).One-tailed tests.

***$p \leqslant 0.001$.

**$p \leqslant 0.01$.

*$p \leqslant 0.05$.

†$p < 0.1$.

organization is committed to implementing the plans for the project. Marketing and sales and technology investments seemed to increase the deviation from expectations supporting the hypothesis that entering markets where existing operational capabilities cannot be applied is risky. Especially, fit with existing technology seems to be important in reducing deviation from expectations.

No moderation relationships were included in the regression analyses, as no such relationships were hypothesized. As the understanding on the impacts of the considered variables in the context of technology-leveraging projects increases, it may be appropriate in future research to also examine moderation.

The regression results also raise further questions. It is possible that some of the variables contribute to the deviation from expectations only through expectation setting, not directly. In order to clarify this, a structural equation model was constructed where growth expectations mediate the impact of decision-making process characteristics and operational capabilities on the percentage of growth expectations reached. The structural equation model is presented in Fig. 3. The numbers on the arrows are the maximum likelihood coefficients of the relationships, and the numbers in the boxes above ''growth expectations'' and ''percent reached'' indicate the degree of variance of these two factors explained by the model.

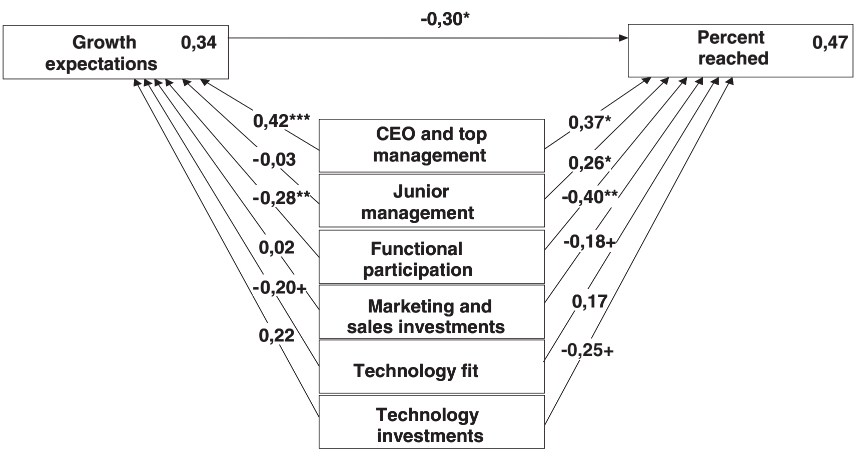

Fig. 3. Structural Equation Model with Growth Expectations as the Mediating Variable.

The goodness-of-fit statistics of the structural equation regression indicate that the model has a good fit. The NFI (0.985) and CFI (0.999) indicators of fit show acceptable levels, i.e. levels very close to 1 (Bentler & Bonett, 1980). The RMSEA (0.0358) value is good as it is less than 0.05 (Browne & Cudeck, 1993). The χ^2 statistic for the regression is 16.37. The maximum likelihood coefficients of the model are presented in Table 2. The table provides the maximum likelihood coefficients of the independent variables on growth expectations and the corresponding coefficients on the percentage of growth expectations reached. The last row provides the coefficient of growth expectations on the percentage of growth reached.

The coefficients of the impact of CEO and top management participation on both growth expectations and percentage of growth expectations reached are significant and positive. The CEO and top management participation seems to contribute to high growth expectation setting, but also to high levels of achievement. This highlights the important role of a CEO and top management in technology-based diversification. The impact of junior management participation on the percentage of growth expectations reached is also significant and positive, but the impact on growth expectation setting is non-significant. It would seem that the participation of junior management affects the success of leveraging projects by increasing the likelihood of reaching the goals. Statistically, functional participation relates negatively both to growth expectation setting and the percentage of expectations reached. The impact of marketing and sales as well as

Table 2. Maximum Likelihood Coefficients of the Variables in the Structural Equation Model.

Dependent Variables	Growth Expectations	Percent Reached
CEO and top management	0.420***	0.366*
Junior management	−0.032	0.263*
Functional participation	−0.281**	−0.397**
Marketing and sales investments	0.019	−0.180†
Technology fit	−0.197†	0.167
Technology investments	0.220	−0.247†
Growth expectations		−0.298*

Note: Maximum likelihood coefficients. Missing values estimated ($N = 63$).

***$p \leqslant 0.001$.

**$p \leqslant 0.01$.

*$p \leqslant 0.05$.

†$p < 0.1$.

technology investments on the percentage of expectations reached is negative while their impact on growth expectations setting is insignificant. This is as expected since large marketing and sales and technology investments contribute to the project risk. Technology fit, on the other hand, would seem to affect through growth expectations, on which it has a negative relationship. This could mean that projects closely fitting to existing technologies are more incremental in nature. In the structural equation model, technology fit has no significant impact on the percentage of growth expectations reached.

According to the results of our analyses, technology-leveraging projects seem to have a tendency to reach their goals when growth expectations are low, when functional participation in the decision-making process is low, when marketing and sales investments are low, and when investments in technology are low. Projects also seem to have a tendency to reach their goals when the CEO and top management participation are high, when junior management participation is high, when technology fit is high, when there is a lot of technological learning in the project, and when the firm has a high growth aspiration.

Sizable investments in marketing and sales as well as technology development would seem to increase deviation from growth projections. There are two potential explanations for this. First, major investments almost always have some uncertainty as to whether they will succeed in terms of delivering the expected benefits. Second, significant investments in marketing and sales as well as technology development may also mean that the project is proceeding into unfamiliar areas. The unfamiliarity may make project success more difficult to achieve.

On the whole, high growth expectations appear to make reaching the goals more difficult. One reason for the better success of smaller projects may also be their lower complexity. A small team assures a sense of responsibility and commitment. An excessively wide formal involvement of many functions may lead to a loss of a sense of responsibility. The formal participation of many functional departments does not necessarily lead to more information being utilized in decision making or to a greater variety of viewpoints.

Active CEO and top management participation is a sign of commitment and support for the project. This seems to be very important, especially in phases where a project faces severe setbacks and where the project team's faith is on trial. Participation of junior management in decision making assures that they are committed to the goals, and that goals are set realistically. An interesting result is that a firm's growth aspiration does not seem to affect project-level growth expectations. Fast growth is not necessarily only sought through large projects, but may also be sought through several smaller ones.

DISCUSSION

This chapter contributes to the understanding of growth through technology-based new product-market entries. The main contribution of the chapter is in the elaboration of specific decision-making process characteristics and their relationships to the deviation of the realized growth from the originally projected growth. The process of diversification is studied from an internal perspective, focusing on managerial processes. Factors that are under managerial control and which impact the success of a growth strategy making use of related diversification are identified. The importance of investing some of the scarce managerial resources in growth instead of tying all of them up in the operative management of an existing, mature business is emphasized. A fruitful topic for future research seems to be the further detailing of the nature of managerial services needed for growth (see Appendix C).

The results of our analyses demonstrate the differing roles of the three studied managerial levels in technology-based diversification. Top management participation is positively related to both growth expectation setting and realized growth. Middle management participation is also positively related to growth expectation setting, but it is not related to realized growth. Operative management participation is negatively related to growth expectation setting and positively related to realized growth. Also, direct applicability of the existing technology-driven competences in the new markets entered was found to reduce deviation from growth expectations. Technological learning during the diversification process contributed positively to realized growth.

Managers operatively responsible for implementing projects have an incentive to assure that all relevant information is taken into consideration in order to make the project plans realizable. Managers at higher organizational levels, who are not directly responsible for implementing technology-based diversification projects, may be more prone to setting unrealistically high "stretch" targets. In addition to having an incentive to ensure that prognoses are not overly optimistic, operative management is also likely to have more detailed practical information critical for defining a technology-based diversification project correctly. The difference between top- and middle management is interesting. While top management is setting targets high it also contributes to reaching them. In contrast, middle management appears to contribute more to setting high targets than reaching them. This contrast may reflect a tendency of middle management to "sell" projects to top management with sufficiently high growth expectation figures in order to get them funded.

The applicability of existing operational capabilities was expected to have a threefold impact on individual-leveraging projects: (1) Applicability of existing operational capabilities in the new market is an indication of the similarity of markets that should reduce the uncertainty of entry. (2) Applicability of existing operational capabilities in the new market reduces the managerial resources needed for planning the entry. (3) Applicability of existing operational capabilities in the new market reduces the managerial capacity needed for acquiring or building the necessary operational capabilities. All these should reduce the deviation from expectations in individual leveraging projects. Our analyses provide partial confirmation for the previous research by showing the positive effects of technology, marketing, and sales complementarities.

A further interesting finding emerging from our analyses is that technology-leveraging projects that are small relative to firm size seem to reach the expected results more reliably than larger projects. In new product development research, an important question has been the impact of project complexity on the success of new product development projects (Tatikonda & Montoya-Weiss, 2001). Project complexity may be smaller in smaller scale projects, and therefore, it could be that smaller scale projects would succeed more consistently. In the case of technology-based product-market entries, this would imply that committing resources to the project gradually might be the optimal investment policy. After reaching preset milestones, more resources could be committed if the results of the first stages were favorable.

The main managerial implications of our research stem from the identification of managerial levers for the success of technology-based diversification processes. The success of technology-based product-market entries is promoted by a decision-making process demonstrating active participation of especially the CEO and top management. Another factor promoting the success of technology-leveraging projects is the choice of projects from markets that are familiar to the firm. When existing operational capabilities are not applicable in the new market, a wide range of possibilities for outsourcing and cooperation exists. External and firm group internal partners may have an important role in idea generation and maturation. Finally, it may be beneficial to plan and implement technology-leveraging projects in subsequent, manageable parts in order to reduce project complexity.

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APPENDIX A. OPERATIONALIZATIONS OF THE VARIABLES (SEE TABLES A1–A7)

As shown in Table A5, the variable "technology investments" has low factor loadings and a poor Cronbach alpha indicator. This is understandable, as the strength of factor loadings on one factor as well as the Cronbach alpha measure the convergent validity of the variable, that is to what extent do the questions measure the same issue. Here, the questions purposely do not measure exactly the same issue, but two aspects of one issue: the amount of investments in the own research and development department may even contradict investments in technology-driven competences acquired from outside the company. It is still, however, meaningful to measure how much the firm in general has invested in its technology-driven competences during the project. Therefore, on the basis of content validity, the variable "technological investments" will be used as the average of answers to these two questions. Furthermore, the factor analysis does verify the discriminant validity of the variable: the two questions do load much more on the factor "technology investments" than on any other factor.

Table A6 shows a factor analysis for the variable "technological learning". Here, neither the results of factor analysis nor the Cronbach alpha confirm convergent validity. However, learning completely new technological fields, having to change the project plans due to such technological learning, buying new patents or licenses during the project and patenting own inventions resulting from the project are important aspects describing how much radically new technological learning happened in the project. They also reflect how much the firm's technological competence base grew because of the project. It seems natural that the answers to these questions do not converge, as it is not to be expected that firms that for example learned new technological fields from the project always would have also bought new patents or licenses. Still, a firm that would have answered giving high scores to all of the four questions would be likely to have had a more intense learning experience in the project than a firm that would have given a high score only to one of the questions. Therefore, on the basis of content validity, the variable "technological learning" will be used as the average of answers to these four questions.

Table A1. Participation of Different Managerial Levels in the Decision-Making Process.

Variable	Cronbach Alpha	Item		Factor loadings 1	2	3
1 CEO and top management	0.936	CEO	Generating growth ideas based on technological competence	0.619	0.046	-0.044
			Screening out ideas realistic technologically and from market potential	0.648	0.092	-0.028
			Evaluating and comparing the ideas	0.693	0.120	0.072
			Making the final decision to enter the new market	0.852	0.013	-0.025
			Choosing people responsible for implementation	0.678	-0.178	-0.109
		Top management	Generating growth ideas based on technological competence	0.830	0.190	0.005
			Screening out ideas realistic technologically and from market potential	0.885	0.136	0.060
			Evaluating and comparing the ideas	0.856	0.162	-0.081
			Making the final decision to enter the new market	0.592	0.409	0.230
			Choosing people responsible for implementation	0.531	0.274	0.006
2 Middle management	0.887	Generating growth ideas based on technological competence		0.253	0.881	0.182
		Screening out ideas realistic technologically and from market potential		0.234	0.825	0.290
		Evaluating and comparing the ideas		0.216	0.835	0.277
		Making the final decision to enter the new market		0.012	0.625	0.086
		Choosing people responsible for implementation		-0.003	0.442	0.007
3 Junior management	0.858	Generating growth ideas based on technological competence		0.150	0.184	0.736
		Screening out ideas realistic technologically and from market potential		0.092	0.213	0.883
		Evaluating and comparing the ideas		0.096	0.197	0.929
		Making the final decision to enter the new market		-0.146	0.050	0.603
		Choosing people responsible for implementation		-0.136	0.041	0.427

Table A2. Functional Participation and Information Intensity of a Decision-Making Process.

Variable	Cronbach Alpha	Item		Factor Loading 1	Factor Loading 2
1 Wide functional participation	0.820	People from many functional departments took part in this phase	Generating growth ideas based on technological competence	0.471	-0.063
			Screening out ideas realistic technologically and from market potential	0.658	0.062
			Evaluating and comparing the ideas	0.999	0.019
			Making the final decision to enter the new market	0.671	0.058
			Choosing people responsible for implementation	0.308	0.024
2 Information intensity	0.917	Generating growth ideas based on technological competence	There were many meetings in this phase	-0.060	0.483
			Information was actively collected from different sources in this phase	-0.008	0.561
			External sources of information were used systematically in this phase	-0.092	0.760
		Screening out ideas realistic technologically and from market potential		0.081	0.721
				-0.082	0.596
				-0.061	0.749
		Evaluating and comparing the ideas		0.205	0.700
				0.167	0.501
				0.039	0.595
		Making the final decision to enter the new market		-0.058	0.530
				0.165	0.368
				0.285	0.599
		Choosing people responsible for implementation		0.019	0.492
				0.016	0.663
				0.018	0.605

Table A3. Existing Process, Business Plan, and Financial Analysis.

Variable	Cronbach Alpha	Item	Factor Loadings 1	2	3
1 Existing process	0.799	A written guideline existed for this kind of a process	0.727	0.110	-0.025
		A set of criteria defining strategically fitting growth projects existed	0.768	0.061	0.079
		There was a certain process for the continuous screening for growth ideas	0.669	0.198	0.132
2 Business plan	0.915	In order to approve a decision like this, a business plan is always required	0.159	0.967	0.199
		In our company a business plan must always include certain parts	0.264	0.745	0.260
3 Financial analysis	0.625	Income statement or balance sheet estimates of the project had an important role	-0.021	0.388	0.605
		Detailed cost estimates concerning the project had an important role	0.076	0.185	0.536
		Plan on sources of financing had an important role	0.062	0.019	0.559

Table A4. Conflict.

Variable	Cronbach Alpha	Item	Factor Loading
Conflict	0.875	During the process coalitions with different objectives were formed within the company	0.760
		The central persons in the process went through many long negotiations	0.585
		There was a lot of disagreement regarding the objectives of the decision	0.851
		There was a lot of disagreement concerning what would be the correct procedure to follow in the process	0.723
		There was a lot of disagreement regarding the correctness of the conclusions	0.799

Table A5. Applicability of Existing Operational Capabilities in the New Market.

Variable	Cron-bach Alpha	Item	Factor Loadings				
			1	2	3	4	5
1 Marketing and sales fit	0.746	Sales and marketing department	0.557	0.126	0.155	-0.026	0.273
		Distribution and after-sales networks	0.469	-0.276	0.001	-0.349	0.337
		Knowledge of customer groups	0.856	0.127	0.040	0.261	-0.264
		Knowledge of sales methods	0.807	0.083	0.170	0.026	-0.025
2 Technology fit	0.694	Research and development department	0.085	0.979	0.024	-0.105	0.145
		Technological competence	0.100	0.539	0.064	0.195	0.044
3 Marketing and sales investments	0.820	Investments in sales and marketing department	0.184	0.198	0.960	0.017	0.056
		Investments in distribution and after-sales networks	0.102	-0.039	0.697	0.027	0.089
4 Technology investments	0.282	Investments in research and development department	0.054	0.166	0.011	0.478	0.055
		Investments in technology-driven competences acquired from outside the company	0.146	-0.104	0.199	0.292	0.119
5 Operations fit	0.788	Production plants	0.123	0.095	0.133	-0.539	0.479
		Purchasing or sourcing department	0.124	-0.052	-0.042	-0.136	0.890
		Knowledge of production technology	-0.080	0.091	0.223	0.009	0.474
		Knowledge of purchasing / sourcing	-0.002	0.177	0.031	0.289	0.879

Table A6. Technological Learning.

Variable	Cron-bach Alpha	Item	Factor Loading
Technological learning	0.503	New technological fields were learned from the project	0.123
		Learning related to technological fields caused changes in the implementation plan of the project	0.123
		New patents or licenses were bought in order to implement the growth plan	0.999
		In the project new technological inventions were made internally, that were patented	0.498

Table A7. Growth Aspiration.

Variable	Cron-bach Alpha	Item	Factor Loading
Growth aspira-tion	0.694	We wanted to grow the company as fast as we could	0.524
		We were prepared to sacrifice the profitability of the company for some years if that way we could get the company to grow fast	0.441
		We wanted to keep the company's operations on the same level as they were	0.623
		Trying to make the company grow fast was pointless	0.683
		We wanted to keep the company small	0.562

APPENDIX B. CORRELATION TABLES (SEE TABLES B1 AND B2)

Table B1. Pearson's Correlation Coefficients between the Independent, Dependent, and Control Variables of Model of Technology-Based Product Market Entries (1/2).

	Growth Expectations	Percentage Reached	Growth from Project	CEO and Top Management	Middle Management	Junior Management	Information Intensity	Functional Participation	Financial Analysis	Existing Process	Business Plan	Conflict	Operations Fit	Marketing and Sales Fit	Marketing and Sales Investments	Technology fit	Technology Investments	Technological Learning	Firm size	Growth Aspiration	R&D Intensity
Percentage reached	-0.221*																				
Growth from project	0.750***	0.408***																			
CEO & top management	0.351**	0.043	0.355**																		
Middle management	0.197	-0.102	0.140	0.276*																	
Junior management	-0.075	0.242*	0.137	-0.003	0.304**																
Information intensity	0.131†	0.013	0.170	0.082	0.452***	0.594***															
Functional participation	-0.126	-0.186	-0.295**	0.206	0.140	0.204	0.144														
Financial analysis	0.299**	0.100	0.385***	0.082	0.229*	0.244*	0.487***	-0.131													
Existing process	0.081	-0.114	-0.006	0.081	0.191	0.192	0.378**	0.296**	0.121												
Business plan	0.122	-0.034	0.149	0.211*	0.228*	0.204	0.448***	-0.012	0.329**	0.438***											
Conflict	-0.229*	-0.059	-0.254*	0.028	0.083	-0.179	0.002	0.041	0.005	0.059	0.049										

*** $p \leq 0.001$; ** $p \leq .01$; * $p \leq .05$; † $p < 0.1$; one-tailed tests ($N = 63$). Missing values replaced with mean.

Table B2. Pearson's Correlation Coefficients between the Independent, Dependent, and Control Variables of the Model of Technology-Based Product Market Entries (2/2).

	Operations fit	Marketing and sales fit	Marketing and sales investments	Technology fit	Technology investments	Technological learning	Firm size	Growth aspiration	R&D intensity	Firm growth
Growth Expectations	-0.056	-0.241*	0.046	-0.211*	0.270*	0.177†	-0.248*	0.251*	0.472***	0.254*
Percentage Reached	-0.084	-0.101	-0.244*	0.241*	-0.237*	0.056	-0.075	0.040	0.023	-0.176
Growth from Project	-0.129	-0.220*	-0.091	-0.017	0.122	0.237*	-0.326**	0.254*	0.522***	0.152
CEO and Top Management	0.028	-0.031	-0.048	-0.050	0.214*	0.079	-0.077	-0.002	0.266*	0.184
Middle Management	0.257*	0.126	0.103	0.108	0.251*	-0.008	0.196	-0.105	-0.048	0.169
Junior Management	0.065	-0.080	-0.164	0.002	-0.046	0.036	0.263*	-0.391***	-0.104	0.011
Information Intensity	0.247*	0.083	-0.075	-0.003	0.062	0.198	0.307**	-0.313**	0.038	0.068
Functional Participation	0.196	-0.040	-0.113	-0.106	0.006	-0.111	0.274*	-0.247*	-0.230*	0.073
Financial Analysis	0.024	-0.053	0.051	-0.047	-0.016	0.007	0.178	0.005	0.265*	-0.011
Existing Process	0.268*	0.113	0.010	-0.055	-0.062	0.058	0.259*	-0.387***	-0.150	0.101
Business Plan	0.336**	0.046	-0.010	-0.070	-0.066	0.098	0.320**	-0.245*	0.003	0.165
Conflict	0.029	0.256*	0.129	-0.194	-0.028	0.000	0.338**	-0.124	-0.284*	-0.022
Operations Fit		0.131	0.214*	0.152	0.092	0.163	0.221*	-0.130	-0.148	0.300**
Marketing and Sales Fit			0.360**	0.091	0.074	-0.065	0.080	0.032	-0.272*	0.087
Marketing and Sales Investments				0.105	0.154	0.071	-0.141	0.128	0.012	0.035
Technology Fit					0.091	-0.144	-0.276*	0.065	0.207	0.014
Technology Investments						0.432***	-0.281*	0.085	0.354**	-0.002
Technological Learning							-0.028	-0.053	0.276*	-0.159
Firm Size								-0.356**	0.494***	0.094
Growth Aspiration									0.312**	0.190
R&D Intensity										0.199

*** $p \leq 0.001$; ** $p \leq .01$; * $p \leq .05$; † $p < 0.1$; one-tailed tests ($N = 63$). Missing values replaced with mean.

APPENDIX C. QUESTIONS FROM THE QUESTIONNAIRE

[Managerial services available for growth]

How many people at each of your company's hierarchical levels takes part in technology management part- or full-time (estimate!)? Technology management means here the monitoring of different technologies and the strategic implications of their development, as well as taking part in developing business opportunities based on technology-driven competences.

Organizational Levels	Involved in Technology-Management Part-Time (At Least ~5% of Working Time)	Involved in Technology-Management Full-Time (Main Task)
Managing director	Persons	Persons
Top management	Persons	Persons
Middle management	Persons	Persons
Junior manager / group leader / expert level	Persons	Persons
Other employees	Persons	Persons

[Applicability of existing operational capabilities in the new market]

To what extent was the project able to use the existing *operational functions* within its first year of operation? Please circle the right answer with regard to the following functions.

Existing Function	Not Applicable at All		Do Not Know		Fully Applicable		
Sales and marketing department	-3	-2	-1	0	+1	+2	+3
Distribution and after-sales networks	-3	-2	-1	0	+1	+2	+3
Production plants	-3	-2	-1	0	+1	+2	+3
Purchasing or sourcing department	-3	-2	-1	0	+1	+2	+3
Research and development department	-3	-2	-1	0	+1	+2	+3

To what extent was the project able to use the existing *competences or knowledge* within its first year of operation? Please circle the right answer with regard to the following areas.

Existing Competence or Knowledge	Not Applicable at All		Do Not Know		Fully Applicable		
Knowledge of customer groups	-3	-2	-1	0	+1	+2	+3
Knowledge of sales methods	-3	-2	-1	0	+1	+2	+3
Knowledge of production technology	-3	-2	-1	0	+1	+2	+3
Knowledge of purchasing / sourcing	-3	-2	-1	0	+1	+2	+3
Technological competence	-3	-2	-1	0	+1	+2	+3

Were significant investments made within the first year of operation?

Function or Competence	No Investments at All		Do Not Know			Very Significant Investments	
Sales and marketing department	-3	-2	-1	0	+1	+2	+3
Distribution and after-sales networks	-3	-2	-1	0	+1	+2	+3
Production plants	-3	-2	-1	0	+1	+2	+3
Purchasing or sourcing department	-3	-2	-1	0	+1	+2	+3
Research and development department	-3	-2	-1	0	+1	+2	+3
Technology-driven competences acquired from outside the company	-3	-2	-1	0	+1	+2	+3

Please respond to the statements concerning the results of the growth project.

Statement	Fully Disagree		Do Not Know		Fully Agree		
New technological fields were learned from the project	-3	-2	-1	0	+1	+2	+3
Learning related to technological fields caused changes in the implementation plan of the project	-3	-2	-1	0	+1	+2	+3
New patents or licenses were bought in order to implement the growth plan	-3	-2	-1	0	+1	+2	+3
In the project new technological inventions were made internally, that were patented	-3	-2	-1	0	+1	+2	+3

[Wide participation in the decision-making process]

In each of the five phases of the decision-making process, how much did each of the hierarchical levels participate in the decision-making process? Please circle the correct answer.

How Active was the Managing Director?	Not Involved in Any Way			Do Not Know	Very Active and Important Role		
Generating growth ideas based on technological competence	-3	-2	-1	0	+1	+2	+3
Screening out ideas realistic technologically and from market potential	-3	-2	-1	0	+1	+2	+3
Evaluating and comparing the ideas	-3	-2	-1	0	+1	+2	+3
Making the final decision to enter the new market	-3	-2	-1	0	+1	+2	+3
Choosing people responsible for implementation	-3	-2	-1	0	+1	+2	+3

How Active was the Top Management?	Not Involved in Any Way			Do Not Know			Very Active and Important Role
Generating growth ideas based on technological competence	-3	-2	-1	0	+1	+2	+3
Screening out ideas realistic technologically and from market potential	-3	-2	-1	0	+1	+2	+3
Evaluating and comparing the ideas	-3	-2	-1	0	+1	+2	+3
Making the final decision to enter the new market	-3	-2	-1	0	+1	+2	+3
Choosing people responsible for implementation	-3	-2	-1	0	+1	+2	+3

How Active was the Middle Management?	Not Involved in Any Way			Do Not Know			Very Active and Important Role
Generating growth ideas based on technological competence	-3	-2	-1	0	+1	+2	+3
Screening out ideas realistic technologically and from market potential	-3	-2	-1	0	+1	+2	+3
Evaluating and comparing the ideas	-3	-2	-1	0	+1	+2	+3
Making the final decision to enter the new market	-3	-2	-1	0	+1	+2	+3
Choosing people responsible for implementation	-3	-2	-1	0	+1	+2	+3

How Active was the Junior Manager / Group Leader / Expert Level?	Not Involved in Any Way			Do Not Know			Very Active and Important Role
Generating growth ideas based on technological competence	-3	-2	-1	0	+1	+2	+3
Screening out ideas realistic technologically and from market potential	-3	-2	-1	0	+1	+2	+3
Evaluating and comparing the ideas	-3	-2	-1	0	+1	+2	+3
Making the final decision to enter the new market	-3	-2	-1	0	+1	+2	+3
Choosing people responsible for implementation	-3	-2	-1	0	+1	+2	+3

[Wide functional participation and information intensity]

Please evaluate the following statements concerning each of the five phases of the decision-making process.

Phase of Decision-Making Process: Generating Growth Ideas Based on Technological Competence	Fully Dis-Agree			Do Not Know			Fully Agree
There were many meetings in this phase	-3	-2	-1	0	+1	+2	+3
Information was actively collected from different sources in this phase	-3	-2	-1	0	+1	+2	+3
External sources of information were used systematically in this phase	-3	-2	-1	0	+1	+2	+3
People from many functional departments took part in this phase	-3	-2	-1	0	+1	+2	+3

Phase of Decision-Making Process: Screening out Ideas Realistic Technologically and From market potential	Fully Dis- agree		Do Not Know				Fully Agree
There were many meetings in this phase	-3	-2	-1	0	+1	+2	+3
Information was actively collected from different sources in this phase	-3	-2	-1	0	+1	+2	+3
External sources of information were used systematically in this phase	-3	-2	-1	0	+1	+2	+3
People from many functional departments took part in this phase	-3	-2	-1	0	+1	+2	+3

Phase of Decision-Making Process: Evaluating and Comparing the Ideas	Fully Dis- agree		Do Not Know				Fully Agree
There were many meetings in this phase	-3	-2	-1	0	+1	+2	+3
Information was actively collected from different sources in this phase	-3	-2	-1	0	+1	+2	+3
External sources of information were used systematically in this phase	-3	-2	-1	0	+1	+2	+3
People from many functional departments took part in this phase	-3	-2	-1	0	+1	+2	+3

Phase of Decision-Making Process: Making the Final Decision to Enter the New Market	Fully Dis- agree		Do Not Nnow				Fully Agree
There were many meetings in this phase	-3	-2	-1	0	+1	+2	+3
Information was actively collected from different sources in this phase	-3	-2	-1	0	+1	+2	+3
External sources of information were used systematically in this phase	-3	-2	-1	0	+1	+2	+3
People from many functional departments took part in this phase	-3	-2	-1	0	+1	+2	+3

Phase of Decision-Making Process: Choosing People Responsible for Implementation	Fully Dis- Agree		Do Not Know				Fully Agree
There were many meetings in this phase	-3	-2	-1	0	+1	+2	+3
Information was actively collected from different sources in this phase	-3	-2	-1	0	+1	+2	+3
External sources of information were used systematically in this phase	-3	-2	-1	0	+1	+2	+3
People from many functional departments took part in this phase	-3	-2	-1	0	+1	+2	+3

[Existing process, usage of business plan, and the financial reporting and analysis related to the process]

Please evaluate the financial reporting related to the project based on the following statements.

Statement	Fully Dis-agree			Do Not Know			Fully Agree
Income statement or balance sheet estimates of the project had an important role	-3	-2	-1	0	+1	+2	+3
Detailed cost estimates concerning the project had an important role	-3	-2	-1	0	+1	+2	+3
Plan on sources of financing had an important role	-3	-2	-1	0	+1	+2	+3

Did exactly predefined guidelines for this kind of a decision-making process exist? Please evaluate on the basis of the following statements.

Statement	Fully Dis-agree			Do Not Know			Fully Agree
A written guideline existed for this kind of a process	-3	-2	-1	0	+1	+2	+3
A set of criteria defining strategically fitting growth projects existed	-3	-2	-1	0	+1	+2	+3
There was a certain process for the continuous screening for growth ideas	-3	-2	-1	0	+1	+2	+3
In order to approve a decision like this a business plan is always required	-3	-2	-1	0	+1	+2	+3
In our company a business plan must always include certain parts	-3	-2	-1	0	+1	+2	+3

[Conflict]

How much disagreement caused by the differing objectives of different groups or individuals was there related to the decision-making process? Please estimate on the basis of the following statements.

Statement	Fully Dis-agree			Do Not Know			Fully Agree
During the process coalitions with different objectives were formed within the company	-3	-2	-1	0	+1	+2	+3
The central persons in the process went through many long negotiations	-3	-2	-1	0	+1	+2	+3
There was a lot of disagreement regarding the objectives of the decision	-3	-2	-1	0	+1	+2	+3
There was a lot of disagreement concerning what would be the correct procedure to follow in the process	-3	-2	-1	0	+1	+2	+3
There was a lot of disagreement regarding the correctness of the conclusions	-3	-2	-1	0	+1	+2	+3

[Dependent and control variables]

What percentage of the whole company's turnover was the project expected to bring in the end of its fifth year of operation (estimate)? _______% The first year of operation is defined to be the first year that the project had sales.

After how many years of operation was the project expected to reach the profitability level (operating profit) that was expected from it (estimate)? After _______ years of operation.

Please evaluate the following statements concerning the expectations from the project.

Statement	Fully Disagree			Do Not Know			Fully Agree
A significant amount of new turnover was expected from the project	-3	-2	-1	0	+1	+2	+3
The project was expected to be the most important source of growth for the company in the following years	-3	-2	-1	0	+1	+2	+3
The project was expected to create the base for the transition of the whole company to a new market	-3	-2	-1	0	+1	+2	+3
New technological fields were expected to be learned from the project	-3	-2	-1	0	+1	+2	+3
New contacts were expected to be gained from the project	-3	-2	-1	0	+1	+2	+3
It was expected that a certain rising cycle could be exploited through the growth project	-3	-2	-1	0	+1	+2	+3

Estimate how large part of your company's turnover has been used for research and development during the last 3 years (1997–1999)? ________% and how large part of the turnover was used for research and development in the years 1985–1987? ________%

To what extent do you agree with the following statements concerning the growth aspirations of your company at the time of starting the growth project?

Statement	Fully Dis-agree			Do Not Know			Fully Agree
We wanted the company to grow as fast as we could	-3	-2	-1	0	+1	+2	+3
We were prepared to sacrifice the profitability of the company for some years if that way we could get the company to grow fast	-3	-2	-1	0	+1	+2	+3
We wanted to keep the company's operations on the same level as they were	-3	-2	-1	0	+1	+2	+3
Trying to make the company grow fast was pointless	-3	-2	-1	0	+1	+2	+3
We wanted to keep the company small	-3	-2	-1	0	+1	+2	+3

What was the annual targeted growth rate of your company at the time of starting the growth project? __________% per year.

How large percent of the whole company's turnover did the project bring in the end of the fifth year of operating (estimate)? ______% What about in the year 1999 (estimate)? ______% After how many years of operation did the project reach the profitability level (operating profit) that was expected from it (estimate)? After______ years of operation.

Has there been any attempt in your company to estimate the value of the whole company's technology-driven competences? Please respond to the following statements.

Statement	Fully Dis-agree			Do Not Know			Fully Agree
In our company we have a commonly known list or description of the most important areas of technological competence	-3	-2	-1	0	+1	+2	+3
In our company we have a list or description of all documentable technological assets, such as patents, licenses, etc.	-3	-2	-1	0	+1	+2	+3
Documentable technological assets have been grouped into different areas of strength in technological competence	-3	-2	-1	0	+1	+2	+3
In our company we have a list or description of "soft" technological assets, such as different persons' areas of specialization	-3	-2	-1	0	+1	+2	+3
"Soft" technological assets have been grouped into different areas of strength in technological competence	-3	-2	-1	0	+1	+2	+3
In our company we have evaluated the competitive advantage in each area of technological competence	-3	-2	-1	0	+1	+2	+3

BUILDING THE PASSIVE INNOVATOR: A FRAMEWORK FOR PERFORMANCE ARCHITECTURES

Norbert Hoelzl and Ursula Schneider

ABSTRACT

The competitive landscape is now changing not only by degree, but in its very nature, due to the impact of open trade and the enabling capacities of new information and communication technologies. In this setting, the single enterprise or corporation may be an inappropriate unit of analysis in understanding the exploitation and exploration of strategic opportunities. This analysis explains how new forms of organization – which we refer to as enterprise architectures – evolve through the interaction of distributed capabilities and monitoring functions. We propose the concept of business models as new units of analysis in strategy research. Business models integrate a market-based view (represented by the passive innovator) and a resource-based view (represented by a capability cycle). Business models are characterized as emerging from the combination of three constituent elements: value proposition, performance architecture, and revenue model. We argue that a monitoring meta-capability for prototyping business models (represented by a coordinative capability) enables the deployment of operative capabilities within market spaces.

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A NEW FRAMEWORK AND NEW UNITS OF ANALYSIS FOR STRATEGIC THEORY

Seldom have enterprises had so constantly to transform themselves, at their core and in their essence, as they do today. The market-based view (Mason, 1939; Bain, 1968; Porter, 1985) and the resource-based view (Penrose, 1959; Wernerfelt, 1984; Hamel & Prahalad, 1994) with their classical concepts of stable industry, enterprise, and business units provided useful tools and concepts for understanding competition in the old industrial economy. As continuous change has become a constant feature of business environments, however, traditional concepts of business units and industries no longer seem well suited for analyzing business phenomena.

More dynamic theories of economic organization and strategy put forward by Schumpeter (1950), Kirzner (1982), and Casson (1982), among others, proposed that creating new kinds of business models was a "normal" task of strategic management. In addition, new research trends such as spatial analysis (Hägerstrand, 1975; Krugman, Fujita, & Venable, 1999; Löw, 2001), market spaces (Kim & Mauborgne, 1999), capability-based competition (Stalk, Evans & Shulman, 1992; Hammer, 1996), capability portfolio management (Eisenhardt & Brown, 1999), capability distribution (Sawhney & Parikh, 2001; Werbach, 2001), and capability transformation (Chaudhuri & Tabrizi, 1999) have contributed to the emergence of a more dynamic view of business processes.

In this chapter, we put forward the argument that *business models* constitute a useful and perhaps essential concept for understanding rapidly evolving competitive landscapes (Bettis & Hitt, 1995; Hamel & Prahalad, 1994). We also suggest how applications of information and communication technology (ICT) are fundamentally impacting business processes, enabling new industrial structures that permeate and cut across traditional industrial and organizational boundaries. Business models emerge from combinations of value propositions, performance architectures, and revenue models that are adequately endowed to cope with high rates of change. We suggest how the innovation of new business models provides frameworks for solving the economic problem of configuring organizations within an infinite space of ideas and recipes.

Three concepts about capabilities are essential in understanding these frameworks. *Capability cycles* constitute the center of such frameworks. A capability cycle defines a specific process of transition and transformation of operative capabilities based on knowledge conversion (Nonaka, 1994; Nonaka & Takeushi, 1995) and on trial-and-error adaptation mechanisms

(Popper, 1994). Capability *transition* refers to the continuous adaptation of capabilities by market-facing business models that develop and deploy *operative* capabilities. Capability *transformation* refers to purposeful capability design that is a response to external events (such as disruptive technologies and regulations) by a governing and regulating parental unit that deploys *coordinative* capabilities. These views of capabilities provide the foundation for our concept of *performance architectures* that is anchored in early works on a resource-based view of the firm (Smith, 1776; Marshall, 1890; Schumpeter, 1934; Penrose, 1959) and that applies notions of the economics of ideas (Romer, 1991) and Stiglitz' new information paradigm (Stiglitz, 2001).

Methodology

> Our knowledge is merely a process of critical guessing; a network of hypotheses; and a web of assumptions. (Popper, 1984)

Our research is explorative and employs a research methodology that is close to *grounded theory building* (Glaser & Strauss, 1967) and Bateson's model of strategic learning[1] focused on a concept of organization that we term the *Space Conscious Enterprise*. Our research topic is in fact an evolving construct because the phenomenon it is intended to represent is itself a moving target.[2] The research at hand does not test propositions – a task that remains for continuing studies. For this research process, we have applied qualitative methods.

In a field with relatively little established knowledge, the first way to acquire knowledge is through experimentation (Kubicek, 1977). We are undertaking to develop experimental knowledge through three learning loops.

First, a study of the management report *Leadership Connection*[3] and interdisciplinary cooperation during international consulting assignments served as a survey control. After reviewing relevant literature to derive initial research questions, we borrowed from different strategy and knowledge theories to establish the first feedback loop which consisted of discussions within an interdisciplinary research team involved in *Leadership Connection* that were subsequently extended to a network of management colleagues via an international Internet discourse run in 2001.[4]

Second, further narrative interviews helped to circumscribe our research objective. We went out to the field and interviewed managers from high-tech industries and academic researchers in order to refine categories.[5] Through this learning process, our research questions began to come into focus.[6]

Through a learning cycle akin to Gibbon's *mode II of knowledge creation* (Gibbons et al., 1994), we began to derive conceptual categories for observation – in this case, concepts of *business model*, *performance architecture*, and *capability cycle*. We then worked with practitioners and researchers to develop a model of generalized interdependencies. This chapter reports the results of these two learning processes.

The third learning loop, which is the subject of further studies, consists of testing the operationalization of our concepts with practitioners and academic partners to develop process knowledge and generate hypotheses that can be tested. We have recently initiated this third loop with a series of embedded case studies that appear to provide support for our models developed in the first two learning processes.

ECONOMIC AND STRATEGIC MANAGEMENT FOUNDATIONS

This section reviews some economic assumptions that we have made about competition in a digital network economy characterized by imperfection of information and competition. Our assumption is that in industries with such characteristics, entrepreneurs/managers whom we refer to as *business architects* must discover, design, and implement business models that constitute their competitive strategy.

Industry Characteristics

Stiglitz' (2001, p. 472) theories of information economics represent a fundamental departure from the prevailing neoclassical economics paradigm. Economists have often assumed that economies in which information was not perfect would behave much like economies in which information is perfect. One of the main results of Stiglitz' research was that this assumption is incorrect – that even small degrees of imperfect information can have profound effects on market equilibria and market imperfections. Stiglitz argued that imperfect information leads to imperfect markets. Thus, contrary to traditional competitive equilibrium analysis (Smith, 1776; Marshall, 1890; Mill, 1848), Stiglitz showed that markets do not clear if information is imperfect, and further argued that information imperfections are pervasive in the economy.[7] Stiglitz' information paradigm differs from the competitive equilibrium paradigm in that information about prices, choices, and wages affect behaviors of market agents.[8] Stiglitz (2001) argues that the dynamics of change are not well described by equilibrium concepts, but rather require concepts of *evolutionary* processes with feedback effects, because what agents do is affected by their perceptions of how an economic system works. Because an individual agent's behavior depends on beliefs formed in prior economic transactions, information economics emphasizes that ''history matters.''

Because information is imperfect in the digital network economy, as in any other, alternative business models compete in imperfect competition, which means they may have some ability to influence prices for their products. Further, because of positive (selfre-enforcing) network feedback effects, collective switching costs on the demand side, and economies of scale on the supply side, the digital network economy is sometimes characterized by oligopolistic market structures.[9] A few business models are likely to emerge to dominate each digital industry in the long term. Mature business models may also exist in temporary oligopolies, protected by high entry barriers such as high switching costs, regulatory barriers, and patent protection, providing motivation for entrepreneurs to innovate new business models that can reap excess profits within evolving oligopolies in the long term.

Business Model as Focal Research Object

Our research into business models reflects Paul Romer's (Romer, 1993, pp. 63–91) central claim that new ideas embedded in technological change drive economic growth. Traditional economists divide the world into needs and physical objects that can satisfy those needs. Since physical objects are subject to scarcity and diminishing returns, traditional economists conclude that the essential economic decision is how to allocate scarce resources in order to create maximum satisfaction of needs. Romer, however, splits the world into physical objects and ideas, which endows human beings with a nearly infinite capacity to reconfigure physical objects by imagining new recipes for their use. In Romer's view, the world is not defined by inherent scarcity and limits on growth. Instead, it is a playground of nearly unbounded opportunity in which new ideas create new products, new processes, new markets, and new constellations to create new wealth (Romer, 1993, pp. 63–91). *Business models* are our term for ideas of how to configure resources. In this context, we focus on the new concepts of business models because we believe classical units of strategic analysis (business unit, enterprise, industry) are unable to encompass all important forms of exogenous and endogenous change in the digital network economy.

In the traditional market-based view, industries are the decisive unit of analysis and define the competitive environment for an enterprise (Mason, 1939; Bain, 1956, 1968; Caves & Porter, 1977; Porter, 1980). Enterprises can (1) decide in which industry they will compete, (2) select their position within a chosen industry, and (3) increase the attractiveness (profitability) of an industry, e.g. by rising barriers to entry. Effective strategies mainly result from successful positioning within an industry space (Bettis, 1998, p. 358). Extending this market-based view, we visualize industries as *opportunity spaces*[10] in which organizations compete based on their underlying capabilities (cf. Kim & Mauborgne, 1999, pp. 83–93).

In contrast to the "industry structure" view of competitive advantages, the resource-based view and the competence perspective characterize profit ability and competitive advantage as emanating from resources within or available to an organization (Wernerfelt, 1984; Barney, 1986, 1991; Prahalad & Hamel, 1990; Sanchez, 2001). In order to contribute to competitive advantage, resources must be valuable, scarce, hard to imitate, and applied within an organization (Barney, 1991, 105ff.). Effective coordination and targeting of resources and capabilities creates competences (Hamel & Prahalad, 1994; Sanchez, 2001) that may be applied in new ways and/or in new fields. In this view, an organization acquires competitive advantages because of its competences and heterogeneity of resources, not because of the market position it occupies. Differences in competences and their underlying resource endowments lead to different profits within an industry. A key contribution of the competence perspective is that it elevates the innovation concept from the product level to the capability level.

Constraints of Traditional Focal Research Objects

Looking beyond the traditional research objects *business unit*, *enterprise*, and *industry* since the mid-1990s, some authors have spoken of a *new competitive landscape* with an increasing innovation rate and faster diffusion of new technologies (Bettis & Hitt, 1995). Part of this new landscape is increasing ambiguity about what "industries" actually mean. Bettis (1998, p. 359) states that such traditional research objects "…may be largely out of touch with the evolution of modern competition in a technology-driven, global world that sees a huge and rapid level of change…" noting further that "…a new competitive landscape is currently being shaped" (Bettis & Hitt, 1995, p. 8).

New Focal Research Objects

According to Bettis, "new suspects" must be introduced as research objects. Bettis underlines the importance of not focusing on the single enterprise, but on groups of enterprises as alternative-competitive units and research objects. He defines competitors as enterprises with similar capabilities, with enterprise borders not as clearly defined as in traditional views because of growing use of market-based coordination mechanisms and relational alliances.[11]

Various researchers have been investigating alternative coordination mechanisms as new research objects, focusing on *strategic networks* (Gulati, Nitin & Zaheer, 2000; Selz, 1999; Dyer & Singh, 1998), *interorganizational systems* (Klein, 1996), and the concept of *value net* (Brandenburger & Nalebuff, 1997). Prahalad and Ramaswamy (2000, p. 81) argue that changes in the demand side must also be considered in strategic analysis, suggesting that the unit of strategic analysis should move from the single company concept to an enhanced network of suppliers, manufacturers, partners, investors, and customers. These observations pave the way for our introduction of a new research object in the following section.

Origin and Definition of the Term Business Model

The term *business model* has its origin within the process and data modeling techniques of enterprises applying ICT (Konczal, 1975; Dottore, 1977). Eriksson and Penker (2000, 7f) expand on the concept of business models in the context of information management, noting the following goals:

- to better understand the key mechanisms of an existing business
- to act as a basis for improving the current business structure and operations
- to show the structure of an innovated business
- to experiment with a new business concept or to copy or study a concept used by a competitor (e.g. benchmarking on the model level)
- to identify opportunities for disaggregation of business processes.

A business model is an abstract representation of the essential organization of an enterprise or value chain. Other researchers have elaborated on this basic definition (Timmers, 1998; Venkatraman & Henderson, 1998; Selz, 1999; Amit & Zott, 2000; Hamel, 2000; Tapscott, Ticoll & Lowy, 2000):

- A business model is a concept that is being applied in practice. It contains a description of *what* utility customers and other partners of the focal enterprise can expect and obtain – the part of a business model that we call the *Value Proposition*. A business model answers the question, *What utility does an enterprise deliver?*

- A business model contains the architecture of value generation – meaning *how* the customer's utility is generated. This architecture describes steps in value generation, required capabilities and their configuration, and agents and their respective roles. We refer to this part of a business model as the *Performance Architecture*. It answers the question, *How does an enterprise deliver economic performance and customer utility?*
- Revenues determine the financial value of a business model. For an enterprise, a business model must define which revenues are generated from which sources. We refer to this part of a business model as the *Revenue Model*.[12] It answers the question, *How will money be made?*

Competitive Strategy as Business Model Innovation

A business model is embedded in a strategy and implemented through business processes. In this sense, "…strategy is a maintained unique advantage by differentiation. Managing that differentiation is the essence of long-term strategy" (Henderson, 1980, p. 1). Following Henderson, we propose that a strategy consciously configures a business model's performance architecture, value proposition, and revenue model to differentiate a firm and create competitive advantages. We also suggest that business models may not always be purposefully designed ex ante. Opportunistic business activities may unconsciously create a business model. After reflecting on its business activities, an organization may define ex post a business model based on retrospectively recognized patterns in its activities (Mintzberg, 1988, p. 14).

The motivation for organizations to select competitive strategies and corresponding business models, whether *ex ante* or *ex post*, is to reap profits. There are basically three main sources of profits (Oster, 1994, p. 29): market entry barriers, heterogeneity of resources, and innovations. In our research, we focus on innovation[13] and the heterogeneity of resources as sources of profits. Thus, this research views the business model as a potential innovation that can be a source of profits. Conscious change of a business model and its underlying resources and capabilities creates the heterogeneity required to sustain profit generation. Thus, the conscious modification and variation of capability-based business models are taken here to be the essence of strategies to gain competitive advantage. Intermediating between a company's strategy and its capabilities is a bridge component that Hamel

(2002) refers to as *configuration* and that we call *performance architecture*. Both terms refer to the unique way in which capabilities, assets, and processes are combined and interrelated in support of a particular strategy.

Innovations in business models may concern value propositions, performance architectures, or revenue models. These three kinds of innovation mutually interact – changes in one component lead to changes in the other two as well. Our focus in this research is on performance architecture innovations, by which we mean conscious transformations of capabilities in order to create competitive advantage. Essentially, architectural innovations are new ways of coordinating capabilities in market spaces. By innovating coordination mechanisms, enterprises can consciously influence configurations of value creation elements. For example, by consciously changing from hierarchical to auction pricing mechanisms, enterprises such as eBay or Priceline have delegated pricing decisions to their customers.

A FRAMEWORK FOR MANAGING PERFORMANCE ARCHITECTURES

In this section, we define capabilities, elaborate a notion of capability-based competition, and introduce the concept of the capability cycle (the conscious management of operative capabilities along their life cycle). We make a distinction between *operative capabilities* and *coordinative capabilities*, and explain how the two kinds of capabilities form the foundation for performance architectures.

Definition of Capability-Related Terms

In order to clearly define capability-related terms, we are applying definitions of Sanchez, Heene, and Thomas (1996), Stalk et al. (1992), and Selznick (1957) for assets, resources, and capabilities, respectively. Assets are anything tangible or intangible that is useful in a value creation process (Sanchez et al., 1996). Resources are any assets available to a firm to use in its value creation processes. Capabilities are recognized as a special kind of resource, because they use other resources. Capabilities are repeatable patterns of action (Sanchez et al., 1996) – a kind of meta-program for deploying assets and resources (Selznick, 1957) through activities and processes (Stalk et al., 1992) that either create value or support value creation (Hammer, 1996). Repeatable patterns or routines are recurring and context-dependent actions that sequence individual actions into coherent organizational behavior (Teece, Rumelt, Dosi, & Winter, 1994). Capabilities can change through adaptive learning dynamics on the group level (Nonaka & Takeushi, 1995).

Competence is the ability of an organization to sustain coordinated deployments of resources and capabilities in ways that help a firm achieve its goals (Sanchez et al., 1996; Sanchez & Heene, 1996). Capabilities within this competence perspective correspond closely to the notion of the process-focused organization in which complete end-to-end sets of activities together create value for a customer (Hammer, 1996, p. xii). A business process is only a capability if it serves customer needs (Stalk et al., 1992). Capability-driven organizations conceive their operations as feedback loops[14] that begin with identifying customer needs and end with satisfying them in the context of industry regulations and technological changes.

We introduce the term *operative capabilities* to refer to such value-creation processes as those that progress:

– from idea to prototype in the product development process
– from order to fulfillment in the manufacturing process
– from need or problem identification to satisfaction in the customer service process
– from order to revenue receipt in the financial transaction process.

Competing on Operative Capabilities as ICT-Enabled, Integrated Processes

Prior use of ICT can be divided into two general applications (Landauer, 1996, p. 5). First, ICT may be applied for the manipulation of information and data. Second, ICT applications may be applied to improve activities that cannot be taken over entirely by computers. It is this second use of ICT, which concerns us here. To elaborate this kind of ICT use, we adapt Gibson's and Nolan's Phase-Scheme (Gibson & Nolan, 1974) for differentiating four stages of electronic data processing (EDP) use. Each stage is characterized by different forms of management use and organizational learning. The four stages often occur sequentially, but can overlap as well (Cash et al., 1983, p. 31):

i. Technology identification and investment in automation of single tasks, such as billing. There is no linkage between individual automated activities. Venkatraman (1991, p. 71) calls this phase the "localized exploitation" of ICT.

ii. Technological learning and adaptation in automating functional areas. On the business process level, the second phase is characterized by connecting individual tasks within a functional area of activities through ICT.
iii. Rationalization and management control leading to integrated business processes. This phase may be shaped by business process reengineering and the internal aggregation of tasks into cross-functional process streams supported by ICT. Adaptive customer-centric processes, such as order management, replace traditional corporate functions (Österle, 1994). This stage brings a fundamental organizational change in underlying business architectures. It is often the initial trigger for adopting new organizational forms that are aligned with new corporate "process streams." Process streams become the basis for operative capabilities and drive the emergence of the *process-focused corporation*[15] (Hammer, 1990, 1996).
iv. Maturity and wide-spread technology transfer leading to networked capabilities. The enterprise alertly pursues opportunities to use ICT. Business processes can be linked across corporate boundaries by intranets and Internet.

As an enterprise reaches stages three and four of ICT adoption, new organizational forms bring fundamental change to underlying performance architectures, creating new process streams and derived operative, integrated capabilities – the foundation of capability-based competition (Stalk et al., 1992).

Capability-Based Competition

The concept of strategy focused on capability-based competition signaled a major shift in the logic of competition to five generic principles (Stalk et al., 1992, pp. 57–69):

– Organizations that build their competitive strategy on capabilities first identify their key processes and integrate them into an end-to-end process capability.
– Capability portfolios are managed centrally and financial investments target long-term payback of capabilities, which leads to scaling effects such as capability distribution.
– Strategic investments in supportive infrastructure such as integrated and automated processes enable the creation of integrated capabilities, linking

processes together across functions and business units, and even across organizational boundaries.
– The goal of the capability-driven organization is to develop and transform capabilities within resource networks in order to continuously innovate business models.
– Because capabilities span across functions, the parental business unit must coordinate operative capabilities within market spaces across organizational boundaries.

Operative capabilities may sometimes be traded in markets for capabilities (Werbach, 2001; Brandimarte, 2001). Organizations are constructed of portfolios of capabilities that inevitably are partly sourced from other organizations. Coordinative capabilities are those that coordinate and integrate operative capabilities and manage them along their respective life cycle.

The Capability Cycle

> Economic activities have one long-term, cyclical goal: first, the transition of research into innovation and money; second, shifting money back into research. These fundamental processes have one crucial resource in common: knowledge. (Schrempp, 2003).

Schrempp's simple image describes a *capability cycle* – a transition of newly developed operative capabilities into commercialization and back again into a development mode. Our concept of a capability cycle is based on concepts and findings in capability-based competition (Stalk et al., 1992), knowledge conversion (Nonaka & Takeushi, 1995), and the trial-and-error mechanism for knowledge generation (Popper, 1994).

Trial and Error as a Driver of Capability Cycles

Economic growth occurs whenever agents take resources and rearrange them in ways that create more value (Romer, 1991, 1993). This occurs, for example, when enterprises re-balance their corporate portfolio through divestment and acquisition, leading to disaggregation and reaggregation of capabilities in various phases of growth (Brandimarte et al., 2001). Both the need for continuous incremental change and the need for transformational changes in capabilities lead to trial-and-error experiments in forming a capability portfolio. Such experiments reflect Loasby's conception of enterprises as hypothesis-generating and -testing entities (Loasby, 1976). Hypothesis-generating and -testing relies on trial-and-error mechanisms, retaining successful solutions to problems and eliminating failures (Popper, 1994). According to Popper, the first step in this process is identifying a problem. In the competence perspective, this is referred to as *strategic gap* identification – the difference between the desired state of an organization's capabilities and its perceived state (Sanchez & Heene, 1996). Step two generates possible solutions in terms of new or modified capabilities. Step three is the elimination of capability failures, leaving a set of successful solutions that create a new set of *distributed capabilities* that become the basis for a new business model (see Fig. 1).

The evolution of *time-based capabilities* reflects the idea of *competence building* that drives long-term competitive dynamics (Sanchez, 2001). Evolution of time-based capabilities through trial-and-error learning highlights the central role of feedback effects for business model innovation. Feedback effects occur both within and among enterprises and include all value-creation processes such as product development, production, customer order fulfillment, and customer service and support (Sanchez & Heene, 2004). Deploying *distributed capabilities* reflects the idea of *competency leveraging* that drives short-term competitive dynamics (Sanchez, 2001).

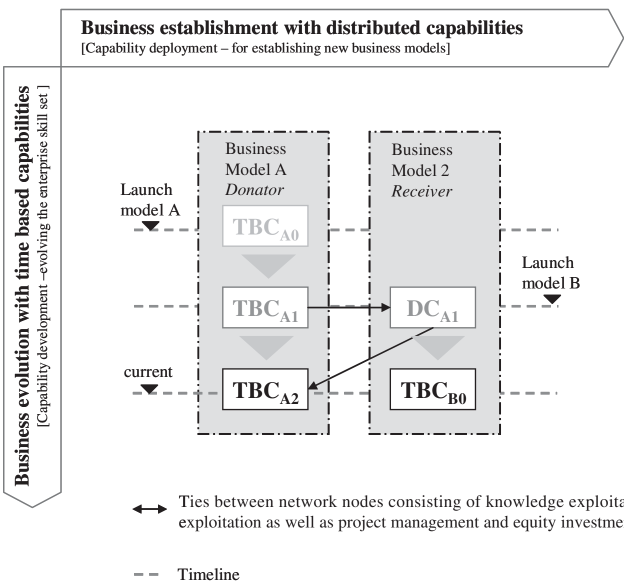

Fig. 1. Trial and Error Mechanism for Capabilities Result in Time-Based Capabilities and Distributed Capabilities.

Four Generic Modes of Capability Transition

In an economy where innovation is crucial for competitiveness, the organizational ability to create new group knowledge and capabilities is critical to business model innovation (Fischer, 2001, p. 205). The ability to sustain continuous innovation and diffusion of capabilities in the capability cycle is a key competitive differentiator among business models. Capability transition refers to the continuous adaptation of capabilities in response to market changes. Capability transition requires knowledge conversion, exploration, and exploitation (Nonaka & Takeushi, 1995) in processes of capability development within specific market spaces (Christensen & Overdorf, 2000). Fig. 2 illustrates the transition processes in the capability cycle.

The capability cycle describes the transition of capabilities from endogenous exploration and development, through external exploitation, deployment, and commercialization, and finally achieving internalization of lessons learned in order to grow endogenously:

I. Pure knowledge exploration – the *business evolution mode*. This is the process of sharing experiences and tacit (uncodified) knowledge that creates new skills, thereby evolving and continuously innovating capabilities over time[16] and creating a set of *time-based capabilities* that define the core of a business model.

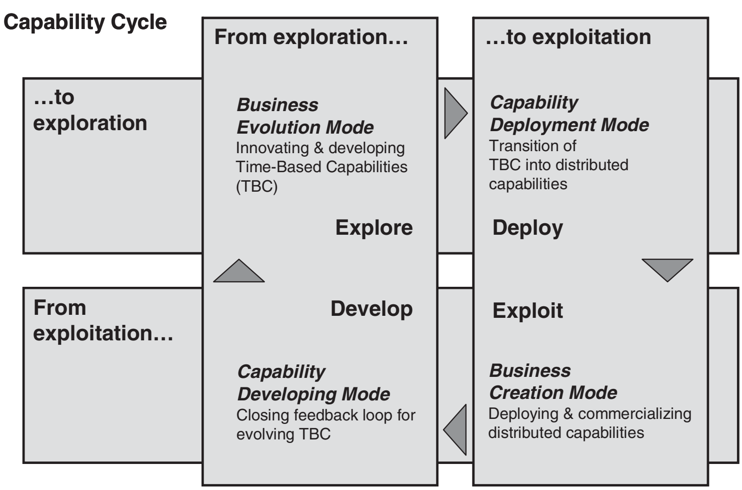

Fig. 2. The Capability Cycle with Four Generic Transition Modes.

II. From exploration to exploitation – the *capability deployment mode*. This process holds the key to business creation because it externalizes capabilities and generates new concepts for performance architectures from existing capabilities.[17] Codifying, spinning off, and diffusing time-based capabilities from a business model's core creates *distributed capabilities*.
III. Pure knowledge exploitation – the *business creation mode*. This mode deploys capabilities in new business models. The donating business model commercializes *distributed capabilities* in new business models and market spaces, using a combination of endogenous and exogenous resources and knowledge. The establishment of new market spaces and the internalization of capabilities into the new business model are the essence of this mode.[18] Explicit knowledge from the donating business model is used in a newly created business model.
IV. From exploitation to exploration – the *capability development mode*. This mode is closely related to learning-by-doing[19] and leads to the evolution of *time-based capabilities* through feedback loops and diffusion of knowledge from operational practice. Explicit operational and procedural knowledge about technologies, products, and capabilities is converted into specific knowledge required for developing capabilities proactively to meet new needs and make use of available technologies.

Table 1 provides examples of how enterprises in the ICT sector deal with time-based capabilities and distributed capabilities in practice.[20] Table 1 provides cases of influential players in the ICT industry managing capability development along life cycles. AT&T drives for a "safe sale," concealing the development of new product and production capabilities until they prove to be successful and finally integrating them into existing programs.

Cisco pursues a bolder "Build to buy" approach toward capability management. First, incremental investments in premature but innovative start-up initiatives secure access to new knowledge. If solutions promise to satisfy customer needs identified by Cisco and if the targeted external capabilities match internal capability needs, the venture receives further funding and directives from Cisco. Cisco calls this process of improving its reach for innovations and end-to-end solutions to guarantee short time-to-markets a "horizontal capability." Finally, Cisco acquires the venture in a "Spin-in" initiative to secure a start-up mind-set and innovative freedom within Cisco frameworks. Hence, Cisco internalizes capabilities for building new business models.

HP manages what we call a "case method." Each enterprise customer is considered a case for capability development. For this purpose, HP initiates development consortia with partners and customers to externalize capabilities

Table 1. Capability Management at Selected ICT Enterprises.

	Applied Capability Cycle				
	AT & T Telco Operator	Cisco ICT Equipment	HP ICT Equipment	Swisscom Telco Operator	Symbian ICT Software OEM
Explore	• R&D unit in-house as separate profit center • Alliance model with partners in innovation	• Own R&D units cooperate with OEMs • Partner and license • Minority investments to gain technology insights without risks • "Build to buy"	• In-house R&D units cooperate in consortia-like ecosystems with large enterprise partners • Building strong ties by joint PPM and KM	• In-house R&D unit "SC Innovations" as separate profit center • Alliance model with best-in-class partners for innovation & development	• R&D as pure TBC capability for mobile OS • Customers are major shareholders • Time-based capability as main purpose
Deploy	• In-house product testing and rapid prototyping • Deploying capabilities over representative lead buyers	• Building "horizontal capabilities": integrating products into end-to-end solutions • Know-how integration without deploying internal resources	• Enlargement of development ecosystem towards lead buyers • Joint implementation w/ enterprise partners • Agilent as co-opetitor	• Alliance model for product testing and rapid prototyping • Auction-style suppliers for commodity components	• Alliance model for product testing and rapid prototyping • Joint development teams create knowledge on group level
Exploit	• Joint start-up project "no name"	• Joint production and marketing • Serving test	• Clear profit sharing agreements into license & service	• Independent unit with strong ties in PPM and KM	• Investors exploit software versions and modules in

	• "Camouflage" market access to test products from "green field" • Strong ties in PPM & KM	markets & early adopters • "Build to buy" decision pro/con acquisition	fees, staff commissions • No investments • Consortia dissolves after implementation	• Securing start-up atmosphere • Development of own brand	own markets • Exploiting capabilities through licensing
Develop	• Integration into/or new program or phase-out • Building of end-to-end capability ("development to operation")	• Select capabilities to integrate into core product lines • "Spin-in": acquire capabilities and retain key people • Or continue to partner	• Service processes and knowledge stored in global KM database • Utilization in training on the job • Play-back to divisions who develop TBC	• New internal program as profit center with end-to-end capability ("R&D to operation") • Optional "Incumbent start-up enterprise" • Otherwise phase-out	• Symbian is considered a possible "spin-in" for Nokia • Licensing of OS to majority of manufacturers of end user devices
	"Safe sale"	"Build to buy"	"Case method"	"Incumbent start-up"	"Spin-in"

temporarily and generate new concepts for performance architectures from existing capabilities. However, HP's goal is to clearly distinguish service contracts that limit the externalization of capabilities and the diffusion of knowledge. HP tries to avoid external capability distribution in favor of internal, divisional capability development. Experiences from customer cases and operational practice are played back as feedback loops into HP's divisions. Explicit operational and procedural knowledge about processes, technologies, and offers is converted into specific knowledge required for developing HP's time-based capabilities.

Swisscom pursues an approach that could result in "incumbent start-ups." An internal profit center, SC Innovations, initiates a best-in-class alliance model for capability exploration with an auction-style identification of commodity suppliers. Within the alliance model, members share experiences, and tacit and specific knowledge creates new skills and evolves capabilities over time. If successful, Swisscom's next step would be an independent market unit with end-to-end solutions (R&D to operation). Products and capabilities are developed within their own brand. At this stage, the alliance-based capability still is an independent market unit with strong ties in project and knowledge management and considerable equity investments by alliance partners. However, it does not constitute a business model on its own. According to market scope and cost scales, the new capability will eventually be integrated as new program or as "incumbent start-up." At this final stage, the alliance-based capability would contribute to a range of Swisscom's business models.

For Symbian, the situation looks different, as Symbian itself is considered a potential "Spin-in" of Nokia, its major shareholder. Symbian's main purpose is to create knowledge on the group level for its investors and consortium members and to license its operating system. Investors exploit Symbian's capabilities in own markets and playback experiences into joint development groups.

These examples of capability management appear to reflect our notions of exploration, deployment, exploitation, and development of capabilities in the capability cycle. The next section elaborates how the capability cycle can be utilized by a new organizational model.

TOWARD A NEW ORGANIZATIONAL MODEL

A metaphor from chemistry can describe passive innovation.[21] Instead of just mixing elements together in a disorganized fashion, we can use chemical reactions to combine

> elements such as hydrogen and carbon into ordered structures like polymers and proteins. To see how far this kind of process can take us, imagine the ideal chemical refinery. It would convert abundant, renewable resources into a product that humans value. It would be smaller than a car, mobile, so that it could search out its own inputs, capable of maintaining the temperature necessary for its reactions within narrow bounds, and able to automatically heal most system failures. It would build replicas of itself for use after it wears out, and it would do all of this with little human supervision. All we would have to do is get it to stay still periodically so that we could hook it up, drain off the final product and refine the recipe. This refinery already exists. It is the milk cow. And if nature can produce this structured collection of hydrogen, carbon and miscellaneous other atoms by meandering along one particular evolutionary path of trial and error (though it took hundreds of millions of years), there must be an unimaginably large number of valuable structures and recipes for combining knowledge, processes, and capabilities that business architects yet have to discover.[22] (Romer, 2001)

Just as the above metaphor explains how to combine chemical elements according to recipes, we suggest that an entrepreneurial corporate entity may configure capabilities (as a business model's constitutional elements) according to innovative recipes. Such corporate entrepreneurs compete and differentiate their organizations by means of innovative coordination mechanisms that lead to distinctive performance architectures and ways of selecting and coordinating partners in value creation.

In his Nobel prize lecture, Stiglitz (2001, p. 522) calls for a certain degree of centralization for corporate governance and control, as imperfect information limits the organizational ability to decentralize. In this context, business models glean information about markets, enabling the parental unit to configure and coordinate its operative capabilities in business innovation processes. We suggest that such an organization is able to learn from mistakes by utilizing a trial-and-error structure for business innovation. Stiglitz' *polyarchical organizational structures*[23] refer to integration and interoperation of corporate infrastructural services, much in the sense of Stalk's et al. (1992) call for organizations to create infrastructures for the development of capabilities. Polyarchical structures allow the same service to be accessed by more than one business model. The passive innovator provides a service-oriented architecture, allowing several business units to access shared capabilities. By consciously managing capability cycles, capabilities are frequently "updated" and business model managers as "end-users" may concentrate specifically on applying operative capabilities within their performance architecture. In this way, the polyarchical organization basically mediates capabilities among business models.

The Passive Innovator as Parental Business Unit

A parental business unit acts as a *passive innovator* when it performs tasks using a set of skills that we refer to as *coordinative capabilities*.[24] Eigner (2001) suggests that a passive innovator may also be a public institutional infrastructure body. In either private or public capacities, the passive innovator controls and allocates resources, knowledge, and capital, and applies coordinative capabilities, creating a kind of capability holding structure. In this role, the passive innovator must develop and monitor standards for managing capability cycles and the transition of capabilities. The passive innovator must recognize opportunities for developing and acquiring operative capabilities and for making trade-offs within the capability portfolio and across functions. Thus, the passive innovator[25] manages interactions and moves intelligence toward the market-facing business units that are responsible for operations (Sawhney & Parikh, 2001).

Because an operative capability is distributed across functions, building capabilities cannot be treated as an operating matter and must be facilitated by a parental business unit. Only a parental unit can direct an organization's attention and investments to new capability needs and infrastructures.

Companies that compete on the basis of their operative capabilities may have an initial advantage over rivals that do not. As more rivals switch to capability-based competition, however, competing on operative capabilities will become less important than the re-arrangement of capabilities during capability cycles and across various value creation processes in order to reduce transaction costs (Stalk et al., 1992). As operative capabilities are to some extent mutually exclusive, choosing the right ones at the right time is the essence of strategy for the passive innovator. We refer to these specific organizational capabilities as *coordinative capabilities*. Further, we refer to *passive innovation* as a coordination process that allocates capabilities and related resources, propagates capabilities, and disaggregates or spins off capabilities in a timely manner.

Coordinative Capabilities for the Passive Innovator

A basic problem in economics is that of *coordination* – trying to maximize the joint surplus of productive activities and resources among a group of agents (Foss & Lorenzen, 2001). On the enterprise level, the notion of coordinative capabilities builds on Teece's concept of (1990, 1997) dynamic capabilities. Accordingly, coordinative capabilities refer to an enterprise's skill-set in integrating, building, and reconfiguring internal and external routines. Coordination encompasses the unique way in which management assembles operative capabilities in support of a particular strategy, the timing decisions within the capability cycle, and capability-driven growth.

Coordinating operative capabilities to reduce transaction costs, link value chain elements within market spaces, and change interfaces between value creation elements are drivers of the evolution of industries (Christensen, Raynor, & Verlinden, 2001). Even if a company does not own every link in a value chain, the passive innovator works to tie these parts into its own business model by using its *coordinative capability* to access and utilize operative capabilities. The strategic management task of the passive innovator is to position the right operative capabilities in appropriate value creation processes at the right time.[26]

Coordinative Capabilities along the Business Life Cycle

Large organizations are especially vulnerable in dynamic industry environments (Foster & Kaplan, 2001). One approach to revitalizing large organizations is to stimulate market dynamics within individual enterprises by actively trading in markets for capabilities (Eisenhardt & Brown, 1999; Werbach, 2001; Brandimarte, 2001). Using market approaches (internally and externally) to configure chains of capabilities may prove a more adaptive way to allocate capabilities and resources, to propagate capability-led growth, and to disaggregate obsoleting capabilities in a timely manner.[27] Case studies suggest that a large corporation is a portfolio containing multiple business models and related operative capabilities.[28] Parental business units must add value by applying their coordinative capabilities to each business model in their portfolio to enhance the performance of existing business models, to identify new sources of growth through capability management, and to promote rapid market engagement. In short, coordinative capabilities enable the passive innovator to engage in triple-loop learning.[29]

Different coordinative capabilities should be applied to new *versus* mature business models. As business models evolve along their life cycle, different levers for value creation need to be used by the passive innovator. Thus, coordinative capabilities extend and give specificity to the notion of dynamic capabilities (Sanchez, 2001, pp. 143–157) as the drivers of capability cycles.

In this role of managing operative capabilities, the parental business unit as passive innovator has three strategic choices:

- it can allow a business model to move away from the organization's capability portfolio, creating a virtual "stand alone" business unit or a potential spin-off
- it can change its operative capabilities to suit the evolving needs of its business models – a process that corresponds to *transitional processes* in the capability cycle. This option is justified when a majority of the business models within an organization's portfolio require the same new capabilities
- the passive innovator can acquire a new business to add operative capabilities and new business models – a process that corresponds to *transformational processes* in the capability cycle.

Coordinative capabilities change as a business life cycle evolves, following four life-cycle phases with respect to a business model. First, in the *build* phase, business models need to be assembled quickly, launching new value propositions on the market. Often, alliances and joint ventures are as effective as acquisitions in this phase. The passive innovator's primary role is to manage the "deal flow" – to perform potentially high-volume deal screening and creative deal structuring. The passive innovator must frequently review the range of small bets in its portfolio and be prepared to divest quickly if necessary.[30]

Second, in the *expand* phase, successful business models and associated capabilities should be replicated across as many markets and geographies as possible. This process requires *capability distribution* and *capability scaling*.

Third, in the *operate* phase, business models must remain focused on cost and efficiency. The passive innovator's management of the deal flow shifts to identifying opportunities to acquire poor performing business models (with a solid market presence) that can be improved through introduction of better operative capabilities. Successfully integrating operations then becomes key for achieving cost reductions and performance improvements.

Fourth, in the *reshape* phase, when a mature industry suffers from overcapacity, a passive innovator should coordinate a consolidation strategy by acquiring a major competitor or seek to reinvent existing business models by consciously disaggregating and reaggregating value chains. If growth and profitability can thereby be improved, the organization may once again return to the operate phase of the business life cycle. Otherwise, coordinative capabilities in structuring spin-offs are important at this phase.

As our discussion of these phases suggests, in addition to balancing processes of disaggregation and reaggregation, achieving the right blend of divesting and acquisition is also important across the four stages. Table 2 suggests how coordinative capabilities vary along the four stages of the business life cycle, and provides hints about the optimal blend of divestiture and acquisition in each phase. Moreover, the four phases of the business life cycle closely correspond to the four modes of the capability cycle in Fig. 2. The passive innovator's levers for improving value generation at each phase are founded in its ability to coordinate exploration and exploitation of group-level knowledge through the capability cycle.

SUMMARY AND OUTLOOK

In this framework-setting discussion, we have most fundamentally proposed that existing strategy concepts and research objects are not adequate to represent and analyze new competitive landscapes and the impact of ICT on how firms may operate today. Therefore, we proposed the concept of the *business model* as a better framework for researching how innovative value propositions, performance architectures, and revenue models are created and lead to new sources of profits in today's economy. We also introduced the concepts of the *capability cycle* and *capability life cycles* to represent processes for developing new time-based capabilities and distributed capabilities, as organizations consciously seek to change existing business models or build new ones. We identified this process of *capability management* as the key activity of a corporate parent.

By coordinating and positioning capabilities within opportunity spaces, a corporate parent acts as a *passive innovator* in managing an evolving portfolio of capabilities that must be transformed, built, or acquired. In performing this task, the passive innovator employs *coordinative capabilities*. We have not provided procedural descriptions of how a parental unit as a passive innovator can coordinate operative capabilities within market spaces – a topic that remains for future research. However, we have pointed to the need to balance the exploration and exploitation of capabilities in the practice of coordinating capabilities.

Our proposed framework constitutes a meta-theory for describing the process of business design and redesign. Each element in our framework – capability cycle, performance architecture, business model, passive innovator – requires further study and definition in order to be useful in theory and

Table 2. Coordinative Apabilities along the Business Life Cycle.

	Coordinative Capabilities along Business Life Cycle				
	Passive Innovator's Objectives	Levers for Value Generation	Critical Coordinative Capabilities	Critical Operative Capabilities	Divesture/Acqusition Ratio and Measures
Build	• Establish a range of viable business models • Assemble business model's required capabilities	• Innovation • Innovating and developing time-based capabilities	• Industry insights to spot trends and to identify value creation elements with excess margins • Deal screening • Creative structuring	• Idea to innovation • Research to operation • Network to operation	• Ratio: 1 to <1 • Many small bets • Specialization • Frequent review • Divesture of completed business models
Expand	• Grow business models and gain market share • Build dominant business model • Distribute capabilities across markets and industries	• Replication and extension of operative capabilities • Transition of time-based capabilities into distributed capabilities	• Deal structuring • Managerial integration • Capturing synergies	• Marketing to sales • Financial engineering	• Ratio: <1 • Mid-size acquisitions to cross-utilize offers and markets • Divesture when efficiency exceeds growth
Operate	• Drive efficiency of operative capabilities • Stay focused on the "sweet spot" between efficiency and cost	• Cost and capital reduction • Deploying & commercializing distributed capabilities	• Operational integration	• Operations and control • Built to order	• Ratio: 1 • Acquire poorly operated offers and brands • Divest when cost advantage is not sustainable

Reshape	• Rationalize industry structure • Improve industry structure • Close learn loops	• Consolidation • Influence industry value chain • Closing feedback loop evolving time-based capabilities	• Industry insights to spot trends and to identify value creation elements with excess margins • Deal structuring	• Reengineering	• 1 to >1 • Disaggregation and re-aggregation of value chain • Divest to operator if reengineered or as LBO to "harvest"

in practice, and further work is required to operationalize those variables in research. In this effort, we would point to three-key areas of emphasis:

I. Understand coordination mechanisms. New digital technologies are making possible a new kind of network economy that is radically reducing coordination costs and making possible new kinds of distinctive business models. Further changes can be expected to lead to further business model innovations. Hybrid forms of coordination mechanisms that now dominate ICT-based business models may suggest much about the forms of economic organization we will see in the future in many industries.
II. Think in business models and capability cycles. Business models, value propositions, performance architectures, and revenue models are the new variables in strategic management practice and need to be represented in strategy theory. By thinking in life cycles, the enterprise can consciously manage the evolution of the set of capabilities that differentiates one business from its competitors. The capability cycle provides a framework for managing operative capabilities along life cycles. Thinking about business models helps management to focus on understanding how to provide customer utility.
III. Act as a passive innovator. The passive innovator as the value-adding parental unit deploys coordinative capabilities to optimize transaction costs and to manage operative capabilities along the capability cycle. Operative capabilities in a given business unit deliver value to the demand side. Coordinative capabilities help improve value propositions of business units. Coordinative capability refers to the unique way in which a corporate parent assembles operative capabilities in support of a strategy. Passive innovation is the coordinative process that allocates operative capabilities and related resources, propagates capability-led growth, and disaggregates operative capabilities in a timely manner. The passive innovator consciously develops and deploys capabilities within market spaces to propagate its business models within evolving industry structures.

NOTES

1. The Institute of International Management at the University of Graz elaborates on Bateson's (1979) model of learning to fit strategic context.
2. Compare to Gibbon's mode II of knowledge creation, which is transdisciplinary in character and refers to the problem-solving capability on the move.

3. Jagger's *Leadership Connection* (1999–2002) is an annual industry outlook with projections of market conditions and "go-to-market" models for business activities. We have interpreted the absence of go-to-market models as a lack of viable models in a given market space. More than 200 high-tech companies participated with Ernst and Young in preparing the *Leadership Connection* study.

4. The Internet discourse was initiated in spring 2001 and delivered valuable insights during its operation until spring 2002. Network members were selected to secure expert insights and diversity in terms of discipline depth and international reach. The qualitative interviews followed a narrative approach with a set of guiding questions. In the aftermaths of the interviews, interviewees used an internet-based discussion forum for exchanging further thoughts and comments.

5. Insights from our own experience in start-up management of OurElements.com, academic work from the Helsinki School of Economics, and insights from various other academic interview partners at Monash (Olympic Games Knowledge Services), Western Washington, and Stanford Universities, as well as interviews with Agilent/Seattle and Siemens/SFO, and Internet discourse run.

6. In parallel, we have received inputs from discourses that have not been directly connected to our research, such as the annual HSE business simulation series that we have been conducting from 2000 ongoing, participation in the Schumpeter lecture series at the University of Graz, several guest speakers at the IIM, and a number of business events during consulting assignments.

7. "Used labor," "the winner's curse," and "informational externalities" are examples of pervasive information imperfections. "Used labor" refers to individuals locked into a job because they are more risk-averse to accepting an alternative offer. "The winner's curse" refers to the "excess" value of a winning bid in an initial auction that represents an information rent that will be made evident in later auction rounds. "Informational externalities" occur in bidding during parallel auctions, when the price information normally generated in sequential auctions is not available.

8. For example, a guarantee conveys information about a firm's confidence in a tangible product and about its durability and quality. Further, information asymmetries are consciously created by management in order to increase bargaining power, leading to the notion that "knowledge is power."

9. For further research on these aspects of the digital network economy see Hoelzl (2003, 18ff.).

10. An environment created by the potential configurations of tangible and intangible resources. Opportunity spaces lead to the notion of the Opportunity Cube, which is explained in detail in Hoelzl (2003, p. 100).

11. Industries based on the division of labor have two characteristic mechanisms of coordination of resources and transactions between agents: markets and hierarchies (Coase, 1937, p. 338; Williamson, 1975). The selection of a distinctive coordination mechanism (pure market, pure hierarchy, or a hybrid form) depends mainly on associated transaction costs. In the long term, coordination mechanisms that jointly minimize transaction costs and production costs will prevail. Reduction of transaction costs can lead to more efficient business models As a consequence, certain market- or hierarchy-based coordination mechanisms can become more

attractive and business models executing those coordination mechanisms will be more attractive.

12. From the finance viewpoint, appropriately discounted free cash flow determines a business model's value (see, e.g. Brealey & Myers, 1991; Copeland et al., 1996; Stiglitz, 2001).

13. Following Romer (1993) and Schumpeter (1950) who put ideas and innovations in the center of sustainable entrepreneurial activities.

14. See also Loasby (1976), who considers an enterprise as a hypothesis-generating and -testing entity.

15. Hammer (1996) describes characteristics of the process-focused firm as an organization utilizing digitally enabled (or transformed) capabilities that can reach beyond their industry borders.

16. See Table 1: HP's consortia-like ecosystems and Swisscom's internal unit "SC Innovations."

17. See Table 1: Cisco's "horizontal capabilities" and Swisscom's alliance and auction model.

18. See Table 1: Cisco's "build to buy."

19. See Table 1: HP's training on the job and play back to divisions.

20. The Table 1 is based on a survey of leading communication firms at the ITU Telecom World 03 in Geneva.

21. The term passive innovation is adopted from Eigner (2001). Eigner describes in his SpacEconomy passive innovation as an institutional body with strong ties to public orders. Eigner's passive innovator is considered a cultural, social, and commercial incubator. This research defines the scope of passive innovation differently: the passive innovator for the Space Conscious Enterprise is considered a coordinative body within a parental business unit applying leadership and industry foresight.

22. Adapted from Science (1991) and Romer (2001).

23. A *polyarchical decentralized structure* (Sah & Stiglitz, 1985, 1986, 1988) is a design for learning from organizational mistakes, referring to a trial-and-error structure on the level of business innovation. For further work also look up Bhide (2001), Visser (1998), and Christensen and Knudsen (2002).

24. See section "Coordinative capabilities for the passive innovator."

25. One may object that those functions are not well described by the term passive. We use the term as a reference to the innovator's passivity with regard to operations and concrete configurations. It creates conditions of opportunity not the opportunities themselves.

26. This task is described further in Hoelzl (2003).

27. Cf. the related concept of *Pulse* (Hoelzl, 2003, p. 102). Pulse is a transitory business opportunity. Pulses evolve from a coordinative fit between a value creation process and an appropriate capability set within a given window of opportunity.

28. Case studies from McKinsey analysis (McKinsey Quarterly, 2003).

29. See Hoelzl (2003, p. 152).

30. In Cisco's management of its capability cycle, Cisco acquired gap-filling technology to assemble a broad line of network solution products by acquiring 71 companies (and associated capabilities) between 1993 and 2001.

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A STUDY INTO THE ALLIANCE CAPABILITY DEVELOPMENT PROCESS

Koen Heimeriks and Geert Duysters

ABSTRACT

In order to understand persistent differences in alliance performance, we present a model of the alliance capability development process. Given the increasing importance of alliances as a revenue generator and the need for firms to optimize their alliance performance, this study uses experience, micro-level mechanisms, routines and capabilities as key ingredients of the capability development process. Building on an extensive literature review, a model is introduced which represents the alliance capability development process. From this model, three propositions are derived, which relate to the role of experience and capabilities (consisting of micro-level mechanisms and routines) in alliance performance. In doing so, we hope to contribute to the understanding of the process underlying the development of an alliance capability.

INTRODUCTION

Increasingly, scholars are intrigued by the role that capabilities play in the process of creating and sustaining competitive performance (Helfat, 2003).

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This study builds on theories such as evolutionary economics, the resource-based view and more recently the dynamic capability view and knowledge-based view in order to come up with a better understanding of this important topic. These theories suggest that sustained competitive advantage for the firm is dependent on its ability to create and leverage new knowledge and capabilities rather than on a mere reliance on existing resources (Grant & Baden-Fuller, 2002). The overarching aim of related studies is to uncover critical antecedents of consistent heterogeneity in firm performance and rent generation. With respect to the role of knowledge, various scholars suggest that the firm's ability to gather, integrate and leverage organizational knowledge is a primary determinant of long-term survival (Tushman & Nadler, 1978; Grant, 1996).

Recently, the growth in alliances has triggered scholars to investigate the antecedents of alliance performance (Contractor & Lorange, 2002). As firms continue to ally at an increasing rate (Khanna, Gulati, & Nohria, 1998), the relevance of successfully managing these initiatives becomes even more important. Whereas organizational economics pays attention to minimization of transaction costs in alliances, theories such as the resource-based view have allowed scholars to investigate the role capabilities play in explaining performance differences (Combs & Ketchen, 1999; Madhok & Tallman, 1998).

So far, two streams of research have surfaced that aim to increase our current understanding of how firms can develop their capabilities (Ranft & Lord, 2002). The first stream analyzes capability development by examining knowledge transfer *between* firms (see e.g. Lane, Salk, & Lyles, 2001; Appleyard, 2002; Zollo, Reuer, & Singh, 2002). This stream of literature implicitly refers in particular to the transaction cost and game theory logic, thereby proposing exchange and relational factors as key determinants of success (Dussauge & Garrette, 1995; Williamson, 1999). As all firms must rely on capabilities owned by others (Langlois, 1997, p. 288), these studies have analyzed the acquisition of capabilities through alliances (Dussauge, Garrette, & Mitchell, 2000; Inkpen, 1998; Powell, Koput, & Smith-Doerr, 1996). Since alliances are one of the primary sources for external capabilities, extensive attention has been paid to critical factors for successful transfer of capabilities (Tsang, 2002a). Typically, such studies center around the dyadic relationship and the creation of collaboration-specific rents (Madhok & Tallman, 1998) or common benefits (Khanna et al., 1998).

The second stream of research investigates knowledge transfer *within* the individual firm. Whereas the first stream specifically looks at external sources of learning, the second stream centers on internal sources of capabilities. In particular, it focuses on the way in which experiences can be internalized. Consequently, it analyzes the internal processes that foster knowledge absorption, dissemination and integration. This rather neglected research area aims to improve our current understanding of how firms can leverage their experience and develop an alliance capability. This capability allows a firm to apply its alliance knowledge to its entire alliance portfolio, as opposed to learning in individual alliances which is central to the first stream. In the end, this stream of research suggests that capability differences are an essential antecedent of sustained advantages in alliance performance.

Apart from a few exceptions (see e.g. Sivadas & Dwyer, 2000), studies tend to concentrate on either one of the two streams. While these streams rely upon a wide array of theoretical underpinnings, the vast majority builds on the resource-based theory, dynamic capabilities perspective, knowledge-based view and on organizational learning theory. This study builds on the second stream of research and its theoretical underpinnings. Despite significant contributions of both streams of research, neither of the two streams has been able to describe the way in which experience translates into a capability (Kale, Dyer, & Singh, 2002). As Tsang (1999, p. 835) argues 'internationalization itself is a learning process'. Albeit the fact that the internalization process can be critical for the success of a firm's future alliances (Simonin, 1997), little attention has been devoted to understanding the underlying development process (Thomke & Kuemmerle, 2002). A growing body of literature focuses on the identification of micro-level factors that help explain persistent performance differences among firms (Dierickx & Cool, 1989; Sanchez, Heene, & Thomas, 1996). Fujimoto (2000a), for example, shows that the use of micro-level or intra-organizational mechanisms can aid in the selection and diffusion of experiences within the firm. This can be seen as a critical element of the evolutionary process of the firm. Although these studies provide interesting results with respect to the role of micro-level mechanisms on firm performance, the specific processes and underlying concepts remain rather unclear. Therefore, we argue that there is a clear need to study the process underlying the development of an alliance capability. This, however, requires insight into the individual concepts and building blocks of such a capability (Gulati, 1998).

This chapter aims to enhance our understanding of the alliance capability development process. In order to accomplish this goal, we propose a model of alliance capability development, discuss the individual concepts and derive three propositions. In doing this, we hope to engender an increased understanding of the critical issues with respect to the alliance capability development process. Eventually, we aim to provide firms with critical insights into how they can leverage their experience and how they can develop an alliance capability.

DEFINITIONS

The concepts involved in the process of developing capabilities have been subject to obscurity (Priem & Butler, 2000). Many scholars have used different definitions of concepts such as knowledge, micro-level mechanisms, resources, assets, capabilities and competences in relation to the same theory (for an overview see Bogaert, Martens, & Van Cauwenbergh, 1994). In order to gain more insight into this process, clear definitions of the different concepts are required. Various scholars have committed to the daunting task of identifying sound distinctions, thereby proposing different approaches (e.g. Dosi, Nelson, & Winter, 2000; Sanchez, 2001).

Given the need for clarity in this field of study, we would like to define the most important concepts, thereby underlining that these are not universal but suitable and appropriate to this study.[1]Following Bohn (1994), Glazer (1991), Kogut and Zander (1992) and Zander and Kogut (1995), we define 'knowledge' as information that allows one to either be able to use (know-how) or to understand and create (know-why). 'Resources' are defined as the stock of available factors (tangible or intangible assets) owned or controlled by the firm (Amit & Schoemaker, 1993; Wernerfelt, 1997). A 'capability', however, refers to the capacity to deploy resources (Mahoney & Pandian, 1992; Makadok, 2001). Therefore, building on Kale et al. (2002), we define an alliance capability as the firm's ability to capture, share, disseminate and apply alliance management know-how and know-why. This ability of the firm refers to the extent to which the firm can ensure that this know-how and know-why becomes embedded in its repeatable patterns of action (Sanchez et al., 1996). Therefore, capabilities are firm-specific, require interactions among resources and are subject to learning (Teece, Pisano, & Shuen, 1997). A 'competence' is different from a capability in that it enables the firm to sustain the way in which it deploys its resources in order to achieve its objectives (Sanchez et al., 1996). This refers to a meta-capability or a firm's ability to develop its capability.

As alliances continue to grow not only in absolute numbers (Duysters, De Man, & Wildeman, 1999), but also in relative numbers (i.e. percentage of revenues coming from alliances) (Harbison & Pekar, 1998), a firm's ability to enhance alliance success becomes even more important. In order to increase our understanding of how firms create enhanced alliance performance, most studies have been preoccupied with investigating the role of experience (see e.g. Powell et al., 1996). In addition to experience, some other studies have analyzed the influence of certain mechanisms on performance (Kale & Singh, 1999). For instance, Kale et al. (2002) suggest that an alliance function can significantly improve a firm's long-term alliance performance. An alliance function helps to disperse and leverage alliance knowledge generated within the firm. However intriguing these findings may seem, what remains unclear is the interaction between experience, micro-level mechanisms, an alliance capability and performance (King & Zeithaml, 2001; Simonin, 1997).

THEORY ON ALLIANCE CAPABILITY DEVELOPMENT

Experience

Various scholars have investigated the role of 'experience' as an antecedent of firm performance from different theoretical perspectives and empirical settings (e.g. Ingram & Baum, 1997; King & Tucci, 2002). As discussed above, theories such as evolutionary economics and organizational learning provide fundamental guidelines to analyze this link. Some studies have analyzed the role of experience and learning curves in realizing productivity gains and rent-generative capacity of firms (Dutton & Thomas, 1984). The majority of these studies suggest a positive relationship between experience and performance, thereby implicitly indicating that experience is an influential variable in the alliance capability development process (Teece et al., 1997; King & Tucci, 2002). For instance, Lei and Slocum (1992) reckon that lack of experience and ignorance are of fundamental concern when it comes to alliance failure. Gaining experience can allow a firm to enhance its problem-solving capacity, as it has to devote less time to solving a particular problem (Bereiter & Scardamalia, 1993, in Koka & Prescott, 2002, p. 800). Moreover, using prior experiences may enable a firm to become more effective at foreseeing and proactive managing the alliance process (Das & Teng, 2002).

In addition to these studies, other scholars investigated firm differences in learning curves thereby mainly referring to organizational learning theories (e.g.

Lapré & Van Wassenhove, 2001). In these studies, experience is seen as the primary driver of a firm's learning curve (Stata, 1989). For instance, King and Tucci (2002, p. 172) differentiate between static and transformational experience. Mukherjee, Lapré, and Van Wassenhove (1998) identified operational and conceptual learning, thereby referring to an understanding related to respectively know-how or input–output stream and know-why or cause and effect relationships. These typologies are essential as they reflect the paradoxical causal effect of experience. On the one hand, experience fosters inertia and routinization (Lorenzoni & Lipparini, 1999) and on the other hand it allows firms to readjust organizational memory and routines in general (Flaherty, 2000). The dual effect of experience is thus likely to lead to routines and foster organizational change (Amburgey, Kelly, & Barnett, 1993).

In line with earlier research, we define alliance experience as the collective body of knowledge generated through a firm's former alliances. This knowledge consists of lessons learned and will have to be absorbed in the minds of employees in order to become an organizational routine that allows a certain task or activity to be performed in a repetitive manner (Nelson & Winter, 1982). The fact that experience is tacit by nature poses a challenge to firms, as it requires an awareness of its importance and a conscious commitment to internalize accumulated experiences. For instance, only as experiences are codified in, example, a best practices handbook can they be spread throughout the firm and used by a larger number of employees in future alliances.

With respect to alliance research, various scholars have studied experience as an explanatory variable of alliance performance (Kale & Singh, 1999; Makino & Chan, 2002). Although most studies find a positive effect, some studies find a curvilinear (Anand & Khanna, 2000), some studies find curve linear (Draulans, De Man, & Volberda, 2003) or inverted U-shaped relationships between experience and alliance performance (Deeds & Hill, 1996; Hoang, Rothaermel, & Simac, 2003). Overall, these studies point to a positive relationship between experience and alliance performance. There are number of reasons for this positive effect. First, experience is said to provide firms with an increased ability to handle and foresee critical issues in alliance management. Simonin (1997) for instance points to the firm's ability to select partners and reduce complexity in the alliance process. Mohr and Spekman (1994) underline the need for firms to foresee and act when case conflict arises. This can be handled better if a firm has prior alliance experience. Therefore, experience can be seen as a facilitator of a firm's ability to both foresee and act throughout the alliance process.

A second reason why experience is an important explanatory variable of alliance performance lies in the fact that experience fosters the development of 'common perspectives' (Nonaka, 1994, p. 24). These common perspectives are important as they influence a firm's ability to absorb new knowledge (Lane & Lubatkin, 1998; Grant, 1996). A firm's absorptive capacity is important since it determines the extent to which a firm can assimilate and exploit new knowledge (Cohen & Levinthal, 1990, p. 135). As Penrose (1959) stresses that knowledge is a highly important asset of the firm, storing and disposing of knowledge for timely availability and future use is essential (Miller, 2002). Various researchers have looked at the influence of absorptive capacity on the rate of learning in alliances (Hamel, Doz, & Prahalad, 1989; Shenkar & Li, 1999; Lane et al., 2001). In line with these studies, Merali (1997) reckons that for knowledge to be optimally leveraged, it needs to be thoroughly embedded in a firm's routines and practices. As a result, different empirical studies from varying backgrounds have indicated that prior experience is salient in shaping a firm's future capabilities (Helfat, 2000). Consequently, in line with previous work in this area, we suggest that alliance experience is an important predictor of alliance performance.

Proposition 1. Prior alliance experience positively influences alliance performance.

Capabilities

As mentioned before, resources, capabilities and competences have become central issues in strategic management literature (Mahoney & Pandian, 1992; Henderson & Cockburn, 1994). Related theoretical perspectives are the resource-based view (Pfeffer & Salancik, 1978), the dynamic capability view (Eisenhardt & Martin, 2000) and the competence-based view (Prahalad & Hamel, 1990; Sanchez et al., 1996).[2]Studies referring to these perspectives have pointed to experience as an explanatory variable for a firm's capability. Although these studies yielded considerable insights, it generally remains unclear *how* a firm can develop an alliance capability (Kale & Singh, 1999).

With respect to the differences between resources and capabilities, various scholars have separated these two strategic concepts. Following Penrose (1959), who separated management of resources and management as a resource, Hunt and Morgan (1996) differentiated between respectively lower- and higher-order resources and Henderson and Cockburn (1994) compared component and architectural competence. Likewise, Fujimoto (2000b) identifies three levels of capabilities: static, improvement and evolutionary capability. The firm's ability to gather capabilities is captured in the terms of evolutionary capability. Overall, as Makadok (2001) reckons, these differences help us understand the difference between the firm's ability to pick resources and its ability to develop capabilities. Picking resources refers to a firm's economic rents generated as a consequence of its resource selection, whereas developing capabilities relates to the deployment of a firm's resources. This is typified by Dosi et al. (2000, p. 2), who underline that capabilities should allow a firm to realize its goals, thereby filling the gap between intention and outcome.

In line with the distinction between resources and capabilities, it is the firm's ability to use or deploy its experience that yields an increment in performance. Thus, experience per se is not sufficient (Kale et al., 2002) and the quality of experience is highly dependent on the underlying learning processes (Tsang, 2002a). Therefore, as Simonin (1997) suggests, firms should actively manage the way in which experiences are used and dispersed. Only if lessons are internalized and transferred can lessons have a significant impact on alliance performance.

Following Kale et al. (2002, p. 750) and Sanchez et al. (1996), we define an alliance capability as the firm's ability to capture, share, disseminate and apply alliance management know-how and know-why (i.e. knowledge) and its ability to embed this in a stable and repetitive pattern of action. Our definition of alliance capability adds two distinct components to Kale et al.'s definition. First, in line with the distinction proposed by Makadok (2001), we add the element of 'application' to the definition. We feel that it does not suffice to merely gather the knowledge. A capability also refers to a firm's ability to use its accumulated experiences. And second, as a consequence of the first aspect and stressed by Sanchez et al. (1996), the accumulated experiences need to be embedded in the organization's practices and routines. Different micro-level mechanisms can be used to foster the process of capturing, gathering and disseminating experiences and embedding these in the organization's patterns of behavior (Dyer & Nobeoka, 2000; Zollo & Winter, 2002). In the end, a firm's capability is to a great extent determined by its micro-level mechanisms that help translate its experience into standardized practices and routines. Therefore, in order to understand how firms can develop their alliance capability, it becomes essential to investigate the micro-level mechanisms firms use to disperse their accumulated experiences and to study how they develop routines.

An alliance mechanism is an intra-organizational feature or device, which a firm can use to manage its alliance portfolio. It aids in capturing, sharing, disseminating or applying alliance management know-how. Alliance mechanisms can be categorized as functions, tools, control and management processes and external parties.[3] Table 1 depicts what mechanisms belong to what category.

Alliance mechanisms play a critical role in the alliance capability process for various reasons. First, these mechanisms enable firms to internalize its accumulated experiences in a structured way. Not only do these mechanisms act as an information-processor, they also help embed experiences into the organization's routines. Providing feedback about lessons can enable a firm to leverage the lessons learned (Kale & Singh, 1999) as well as allow it to

Table 1. Alliance Mechanisms.

Functions	Tools	Control and Management Processes	External Parties
Vice-president of alliances (1)	Internal alliance training (7)	Responsibility level for alliances (20)	Consultants (27)
Alliance department (2)	External alliance training (8)	Rewards and bonuses for alliance manager (21)	Lawyers (28)
Alliance specialist (3)	Training in intercultural management (9)	Rewards and bonuses for business managers (22)	Mediators (29)
Alliance manager (4)	Partner selection program (10)	Formally structured knowledge exchange between alliance managers (23)	Financial experts (30)
Gatekeeper or boundary spanner (5)	Joint business planning (11)	Use of own knowledge about national differences in international alliances (24)	
Local alliance manager (6)	Alliance database (12)	Alliance metrics (25)	
	Use of intranet to disperse alliance knowledge (13)	Country-specific alliance policies (26)	
	Alliance best practices (14)		
	Culture program (15)		
	Partner program (16)		
	Individual evaluation (17)		
	Comparison of alliance evaluations (18)		
	Joint evaluation (19)		

Source: Duysters and Heimeriks (2002).

learn in a continuous fashion (Pisano, 2000, p. 131). Moreover, such micro-level mechanisms serve as a platform for the transfer of experiences (Brown & Duguid, 1991). For instance, using a formalized structured way of knowledge exchange among alliance managers can help to ensure exchange and dispersion of experiences.

Since various studies confirmed that routines and practices aid in realizing productivity and performance gains (Joskow & Rozanski, 1979; Argote, 1993), these mechanisms seem to play an important role in shaping routines or stable patterns of behavior. For instance, Tsang (2002b) argues that sharing experience among alliance managers is an important way to disperse knowledge. Moreover, Fujimoto (2000a, p. 276) finds that an 'internal evolutionary mechanism' helps to ensure the evolutionary process of organizational routines. As employees create short-term solutions to certain problems, they aid in establishing routines and practices and capabilities. In this way, mechanisms help to standardize and repeat routines (by creating operational effectiveness and efficiency) and diffuse new routines (creating optimal learning potential). Furthermore, given the rate of depreciation of knowledge in various industries (e.g. due to employee rotation or the turnover rate of employees), routines become critically important to retain and transfer knowledge (Argote & Darr, 2000). Micro-level mechanisms can play a very important role in ensuring adequate dispersion of knowledge to become embedded in a firm's routines in a timely fashion. This dual function of mechanisms can – when simultaneously applied – help develop a firm's ability to solve problems (Fujimoto, 2000a, p. 277), as well as act as a meta-capability to change routines (Amburgey et al., 1993; King & Tucci, 2002), which aids to optimize the learning potential of the firm.

Second, various mechanisms can help to coordinate tasks and responsibilities (Spekman, Isabella, & MacAvoy, 1999). Installing certain mechanisms can aid in assigning clear task and role responsibility so as to assure a sufficient degree of control (Mintzberg, 1983, pp. 4–9). Grant (1996) argues that rules and procedures, which support coordination, are an important way to integrate knowledge. For instance, the use of alliance metrics allows a firm to measure the extent to which goals are realized.

Third, certain mechanisms can support day-to-day alliance management activities. Increasing the knowledge of employees on particular stages of the alliance life cycle can enhance performance. Using for instance alliance trainings or an alliance database facilitates access to recurring pitfalls in day-to-day alliance management. Conflict situations may be avoided when firms use joint business planning to align the partners' goals and expectations (Mohr & Spekman, 1994).

Fourth, the use of micro-level mechanisms can spread a signal throughout the firm that alliances are deemed important. They reflect a dedication on the part of the firm. As mentioned earlier, a firm's routines play an important role in the development of a firm's alliance capability (Spekman et al., 1999).

The other aspect of an alliance capability is inherent in a firm's routines.[4] Micro-level mechanisms form an essential antecedent of routines (Florida & Kenney, 2000). The combination of mechanisms and routines fosters the development of an alliance capability.

Routines can vary from firm to firm and therefore contribute to our understanding of why differences in firm performance tend to persist (Coriat, 2000, p. 216). Mechanisms allow a firm to both develop and change routines as new experiences can be transferred through its mechanisms to adapt its routines. Moreover, the fact that routines can be seen as the equivalent of individual skills (Nelson & Winter, 1982, p. 73) suggests that knowledge can be applied in an efficient manner when dispersed via micro-level mechanisms.

Within the context of this study, routines are defined as the higher-organizing principles through which knowledge is captured, shared, disseminated and applied. They provide the basis for repetitive patterns of actions in alliances. For various reasons, routines play an important role in the alliance capability development process. First, a routine contains a problem-solving or learning aspect and a control-oriented aspect (Coriat, 2000). As firms capture, share, disseminate and apply alliance-related knowledge, they are basically involved in a learning process. When doing this, lessons are derived from experience and spread to others in the firm. The control-oriented aspect of routines is related to the fact that firms should control for the effectiveness of the adoption of knowledge in the learning process. The combination of learning and control may create a dynamic effect and alter in a firm's routines, which can help overcome organizational inertia (Hannan & Freeman, 1984). Although repeated practices can enhance a firm's alliance capability as it translates experiences into routines, the firm can remain strategically flexible when it learns from new experiences and adopts new routines (Eisenhardt & Martin, 2000). In this way, it can both exploit existing practices while at the same time explore newly generated insights which are transferred via its mechanisms. This cyclical process is reflected in Fig. 1, the alliance capability development process, by the loops that are depicted between experience, mechanisms and routines.

Second, as a result of the first reason, routines are essential building blocks of capabilities (Dosi et al., 2000, p. 4). The firm's set of repeatable

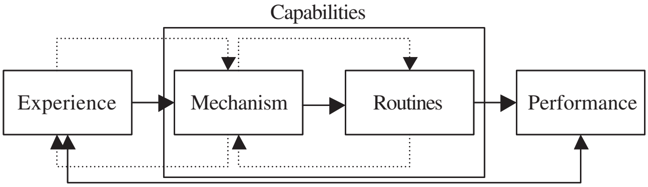

Fig. 1. A Model of the Alliance Capability Development Process.

patterns of actions, consist of technical and social skills (March, 1994), which ensures a smooth functioning of the organization (Coriat, 2000, p. 214). These are embedded in the firm's organizational memory and are critical to the creation of efficiency one on one hand and learning on the other hand. Thus, we posit that a firm's alliance performance depends on the mechanisms it has in place that help capture, share, disseminate and apply its alliance knowledge in repeatable patterns of actions.

Proposition 2. A firm's alliance capability is positively related to a firm's alliance performance.

Interaction between Experience and Capabilities

The third relationship this study wishes to address concerns the interaction effects between experience and capabilities. As both a firm's experience and its capabilities are posted to have a significant influence on alliance performance, firms that simultaneously gain experience and successfully process this via its micro-level mechanisms are expected to have a performance advantage over those firm's that do not. Although experience may positively influence alliance performance, it depends on a firm's ability to integrate these experiences whether or not it can develop an alliance capability (Simonin, 1997). Therefore, we expect that the interaction effect between experience and capabilities significantly influences a firm's alliance performance.

Proposition 3. Alliance experience and alliance capability reinforce each other's effect on alliance performance.

Therefore, the interaction effect among alliance experience and alliance capability is likely to be positive.

ALLIANCE CAPABILITY DEVELOPMENT PROCESS

Following the logic above and inspired by Zollo and Winter (2002, p. 340), we propose the following model to link the different concepts. In the model, experience is the primary antecedent of a firm's alliance capability. A firm's alliance capability then is a critical mediating variable of its alliance performance.

As in previous studies, this model proposes experience to be a primary driver of an alliance performance. However, we do not merely expect a direct relationship between experience and performance, but suggest experience to be a key driver of the alliance capability process. As a result, a firm's alliance capability is proposed to be a mediating variable. As we expect that reality is more complex than merely gaining a lot of experience in order to be able to improve alliance performance, this model represents a more subtle process. Moreover, using experience as a sole explanatory variable of alliance performance would underestimate the complexity involved in alliance management. Given the complex nature of alliance management (Park & Ungson, 2001) and learning in alliances (Inkpen, 2002), this model does not pretend to be exhaustive. However, it does aim to provide a better understanding of the factors involved in creating insight in the alliance capability development process.

We expect the alliance capability development process to be subject to iterations. The model suggests a link between experience via capability to performance. However, as learning is an interactive and highly volatile process, we expect various loops to be relevant as well (Argyris, 1977). Trial and error and learning-by-doing are highly relevant concepts when it comes to developing capabilities. Consequently, the capability development process tends to consist of incremental improvements (Fujimoto, 2000a). Not only is experience likely to be an important input for the micro-level mechanisms, but the latter will also provide new insights that in turn will influence experience. For instance, an alliance manager's experience can be highly relevant input for an alliance database. We also expect that the use of the database provokes exchanges of other employees involved that may lead to new insights for the alliance manager at hand. Overall, the complexity of the alliance capability development process is evident and this study intends to create increased understanding of this process.

In principle, the model suggests three relationships. First, alliance experience is expected to influence a firm's alliance capability. Second, alliance capability is said to influence a firm's alliance performance. Third, alliance experience and alliance capability are expected to be related, which implies that interaction effects could significantly influence alliance performance. Besides these primary relationships, we also expect a direct relationship between experience and performance to be of importance. Especially in the case when firms have low experience levels, we reckon that accumulated experience may have a positive effect on performance. However, in general, we expect knowledge generated through experience to positively influence alliance performance as a result of the dispersion and leveraging of that knowledge. Moreover, alliance performance can eventually also provide highly relevant information, which can be seen as an important input for experience. After all, gaining insight from earlier alliances and their performance lies at the very heart of the development of an alliance capability.

DISCUSSION AND CONCLUSION

Alliances continue to play an increasingly important role for firms. Being aware of the differences in rates of organizational learning (Pisano, Bohmer, & Edmondson, 2001), this study has tried to uncover the intra-organizational factors that are inherent in capability development process. Given the complexity of the nature of capabilities and the obscurity surrounding related terminology (Dosi et al., 2000), recently extensive research has been conducted to uncover the role of capabilities in explaining differences in performance and rent generation among firms. Whereas former studies tend to focus on only one of these aspects, this study has tried to pinpoint how a firm can develop an alliance capability. The proposed conceptual model (see Table 1) depicts the process that incorporates different constructs which are found to be relevant in a variety of studies. Our model suggests that experience and capabilities, which consist of mechanisms and routines, are key variables in this process. Three relationships are derived from the model, which provide the basis for three propositions representing the relationships between the main explanatory factors of alliance performance.

So far, various theoretical perspectives and empirical settings have served to investigate the role of experience in explaining persistent performance differences among firms. Studies building on organizational learning theory and evolutionary economics helped to gain insight into experience and divergent learning curves in organizations the resource-based view. Similarly, alliance research has enhanced our understanding of the critical role of experience in improving alliance performance. However, a direct relationship between experience and alliance performance seems highly unlikely and a more subtle process seems to underlie this relationship. Consequently, various scholars suggested experience to be a predominant variable for capability development (Hoang et al., 2002; Kale et al., 2002). Experience is an essential aspect in the alliance capability development process because it helps firms to become aware of recurring pitfalls. Moreover, shared experience ease the adoption of new knowledge through the creation of common perspectives (Nonaka, 1994), thereby increasing a firm's rate of learning.

As experiences are a critical input to create routines (Nelson & Winter, 1982) and micro-level mechanisms serve to transfer experience, a capability is the set of repeatable patterns of actions that result from a firm's mechanisms. Consequently, mechanisms and routines are the two components that underlie the process of developing a capability. Mechanisms are essential in the capability process as they help integrate experiences and knowledge. Moreover, they can help coordinate tasks and responsibilities as well as support day-to-day alliance management activities. In addition, these mechanisms represent a dedication and commitment on behalf of the firm to pay attention to alliance management.

In essence, micro-level mechanisms represent 'physical artifacts', implicitly referring to an essential element of organizational memory and routines as defined by Moorman and Miner (1997). They represent 'an intent to learn', thereby referring to a firm's dedication to develop an alliance capability (Hamel, 1991). Investing in these mechanisms will stimulate knowledge articulation and codification, underlining a firm's commitment to deliberate learning (Zollo & Winter, 2002). And, as Nonaka (1994, p. 17) argues, 'commitment is one of the most important components for promoting the formation of new knowledge within an organization'. For instance, when a firm has an alliance department this indicates a deliberate and conscious commitment to integrate, internalize and disperse relevant knowledge.

Obviously, the mere existence of these mechanisms will not be sufficient to develop an alliance capability. This requires an additional condition, which is the effective use of these mechanisms so as to embed prior experiences in organizational routines. Capturing, sharing, disseminating and applying this knowledge will result in repeatable patterns of action, which creates both efficiency gains and learning opportunities for a firm.

Mechanisms in turn are an essential antecedent of routines, because these repeatable patterns of behavior create the basis for efficiency gains. As experiences are translated into the organizational memory via micro-level mechanisms, a firm will be better able to handle recurring problems in alliances. Moreover, the average skill level of a firm's employees will be raised as new experiences are consciously dispersed and shared among them.

This will enable a firm to adopt new experiences in their routines and create a basis for organizational learning.

Overall, experience, micro-level mechanisms and routines are prominent concepts in the alliance capability development process. However, as presented in our model, this is not merely a linear process. As shown in the model, enhanced alliance performance revolves around a learning process, which involves various loops. Furthermore, we are aware of the fact that environmental changes can render obsolete a firm's set of routines which at the same time can limit its ability to adapt (Levinthal & March, 1993). Incremental improvement and continuous updating of mechanisms and routines are thus required if firms want to spread experiences on a continuing basis so as to gain sustained alliance performance in the end.

NOTES

1. For an overview of definitions and discussions on this topic, we refer to Von Krogh, Roos, & Kleine (1998) and Sanchez (2001).
2. For a comparison of these theories, we refer to Teece, Rumelt, Dosi, and Winter (1994) and Sanchez (2001).
3. See Duysters and Heimeriks (2002) for an empirical analysis of the relative impact of different mechanisms.
4. For an extensive overview of the concept 'routines', I refer to Nelson and Winter (1982), Prahalad and Hamel (1990) and Coriat (2000).

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