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The Outsiders' Blessing:

Radical innovation through corporate entrepreneurship in small-established firms

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Abstract

Scholars have for long time emphasized the role of corporate entrepreneurship and the impact of radical innovations as a mean for economic development. Despite a large set of knowledge and literature, focus has mainly considered large established firms or start-up firms. Small-established firms have in this context been left out, and these firms are unique in the condition they bear specific characteristics of both small and of large firms. The current paper aims to examine the role of corporate entrepreneurship in small-established firms in the development of radical innovations. Theoretical propositions argue that small firms have advantage by their entrepreneurial behavior in comparison to large firms. Present enquiry defines and evaluates corporate entrepreneurship according to the five dimensions; innovativeness, pro-activeness, risk-taking, autonomy and competitive aggressiveness. Empirical evidence demonstrates through a qualitative multiple-case study that the role of corporate entrepreneurship was significant in the development of radical innovations in small-established firms. It appeared that pro-activeness, risk-taking and autonomy were most important in the firms' corporate entrepreneurship.

Keywords: Radical innovation, corporate entrepreneurship, small-established firms

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1. Introduction

1.1 Problem description

Many scholars have investigated the impact of small and medium sized enterprises (SME), and its influence and contribution of innovations for the economic development (Dutta and Evrard, 1999; Rothwell, 1989). Schumpeter (1934) was presumably one of the first that claimed the importance of radical innovations, as a vital driver to gain new entries and as an essential driver of the advancement of the economic and industrial development. But radical innovations are still a large tricky challenge in the context of SMEs since radical innovations are often associated with bringing additional implications such as larger uncertainties and discontinuities (Leifer et al, 2001). And requires additional capabilities and resources in comparison to incremental innovations (Herrmann et al, 2007).

Prior research in the area shows ambiguous evidence of the effect of radical innovations in both small and large firms, why there are such different results from research concerning radical and incremental innovations might not be completely surprising when research demonstrates that both entrepreneurs, policy makers and academics all have different definitions of what is associated with radical innovations, what are the means behind and what environment are most favorable in bringing forth radical innovations (Massa & Testa, 2008). The difference between incremental and radical innovations is explained in various definitions, one generally defines incremental innovations as those that retain a firm's competitive position, and radical innovations as those that radically change the marketplace (Leifer et al, 2000).

Research that has focused on underlying attributes of extracting radical innovations first concluded that firm size, with an implicit larger resource base, is the variable that constitutes the main influence on firms' capability to produce radical innovations, but later turned and argued that firm size is an independent variable, and claimed that firms' organizational competencies are instead at the core of radical innovations. These competencies are examined as willingness to cannibalize their own investments and in their place focus on new paths. These concerns should be regularly introduced at firms' core competencies in order to develop radical innovations (Chandy and Tellis, 1998; Nijssen et al, 2005). Supplementary research claims that large firm size, with scale and scope opportunities, is more associated with and favoring of incremental innovations, which demands less firm flexibility and mobility than radical innovation does (Koberg et al, 2003).

Small-established firms

Definitions of SME vary across countries and industries. In order to distinguish between SME and large firms a number of criteria are established. Examples of different criteria for classifying firms in size classes are number of employees, annual turnover, annual balance sheet and autonomy (OECD, 2004). Small firms are in this matter associated as those with fewer than 50 employees, medium firms between 50 and 250, and large firms those that exceed 250 employees. They can further be classified regarding firm age, where new ventures are defined as those younger than 6 years (Zahra et al, 2000), and those that are older are thus assumed to be regarded as established firms.

Regarding size-specific characteristics, there is research presented that smaller firms in comparison to large firms more often are associated with constraints such as lack of manpower, lack of financial resources and are short of skilled labor (Dutta and Evrard, 1999; Freel, 2000; Kaufmann & Tödtling, 2002). By contrast they are characterized by supporting features concerning innovativeness, such as lack of hierarchy, open boundaries, mobility and high-developed adaptability (Ackroyd, 1995). Additionally research argues that other size-specific characteristics that are associated with smaller firms are for instance, less bureaucracy, efficient internal communications, and ability to develop partnerships (Nooteboom, 1994; Van Dijk et al, 1997).

Many studies have emphasized and in various forms explored large firms' innovative ability, both in terms of their weaknesses and their strengths. What's favoring large firms is much related to their large resource base, which implies they often possess skilled technical labor, technical expertise in terms of rich external networks and large indoor research. In contrast research indicates that large successful firms often fail and that they have inabilities to produce radical innovations even though they have a large resource base, which is one undertaking for innovativeness (Rothwell, 1989). Evidence shows that large firms often possess saddled routines and customers, aspects that hamper their ability to innovate. It often turns out that they keep responding to customers demand, and keep sticking to familiar and mature technologies, instead of experimenting with novel technologies for finding new paths, supporting radical innovations (Christensen, 1997; Ahuja and Lampert, 2001; Lokshin et al, 2009).

Except that firms' resources are argued to constitute one factor for addressing radical innovations, it's further argued that factors such as ability to commercialize innovations, is another significant factor (Sorescu et al, 2003). Research on large firms states that such firms seem to be short and face difficulties of commercializing radical innovations (Stringer, 2000), and even that large firms in general are considerably less generative in bringing radical innovations (Henderson, 1993). Research is ambiguous and in contrast, studies state that dominant large firms that have a larger resource base are those that constitute the largest source of radical innovations and also that those that are brought to the market are more financially valuable then those brought by smaller, non-dominant firms (Sorescu et al, 2003; Craggs and Jones, 1999).

Firms' capacity to develop radical innovations is thus linked to there various characteristics. These characteristics are further assumed to be of importance to utilize in order to survive and compete in the ever-changing business environment. Meanwhile, both large firms and small firms have been explored in various forms. It's expected that there are firms that possess characteristics of both small and large firms. These firms possess small firm characteristics, such as lack of legitimacy, visibility and flexible internal routines that rapidly manage to respond to changing demands. Simultaneously, they hold large firms characteristics, which are experience, technical skills and a large body of knowledge. It's assumed that these small-established firms are a relatively unexplored area, and constitute a research gap in existing research.

These assumptions advance interests in small-established firms and how they compensates their lack of size-specific characteristics generating advantages in innovation, by harnessing behavioral and entrepreneurial activities in their innovation processes. Small-established firms are in this context considered to be those that have less than 50 employees and are older than 8 years.

Corporate entrepreneurship (CE)

Corporate entrepreneurship (CE) has for several years and in many studies been proved to be a strategic practice for firms working in aggressive business contexts that both contribute to improved and increased financial firm performance (Covin & Zahra, 1995; Schumpeter, 1994). Several scholars have for many years put focus and studied concepts of corporate entrepreneurship, which make the concepts widely recognized and explored. Corporate entrepreneurship is generally defined in the presence and arena of innovation, rejuvenation, redefining of organizations, industries or markets in order to achieve competitive advantage (Covin & Miles, 1999).

Additional studies claim that radical innovations are the fundamental undertakings in entrepreneurial activity (Ahuja & Lampert, (2001). Based on previous research, concepts of entrepreneurship and especially corporate entrepreneurship, is associated as the driver of *what* is happening in the firm (Dess et al, 2003). More specifically it could be defined as a new entry is undertaken; the firm enters a new market with a new product, service or process. That could be put in comparison to *what* is happening in the firm, thus the argument could be advanced as to *how* the new entry is undertaken, which is linked to the firm's entrepreneurial orientation (EO), that is practices, methods and decision-making managers use in order to behave entrepreneurially (Lumpkin and Dess, 1996; Lassen et al, 2006).

Motivation

Much of prior research has focused on studying various forms of corporate entrepreneurship in different contexts, both in large established firms and in small firms (Lassen et al, 2006; Dess et al, 2003; Lumpkin and Dess, 2001). Based on prior research, which indicates that large and small firms bear different characteristics that are linked to both size, age, cultural and social aspects, it's assumed that there are firms that simultaneously possess both large firm characteristics, as well as small firm characteristics. How large and small firms practice corporate entrepreneurship as a means to develop radical innovations is according to the literature review already in place. What's then of interest is partly how this category of small but established firms pursue their entrepreneurial behavior in order to generate radical innovations. And what role corporate entrepreneurship has in their innovation processes. Small-established firms are in this context expected to be an unexplored area, in comparison to large and small firms. This set of firms is particularly interesting and important from an economic perspective when small enterprises account for more than 25 % of the European unions total turnover and employ approximately 60-65% in several of Europe's largest countries (Dutta and Evrard, 1999). Those that manage to utilize both large and small firm characteristics are expected to hold a strong competitive advantage and are an important set of firms in the context of the economic and industrial development. Examining this subject is at the core of this paper, and the objective is consequently to contribute and add theory-building insights in the area. The paper aims to draw a set of cross-case comparability in terms of analytical generalizations, which are based on a multiple-case study.

1.2 Research question

Research question(s):

What role has corporate entrepreneurship in small-established firms when developing radical innovations?

- Identify characteristics associated to small-established firms that have developed radical innovations.
- Examine how they pursue certain entrepreneurial dimensions when they develop radical innovations.

1.3 Thesis disposition

The paper will consist of six chapters, where the first will address an introduction where the reader will get a short guide through the subject and achieve knowledge concerning prior and basic research in the area. Discussions and arguments about current problems and research gaps will take place as well as definitions of the research question and purpose.

The second chapter will constitute the theoretical framework that will be used in the paper. In-depth examination will take place and clarify theoretical models and definitions that the paper will be based on and will use as a benchmark in the empirical work.

Subsequent chapters will describe the research methodology, which is what research design, research strategy, and research methods have been considered. The different standpoints will be analyzed; strengths and weaknesses of methods chosen and those that have been neglected will be elaborated.

The fourth chapter, empirical findings, will address data from the five case studies.

After the data are collected the empirical findings will be analyzed in the fifth chapter, which is based on theoretical models and definitions that have been used.

The sixth chapter will address the paper's contribution to existing literature. It will further provide managerial implications that are based on experience from the multiple-case study. It will end up with suggestions on future research.

2. Theoretical framework

The current chapter aims to outline the theoretical framework for the present paper.

2.1 Introduction

The role of innovations and their position in entrepreneurial activities has for several decades been widely recognized as a means for economic development. Schumpeter (1934) was likely one of the first that acknowledged its extensive influence. Simultaneous with scholars focusing attention to innovations and their effect on the general industrial development new concepts on the various forms of innovations have emerged.

2.2 Literature review

The study of innovations and their positive effects on both SMEs and on large firms is a subject that has been well explored over the last few decades (Hansen, 1992; Acs and Audretsch, 1988; Van Dijk et al, 1997). The impact of innovations in firms is consistent, and reveals that it constitutes an important factor in order to retain firms' competitive edge. Innovations could generally by definition be defined as the commercialization of an invention (Schumpeter, 1934). And even though the concept of innovations is so widely recognized as important for firm performance, radical innovation is a subject that is faced with large inconsistency in both SMEs and in large firms. These inconsistencies can partly be explained by studies that show the concept of innovation, from a broad perspective. As being perceived differently all the way from its definition by entrepreneurs, academics and policy makers, it inserts implications that bring constraints for the fostering of innovations, where policy makers support firms in a way that is not perceived as positive efforts for firms' development of innovations. The different viewpoints on innovation perspectives further introduce contradictions in the mutual work about how research should progress in the future, both concerning the practical work as well as in the academic research (Massa and Testa, 2008). The role of radical innovation is thus expected to be challenged, based on the wide misalignments concerning innovations and radical innovations.

Most research that has focused on radical innovations does not only perceive radical innovation from different perspectives. Researchers also choose to define the concept differently from each other. Leifer et al (2001) define a radical innovation as "a product, process, or service with either unprecedented performance features or familiar features that offer significant improvements in performance or cost that transform existing markets or create new ones".

Some studies claim that radical innovations are equal to disruptive innovations (Christensen, 1997), and highlight the distinction between regular innovations with disruptive innovations from the definition of regular innovations as improvements in old technologies, which are demanded by customers. Disruptive innovations are in this matter associated with those innovations that are not associated with being improvements of old technologies, instead it's a package that consist of a new technology with a new set of attributes, not previously existing and not demanded by customers. Radical innovation is in this matter, in contrast to the previous definition, not linked to costs. Focus is instead on the character of the technology. The new package with a new set of attributes is new to the market, and will in time outperform the ordinary innovation based on old technology. Gradually the disruptive innovation, with

a new technology will conquer customers of the old technology (Christensen et al, 2000; Bower and Christensen, 1995).

Additional research extends previous definitions of what radical innovations are and also what the underlying dimensions are (Caraynnopoulos, 2009). In contrast to prior argument does current argument use a more diffuse distinction between incremental or sustained innovations with radical innovation. The present argument bases radical innovations in terms of disruptive technologies, where radical innovation and incremental innovation are each other's opposites. In between there is both architectural and modular innovation. And all four types, incremental, architectural, modular and radical innovations can all be classified as disruptive technologies. The determining factor of what a product or process should be, is decided by existing knowledge. It's argued that knowledge can be divided along two dimensions, modular knowledge that is knowledge regarding the underlying components, and architectural knowledge, that is knowledge about how these components are connected. When firms thus manage to bring knowledge both about the underlying component and knowledge about how a particular component is linked to another component, the firm has compiled a radical innovation (Caraynnopoulos, 2009).

How do we measure and define radical innovation?

In order to elaborate radical innovation projects in firms, it's necessary to establish a mutual definition regarding what's perceived as a radical innovation project. The current paper thus establishes a proposition based on definitions by Leifer et al. (2000) and O'Connor and McDermott (2004), which argues that a radical innovation project needs to comprise at least one of the three following:

- Significant (30-50%) reduction in cost.
- New to the world performance features.
- Significant (5-10 times) improvement in known features.

What's in common for most definitions of radical innovations is that the underlying dimensions in the definition mostly concern two aspects, technology and market, in comparison to incremental innovation that emerges on a continuous basis and is linked to improvements in previous products. Does radical innovation emerge on a discontinuous basis, which is related to new technology and to a new market. In order to focus on radical innovation instead of incremental innovations, firms need to possess both the resources and the competencies that manage to produce such products that are new to the market. They also need to have organizational capabilities that can disregard existing and old markets and shed light on creating new ones (Hermann et al, 2007).

What's challenging and characterizing radical innovation projects is that producing radical innovations is often associated with an arena of several uncertainties commonly anticipated and linked to technology and market concerns. One of these is market uncertainty, which implies a question of whether there are any needs of the customers when the products are produced and the technology emerges and is launched. Another is technological uncertainty, which includes whether the technology works and fulfills the expected requirements. Firms are also exposed to organizational and resource uncertainties. Organizational uncertainties refers to whether the organization manages to recruit the right people for the project, and whether the team have the right

management to lead the project. Other organizational uncertainties are concerned with issues of how to deal with conflicts between mainstream operations and the parts engaged in radical innovation projects. Resource uncertainties that are linked to radical innovation projects concern issues of whether the project team have appropriate financial resources, competencies and partnerships with external contacts (Leifer et al, 2001).

2.2.1 Small-established firms

There are numerous ways and procedures in order to distinguish and classify small and medium sized enterprises. Most countries use and apply different classification criteria and standards. Many countries also distinguish between a legal and a statistical definition. The legal definition based on recommendations from EU covers annual turnover, annual balance sheet, independence and number of employees. The main criterion for the statistical definition usually considers number of employees, see table 1. Those EU countries that don't use the legal definition mostly use a simplified legal version, which implies that variables such as number of employees and annual turnover are the only ones included (OECD, 2004).

Table 1

	Number of empoyees
Micro firms	<9
Small firms	10-49
Medium firms	50-249
Large firms	250>

The importance of radical innovations has been declared in research and literature in a substantial extent during the latest decades, both how radical innovations are pursued and developed in large as well as in small firms. Meanwhile, the literature partly clarified characteristics of radical innovation, and the difference between various innovation concepts. Have size, age and behavioral-specific characteristics and their effect on large firms as well as on small firms been examined. And the way these characteristics influence the development of radical innovations. Even though this large body of knowledge has been provided during years of research, it's expected that there are firms that have both characteristics of large firms and of small firms. They simultaneously fulfill some of the definitions of both large and small firms and it's expected that the existing research has missed this group of firms. It's then assumed there is a gap in the existing literature.

Firms can according to age be categorized with the threshold of 6 years, which implies that those firms younger than 6 years are founded as start-ups or new ventures (Zahra et al, 2000) and those that are older are expected to be categorized as established firms. The expected research gap consists of firms' that are established, that is they are neither new ventures nor start-ups, concerning age-specific characteristics. But they are still small according to the number of employees, which implies that they have less than 50 employees (see Figure 1). Small-established firms are thus in this context consisting of those firms that are older than 8 years and have less than 50 employees. It's further assumed that these particular firms have characteristics of both large established firms and small firms and thus bear size, age and behavioral specific characteristics of both large and small firms. Small-established firms thus possess characteristics such as high flexibility, mobility and closeness to customers and have a potential of high

entrepreneurial organizational behavior, simultaneously as they have characteristics such as large external network constellations, skilled technical labor, a relatively large resource base and lot of experience.

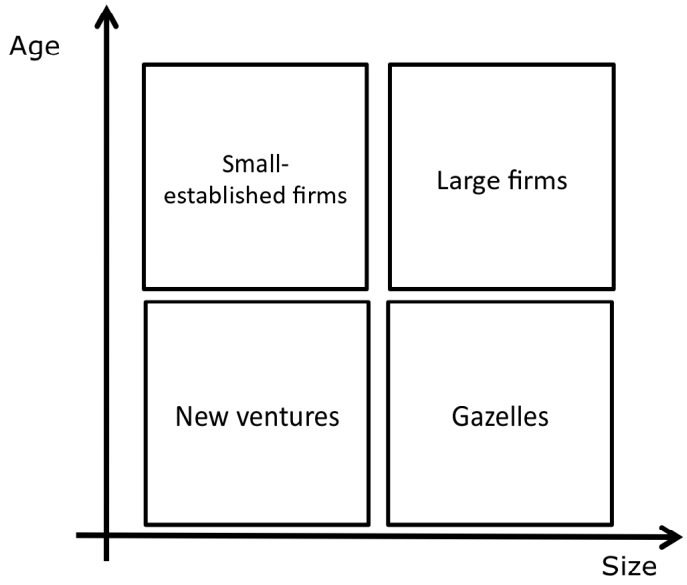

Figure 1

Much of today's research states that cause of different size, age and behavioral characteristics is innovative activity supported by different means for small and large firms (Acs & Audretsch, 1988; Hansen, 1992). Where small firms tend to have more behavioral advantages. That is higher level of motivation, higher capacity of customization, and more diversity that is related to flexible learning and knowledge capacity favoring radical innovations. Large firms, in contrast, tend to have more size-specific advantages (Nooteboom, 1994; Rothwell, 1989; Sorensen and Stuart, 1999; Carayannopoulos, 2009).

Studies have focused on large firms claim that according to size-specific characteristics. These firms are generally associated with having a large resource base, in comparison to smaller firms, which can be expressed in various forms. As one effect of having large resources, large firms can have afforded a larger R&D laboratory, they have the strengths to financially attract highly skilled specialists and have larger distribution and servicing facilities. In addition to having a large R&D laboratory, they have the muscles to purchase technical expertise and if they want to focus on core businesses instead of having indoor research they can choose to outsource all research. Financial strengths imply that expansion opportunities are increasing as well as funds to put aside for patent registrations and patent take-over. Moreover, larger firms have larger opportunities to get access to capital markets and get funds for R&D investments. In order to diversify risks and financial investments they can further invest in a larger portfolio with several products for various markets and industries (Rothwell, 1989).

Except for the advantage of having large financial resources, large established firms do often have a large and rich network that is available when they need external knowledge. Another positive effect of being a large player is that the legitimacy linked with the companies name and reputation, opens a lot of doors, especially when they

searching for potential partners, financial capital, new markets and public agencies that they previously did not been related to the firm. There is also a lot of prestige, for many partners and agencies, in having connections to a large company and the legitimacy that goes with it (O'Connor and McDermott, 2004).

In comparison to large firms do small firms lack in several aspects considering size-specific characteristics. They often have a considerably smaller resource base, which implies they often lack qualified technical expertise and resources to examine and utilize external sources as a means for increasing the technological knowledge. They further have difficulties in getting access to financial capital and financial institutes (Rothwell, 1989; Freel, 2000). Direct financial support, such as private equity constitutes a fundamental concern in small firms ability to innovate and commercialize innovations (Kaufmann and Tödtling, 2002). With a small financial resource base it's further more difficult to attract private equity and pursue acquisitions of possible partners or competitors. Lack of financial resources does also imply difficulties to gain from economics of scale and payoffs for patent registrations and patent applications. Moreover, it entails that the number of product efforts are stricter and there is a need to only concentrate on a few products. Portfolio diversification and spread of risks is thus not a frequently occurring means (Rothwell, 1989; Freel, 2000).

Small firms are short of in several perspectives, as an effect of smallness and a more strictly limited amount of resources. With these shortages and characteristics, and because of their lack of external contacts, the need for small firms in engaging in external partnerships and networks is thus a bit more important. Another effect of smallness and the limited amount of resources is lack of trust, something that constitutes a barrier in the search for formal collaborations (Dutta and Evrard, 1999; Freel, 2000; Hausman, 2005). It's further been proved that small firms generally lag behind larger firms in terms of the use of new technologies, which often turns out as a result of a lack of necessary skilled manpower (Dutta and Evrard, 1999). A reason why small firms have such inabilities to attract skilled technical labor, which is argued to be an essential resource for innovativeness, is difficulties in matching the high wage rates (Freel, 2000). Another reason why small firms often lack in skilled manpower is the limited career opportunities that exist in small firms. The effect implies that small firms are in need of supporting high skilled employees to grow and develop, and try to provide advancement. The consensus of small firms' shortages and future challenges is to counter these current constraints and innovate both from organizational and technological perspectives and construct partnerships and networks (Dutta and Evrard, 1999; Freel, 2000).

In contrast to disadvantages associated to size-specific characteristics related to small firms, they do also have numerous advantages because of the same characteristics. Research stresses that small firms are often associated with characteristics such as lack of bureaucracy, efficient internal communication systems, high flexibility and nearness to market (Freel, 2000). Studies emphasize that small firms are often characterized by an organizational structure that consists of a lack of hierarchy and where the organization are more functional in a matrix-oriented structure with pervious boundaries, where organizations tend to adopt a more project-oriented approach, in comparison to large firms that tend to work more in processes without any specific objective, time line, and predetermined resources. Anticipated effects of the mentioned characteristics are that small firms are extremely mobile and flexible. They have a high

adaptability and rapidly adapts to the continually changing customers' demand (Ackroyd, 1995; Freel, 2000). A consequence of high flexibility and a high adaptability is closeness to customers, and that small firms are very applicable for customizations and innovativeness. Small firms are thus more proper for niche markets, and have more behavioral qualities such as managing to transform technology in several of the new technology-product-market arrangements (Nooteboom, 1994). Additional and consistent studies argue that features such as smallness, youth, and niche market operations characterize small firms. In niche markets they were getting rid of large firms' scale and scope advantages, with features such as different network constellations from those constellations large firms possess.

The result of these characteristics, specifically for small young firms, is that they achieve additional attributes characterized as lack of legitimacy and low visibility. Which implies that when small firms have a thin track record of operations they will be less prone to be perceived as legitimate and less prone to be visible to large firms they will eventually challenge. The same thing occurs, with a thinner and less established network constellation. And with those small firms operating in niche markets. The mutual implication and its effect is that small firms get rid of large firms attention. These features are on the one hand threatening their survival, but on the other hand they constitute beneficial attributes that makes smaller firms superior in commercializing radical disruptive technologies in comparison to large firms (Carayannopoulos, 2009).

It also indicates that perceptions of lack of legitimacy of a new product reduce the chances that large firms will choose to practice development and commercialization of their own edition of the innovation (Carayannopoulos, 2009). Other studies show that small firms that operate under a lack of legitimacy and have produced radical innovations possess several benefits. While these firms operate in niche markets and not in mainstream markets, many large firms remain to focus on innovations in existing products instead of developing new products. These small firms can then commercialize their radical innovations; while the larger incumbents in mainstream markets ignore them. The radical innovation made by the small firm can then with time conquer customers and with time also the mainstream market before larger incumbents realize them (Christensen, 1997). Thus, it's argued that liabilities such as lack of legitimacy constitute advantages for producing and commercializing radical innovations for small firms (Christensen, 1997; Carayannopoulos, 2009).

Supplementary research argues that small young firms organizational behavior is more applicable in a rapidly changing business environment. And their capabilities fit best for the generation of radical innovations. Older firms benefit more from their organizational routines and processes where the environment is more stable and they can focus on basic and fundamental research, such as the generation of incremental innovations (Sorensen and Stuart, 1999).

Table 2: Small firm characteristics in innovation

Advantages	**Disadvantages**
Lack of bureaucracy	Small resource base
Efficient internal communication systems	Lack of legitimacy
High flexibility	Difficulties to get access to capital markets
Nearness to market	Lack technical manpower
High adaptability	Old technology
Lack of hierarchy	Lack portfolio diversification
Customized products	
Niche market operations	
Reconfigure technology	

Challenges for small-established firms

While small-established firms possess a variety of characteristics of both large and small firms, they are also exposed to large challenges. Studies claims that established firms are faced with behavioral-specific characteristics that appear to constitute disadvantages (Christensen, 1997; Ahuja and Lampert, 2001). And small firms are exposed to size-specific characteristics that cause disadvantages. It's thus of significance for small-established firms to master these characteristics associated with established firms and small firms in order to efficiently produce radical innovations.

Challenges associated with behavioral-specific characteristics of established firms:

- Short-term focus.
- Threat of cannibalization.
- Internal conflicts as an effect of emerged need of engaging external knowledge and rearrangements in old settings and compositions.
- Mastering formally established routines and processes and bureaucratic mindset.
- Support individual entrepreneurial initiative.
- Focus on new technologies.

Some of the characteristics associated with established firms are concerned with saddled routines and processes, where they are serving certain established customers. The effect is that they abandon a long-term focus and exploring new paths that will generate radical innovations (Christensen, 1997). Static firms tend to be less flexible and have more difficulties in respond to a changing business environment and thus have more difficulties in producing radical innovations. Consistent research stresses that established firms too often assumes that means and routines for projects that have produced incremental innovations will work as well in projects for radical innovations (McDermott and O'Connor, 2002; O'Connor and McDermott, 2004).

Additional challenges for small-established firms are those firms that aim to produce radical innovations and simultaneously have products on familiar markets and are highly exposed to large strategic issues of the threat of cannibalization. Such issues can when cannibalization concerns emerge provide internal difficulties and conflicts with mainstream operations (Chandy and Tellis, 1998; Nijssen et al, 2005). Another strategic issue is that firms when they engage in radical innovation projects need to extend current knowledge base in the firm, which can lead towards conflicts against those who

already work in the firm that feel threatened. Focusing on radical innovation projects instead of ordinary incremental innovations in an R&D laboratory may also provide challenges when inside competence needs to be transferred into a new set of compositions outside the R&D laboratory in new settings (McDermott and O'Connor, 2002). There is currently a large mismatch; many large firms believe that the previous team composition for incremental innovation projects should be similar to the team composition in radical innovation projects (O'Connor and McDermott, 2004).

Supplementary challenges associated with behavioral-specific characteristics and established firms are concerned with internal mechanisms that constantly block and inhibit advancement of new ideas and entrepreneurial activities. Large established firms are often very slow-moving, and have a bureaucratic mindset with lots of formal channels were all new ideas, and entrepreneurial initiatives need to go through. They are further often associated with a large hierarchical decision making structure that supports the slow-moving approach and contribute to a long office turnaround time for new ideas (O'Connor and McDermott, 2004).

Many established firms are currently lacking in developing routines and systems supporting radical innovation projects. Those that presently exist are more often concerned with incremental innovation projects. Studies claim that drivers behind radical innovation output in large firms are not the organization per se. It is individuals and individual initiatives that drive radical innovation. What appears to be important, is to have individuals that on their own, with their entrepreneurial behavior manage to bypass established firms' slow-moving bureaucratic systems with many formal channels that need to be managed during all procedures from idea to output (O'Connor and McDermott, 2004).

What's then challenging for firms is to support these individual actions that are mechanisms for radical innovations, construct systematically implemented processes for supporting, and rewarding radical innovation activities, such that firms achieve radical innovation capabilities that iteratively produce radical innovations over and over again. These systems and processes should as well include management systems and emphasize the importance of organizational culture (O'Connor and McDermott, 2004; O'Connor and Ayers, 2005). Further challenges for small established firms, in order to produce radical innovations, are to look beyond established routines and processes for incremental innovation projects. Instead of using technologies that are old for the organization, they should explore novel technologies. It's also of significance to focus on emerging technologies in the industry, such technologies that are recently developed. These technologies are argued to increase the opportunity of producing breakthroughs. Additionally, when firms work for producing new products, it's vital to study new arenas for finding new solutions and not try to find new solutions near old ones, which will contribute negatively to exploring new paths and new radical innovations (Ahuja and Lampert, 2001).

In order for firms to distinguish themselves from competition they need to possess and handle their resources in a proper manner. Simultaneously they need to have the right competencies, which they need to build, adapt, integrate, reconfigure and release in a dynamic fashion if they want to gain sustained competitive advantage through the development of radical innovations (Hermann et al, 2007). It's assumed that small-established firms possess some of these characteristics of both large established and

small firms. Namely small firms behavioral-specific characteristics and large established firms resource-specific characteristics. This group of firms is then assumed to be an important influence in the economic development. While research has focused on both large established firms as well as small firms, it's interesting to examine, the expected research gap, how small-established firms with a different setting of characteristics pursue radical innovations.

These assumptions and expectations advance the interest of how small-established firm characteristics more specifically are shaped and operationalized. And how their organizational behaviors, with their different setting of characteristics influence their development of radical innovations. That is how they apply entrepreneurial activities and what role these activities have in the development of radical innovations.

2.3 Corporate entrepreneurship (CE)

Entrepreneurship has for several decades been studied by various researchers, and its undertaking for economic development is thus widely recognized (Schumpeter, 1934). Entrepreneurship can be defined as creating new organizations and assumes that individual entrepreneurs are those that create and develop the organization. And as fast as the organization is developed ends the entrepreneurial activities. While entrepreneurship has been in focus for decades the concept of corporate entrepreneurship (CE) has been studied only the last few years. Partly as an effect of the need that has emerged from firms that seek to outperform competitors and increase firm value, flexibility and growth. When entrepreneurship emphasizes the creation of a new organization corporate entrepreneurship, in comparison, focuses on how to innovate on behalf of an existing organization. It implies that corporate entrepreneurship is concerned with developing new businesses within existing firms and it implies they aim to increase the firm's profitability, and generate competitive advantages (Carrier, 1997).

Corporate entrepreneurship can further be defined as "…processes where an individual or a group of individuals, in association with an existing organization, creates a new organization, or instigate renewal or innovation within that organization" (Dess et al, 2003).

It's further argued that if firms manage to perform CE in an efficient way it's an applicable means in order to outperform competitors through innovations (Dess et al, 2003). Additional studies define corporate entrepreneurship as "the presence of innovation plus the objective of rejuvenating or purposefully redefining organizations, markets, or industries in order to create or sustain competitive superiority" (Covin and Miles, 1999). From the two definitions above it states clearly that CE can adapt various means. It can adapt four different forms, namely sustained regeneration, organizational rejuvenation, strategic renewal and domain redefinition. All four forms are associated and do in some way bring competitive superiority. And all four tell us what is happening in the firm (Covin and Miles, 1999; Dess et al, 2003).

Corporate entrepreneurship could be expressed in various forms, one alternative is to engage in *sustained regeneration,* which implies that firms in a continuous manner introduce new products, services or enter new markets. When firms conduct sustained regeneration they are associated with firms' that have cultures, systems and structures that promote innovation. The second form of CE, *organizational rejuvenation*, includes that those firms that adapt this form strive to change their internal organizational

processes, structures and capabilities in order to sustain or improve their competitive position. *Strategic renewal* implies, with the organization as a benchmark, that firms redefine their corporate strategy, that is redefine how the firm should compete and behave within its business context, moreover, how the firm's relationship interface with it's environment should be reconfigured in order to sustain or improve its competitive advantage. The last form of CE, *domain redefinition*, refers to such entrepreneurial activity where the organization develops new products for new markets. They create a new market, which implies that they adopt first mover position and by that hope for sustained competitive advantage (Covin and Miles, 1999; Dess et al, 2003).

Corporate entrepreneurship is in this context explains what is happening in the organization, that is, what specific mechanisms and means are pursued to gain superior advantages. Corporate entrepreneurship can in this perspective answer the question what business should the firm enter? What's of additional interest is the question of how the firm should enter the specific business. That is a firm's entrepreneurial orientation (EO) and represents those processes, decision-making activities and practices that guides to the new entry. A firm's EO can consist of several specific key dimensions that support the firm in achieving a new entry. Studies by Lumpkin and Dess (1996) argue that these dimensions that characterize a firm's EO include (1) autonomy, (2) innovativeness, (3) risk taking, (4) competitive aggressiveness and (5) pro-activeness. The impact of each dimension in a firm's EO can vary across firms, and in some instances some of these dimensions can be totally left out. Since each specific occasion of firms acting is unique it's further argued that these five dimensions could operate in independence, simultaneously as they can covary. What determines how they react to each other and what influence they have on the firm's overall EO is decided with regard the environmental and organizational context (Lumpkin and Dess, 1996).

The current paper will in its empirical section emphasize two elements, see Appendix 1. Where the first element will investigate and focus on general information in the small-established firms. The present part will focus on subjects such as organizational structure, power structure, market share of the company and industry structure of competition. The examination will further stress organizational characteristics, and what main advantages and disadvantages in comparison to their competitors do the firms experience.

The second examination element focuses on the five previously mentioned dimensions in a firm's entrepreneurial orientation, by Lumpkin and Dess (1996). Which in this empirical inquiry are translated and interpreted accordingly:

Pro-activeness: The term pro-activeness is associated with firms' capacity and inclination to manage processes that aim to capture new business opportunities. It further means how firms' are related to market opportunities, how firms manage to take initiative and shape the environment and create new demand and needs. Pro-activeness is in this paper operationalized interpreted according to which extent firms introduce initiatives for seeking and seizing new market opportunities, more specifically by whom and why are initiatives taken in the radical innovation projects. What are the reasons behind the project? Is the project an effect of problems they have faced, is it by specific needs they have perceived or is it cause by expected changes in the market?

Risk taking: The subject of risk-taking is based on five factors. The first factor refers to firms' propensity to engage in projects that are unfamiliar to the firms, or in projects

with uncertain return. The second factor is defined according to firms' decision-making procedure regarding resources, for instance how structured is the process? The more structured and rational the procedure is, the more risk averse is the firm. The third factor considers firms' tendency to apply evaluation techniques when they decide whether to engage in the project or not. Firms that practice several or advanced financial-, non-financial evaluation techniques are argued to be more risk averse than others. The fourth factor relates to present planning techniques applied in the projects'. It's argued that the more and advanced planning techniques are pursued in the projects, the more risk averse are the firms, the final factor reflects management involvement in the projects. That is support, communication and information exchange, firms with large amount of management involvement are considered to be such firms that are less willing to adopt risk in their projects.

Autonomy: To investigate the level of autonomy two main factors have been considered. The first factor which is labeled authority considers the project's level of independence and the level of delegated authority from management. The second factor considers the characteristics of the project, that is level of informal processes and how much flexibility the project and its members had. The more flexibility the project had, the more autonomy. If the project was required to deliver formal reports, updates or reviews, it's considered to have less amount of autonomy.

Competitive aggressiveness: Implies a firm's propensity to outperform its competitors in a specific marketplace. That is how the firm relates its own act to competitors existing in the marketplace. In the current study firms' competitive aggressiveness will be evaluated according to how they are scanning the competitive environment, what kind of search mechanisms are utilized? And how they develop corporate objectives and strategies considering competitors' strategies and objectives?

Innovativeness: Reflect firms' propensity to engage in and encourage novelty, new ideas, experimentation and processes that generate new services, products or processes. In addition it reflects firms' willingness to explore new options and ways in which they achieve increased value in terms of new products, services or processes. Innovativeness is in the current paper operationalized defined according to the three criteria:

- Significant (30-50%) reduction in cost
- New to the world performance features
- Significant (5-10 times) improvement in known features

Within the firms' radical innovation projects, the product need to fulfill at least one of the criteria in order to be defined as a radical innovation.

3. Research methodology

Conducting business research implies several choices and procedures that research can make use of. The purpose of this chapter is to outline methodological approaches used in this research paper and elaborate supporting arguments. The present chapter will start to outline the chosen research strategy, it will continue with research design and end up with research method.

3.1 Research strategy

The fundamental departure and benchmark in most business research projects is the choice of what research strategy should be incorporated. According to Bryman & Bell (2007), researches have two main strategies to choose among, a qualitative research approach or a quantitative research approach.

Qualitative research is mostly associated with emphasizing words and expressions and is mostly associated with inductive research concerning the relationship between theory and research, which implies that theories are extracted from research. It further supports *interpretivism* that argues for clear distinctions between humans and social science; research can be regarded as scientific without the need of being able to collect measurable observations. Qualitative research presumes and rejects the notion that scientific research should and/or could be generalized. Moreover, it support *constructivism*, which assumes that social integrations and behavior are integrated with social phenomena, such as organizations, and are also examples of means for developing social phenomena (Bryman & Bell, 2007).

It's considered that business research is exposed to a variety of influences and paths to adopt. In order to provide a hypothesis associated to firm specific un-quantifiable observations, the current paper aims to examine social integrations and behavior in the context of organizations. It's further argued that hypotheses that the paper seek to provide are not considered to adopt a statistical generalized character, implications form the paper will instead be of an analytical generalized character. An implication of current demands of the paper implies that the paper will constitute a qualitative nature.

3.2 Literature review

In order to conduct business research, pursuing a systematic literature review is one of the first issues to consider and deal with. Undertaking a systematic review is regarded as a fundamental scientific activity (Tranfield et al, 2003). Before starting a research it's important to know what's already known, so that a situation when prior research has already investigated the area of interest of the researcher does occur. Other means of systematic literature is to reveal to your readers that you are knowledgeable and well prepared in the subject, that you have a clear understanding and are capable of making interpretations of theories and concepts regarding prior scholars. By being very proficient, it could further be a mechanism for addressing the need and importance of your research that will fill a gap in prior research (Bryman & Bell, 2007). The process of conducting a systematic review could be divided into several steps, Tranfield et al (2003) suggest that such a process possesses certain key characteristics, which the current paper literature review will be based on, and the key phases of this process are:

Conducting a review – based on keywords and search terms a comprehensive unbiased search is pursued (see Appendix 2).

Search strategy

When conducting a review, additional undertakings could be adopted, Pittaway et al (2004) lists several appropriate steps a systematic review could be based on, which will be undertaken in this paper, these steps are:

- Define the research objective.
- Identify keywords.
- Develop certain search strings and combinations based on the keywords.
- Databases (Business Source Premier (EBSCO), Scopus and Google Scholar) chosen were to be used when pursuing the search with the search strings.
- The review was summarized in order to reach and refine research objective.

3.3 Research design

The subsequent phase in conducting business research when a research strategy and a literature review is established, is to determine what research design is most appropriate. The choice of design does not clarify how data should be gathered, instead what should be explored, explained or described. And one commonly well-known design is the case study research.

When are case studies appropriate to use?

The case study research is a design that brings detailed and intensive in-depth analysis of a single case, which could be a person, an event or an organization etc. It is an empirical inquiry that focuses on situations where there will be several variables of interest and which relies on various sources of evidence with data needed to unite results. It guides data collection and analysis from prior developed theoretical propositions. A case study research could be defined as:

> *"…illuminate a set of decisions; why they were taken, how they were implemented and with what result"* (Yin, 2009).

It should be noted that case study research could include multiple- case studies, as well as a single-case study. Even though multiple-case studies have some links and similarities with the comparative design that aims to compare data and observations between cases or situations, it's still argued to be case study research (Bryman & Bell, 2007).

Theory building case study research is applicable to conduct in situations where little is known about a certain phenomenon and current perspectives are inadequate since it have too little empirical consistency. Theory building case study research is in these situations appropriate since it does not rely on prior literature or previous empirical evidence. And it's thus particularly suitable in early stages of research in a topic or to provide newness to an already examined area (Eisenhardt, 1989). Before determining what research design is most applicable it's vital to synchronize with research questions. The way the research questions are formulated is deciding of what form the method will take. Research could be of exploratory, explanatory or descriptive nature, and which path the research adopts is dependent on how the research question is framed. "What" questions seem to be exploratory in nature and are both linked to surveys, experiment

or case study approaches. Also, questions that start with "how" and "why" are associated with case study research (Yin, 2009).

Why are case studies used?

Theories from case study research have significant strengths such as testability, validity and novelty. Given the strengths of its independence from prior literature and past empirical evidence, it's particularly convenient to new research areas where existing literature is lacking (Eisenhardt, 1989). The current paper aims to investigate a research area that is both new and old. It's been explored in terms of theoretical propositions but it's new in the sense that these propositions have only been tested in certain specific empirical circumstances. The current paper will focus on a particular set of conditions that prior research has rejected. It will thus provide new interesting theory-building evidence, but it's not frame breaking in the sense that it's totally new to prior research. In order to enhance generalizability, validity and deepen the understanding of the occurrences it's appropriate to apply numerous case studies instead of only one case study (Miles and Huberman, 1994).

The essential problem in the current paper will be the examination of the concern around "what" role corporate entrepreneurship was in small-established firms and "how" do certain firms practice behavioral characteristics. The core of the research will be to illustrate, and develop an understanding around the concept of corporate entrepreneurship in the development of radical innovations in the context of small-established firms. It's assumed that there will be several variables that will influence numerous sources of evidence that need to be merged in order to achieve reasonable results. Simultaneously a number of firms will be examined, which implies that a cross-case hypothesis's will be provided, which is aimed at extending analytical generalizations, which implies that the current research aims at generalizing a particular set of results to some broader analytical theory. Of the mentioned conditions it's argued that an explorative multiple-case study is convenient for current research objectives.

Case selection

Cases that were selected for the current research are such firms that needed to fit certain criteria, these are:

- The firms existed for more than 8 years
- The firms had engaged in radical innovation project(s)
- The firms had fewer than 50 employees

External validity

Since the current paper has pursued a multiple-case study it provides an increased external validity. By pursuing a multiple-case study it has also increased the papers opportunity to establish analytical generalizations. In order to increase the papers validity all the interviews have been tape-recorded with the interviewees' approval.

3.4 Research method

Subsequently, the research strategy and the research design have been determined, it's the decision as to whether data should be collected and what technique should be applied that needs to be clarified. The collection of data is based on two main sources. The first source constitutes by secondary empirics, which are academic literature. The

present source has then outlined the guidelines and directions for the gathering of data in the second source, which are first hand empirical findings, more specifically a multiple-case study. The analysis will then combine the theoretical framework with the multiple-case study. In order to collect evidence for the multiple-case study, there are numerous ways and sources of doing that. Some examples are; documents, archival records, participant-observation, physical artifacts, interviews and direct observation. In order to maximize the quality of the research is it appropriate to use as many sources of evidence as possible (Yin, 2009). The current research aims only to practice interviews, which is cause of limited amount of time and the restricted scope of the research. It is thus applicable to remind of the weaknesses of practicing interviews and the impact of only using one source of evidence. Although only interviews will be conducted, the interviews are of semi-structured nature, and thus provide data from different perspectives. Some part of the interview will possess structured questions while others will be of open-ended character.

Interview guide

The data collection in the current inquiry focuses on CEO/owners or project leaders that have pursued radical innovation projects in the firm, in order to establish replication logic, and increase the external validity between the cases where an interview protocol developed (see Appendix 1)**.** The first part of the protocol consists of structured questions and concerns general information about the firm's characteristics, market, industry and competitive priorities.

This kind of interview is also called standardized interview, which is related much to the standardized nature of the interview schedule. The idea behind this kind of interview is that the interviewer conducts questions in such a way that respondents' answer easily can be aggregated and categorized. This implies that a prerequisite is that the interviewers give the same kind of questions to all respondents and each interview exactly follows the same order as the prior and next-coming interview. All questions are framed and extracted in same manner to all interviewees, which both facilitates aggregation and quantification of data as well as it is a demanded, in order to retains validity.

The second part of the interview guide relates to information concerning the radical innovation project and more precisely the firm's organizational behavior. The firm's organizational behavior or its entrepreneurial behavior is in its containment associated with the 5 dimensions of entrepreneurial orientation. This part of the interview is thus adopts a more unstructured approach.

In comparison the structured questions are the unstructured questions stressing interviewees' own opinions and statements, focusing on the interviewee's point of view and interest, which necessarily does not need to fit any scheduled answer sheet that is more of importance in quantitative research. Qualitative research is in this sense much more flexible, interviews can be carried out on several different occasions with different interviewees, questions don't need to be standardized and can range to some extent between interviews. Additional questions that occur during interviews are appropriate to put forward, adjustments are approved, and most important for the interviewer is to receive rich and detailed answers (Bryman & Bell, 2007).

A semi-structured interview, as the current paper will conduct, is more adherent to an interview guide where the questions are framed and asked in the same or similar order for all interviews that are carried out. This kind of approach is of particular interest when conducting a multiple-case study, when it's needed for some sort of structure in order to ensure cross-case comparability (Bryman and Bell, 2007). Although, specific aside steps are applicable and new emerged questions that arise during an interview are appropriate to bring up. Whether the researcher should adopt a totally unstructured or semi-structured interview style is much due to research specific objectives, the level of structure in the interview is partly based on how much pre-idea and pre-focus about the research the researcher have. With a more clear idea about specific issues it might be appropriate with a semi-structured interview, which will provide more specific data. By using more structure in the interview, the interviewer receives more issue-specific data. In opposite if an unstructured interview is performed, the data have a much more general nature. The choice of using semi-structured or unstructured interviews is also linked to and influenced by the choice of research design. For instance, in cases where multiple-case studies will be performed, it's more appropriate with semi-structured interviews, which implies that data can be more comparative to each other (Bryman & Bell, 2007).

Conduct qualitative interviews

In order to preserve high quality of the data collections the use of a comprehensible language and not asking leading questions was of concern. In order not to lose flexibility and data from interviewees' a tape recorder will be applied to the largest possible extent on interviewees' approval. By only taking notes, the interviewer is exposed to miss certain terms and phrases, important in qualitative research. The interviewer obtains the opportunity to go over the interview if some parts are fuzzy or missing, a scenario that could be anticipated frequently since it is almost impossible to capture and perceive all details since it is a challenge to simultaneously write and perceive respondent expressions (Bryman & Bell, 2007).

Each interview will be transcribed directly after each has been realized. Which is of significance in order to extract what respondents are saying and in what way they doing it. Expressions and body language are vital issues in qualitative research (Bryman & Bell, 2007). By transcribing interviews directly, it's possible to reframe questions and improve the interview protocol for subsequent interviews.

The current interview guide is based and framed on propositions of Kvale and Brinkmann (2009) that list key issues of how to develop and how to extract questions to maximize answers of significance for the research. Kvale and Brinkmann (2009) claims that these specific quality criteria's are:

- The scope of unplanned, rich, in depth, and relevant responses from the respondent.
- The coverage of long answers from the interviewee and short questions from the interviewer.
- The extent to which the interviewer choose to pursue and describe the meanings of the significant aspects of the responses.
- The interviewer intends to verify absorbed interpretations of the interviewee's answer.

- The interview is self-reported, if this is lacking, supplementary explanations are needed.

Internal validity

The current paper adopts a descriptive and exploratory character and is thus not exposed to threat of internal validity to the same extent as explanatory studies.

Reliability

Since present paper adopts a qualitative research approach it's exposed to difficulties in maximizing external reliability. This implies that it's difficult to replicate the conducted case studies in the current paper and arrive at the same findings if one should pursue the same case studies once more. The reasons are several, and some reasons are that it's difficult to find exactly the same settings and circumstances that occurred in the original case studies. Another issue is the difficulties to replicate same social role between different researchers and between the past and the present. What's been established in order to enhance reliability is partly a literature review that is based on keywords, search terms, search strings, exclusion and inclusion criteria in certain databases. In addition an interview guide has been established that provide consistency for future replication opportunities.

Besides the English language has been applied as much as possible throughout the inquiry, in order to minimize errors and miss interpretations both between the case studies, and between the case studies and the theoretical framework. To further increase the validity of the empirical data the transcribed data has been returned to the interviewees' in order to check that no interpretations or misunderstandings have occurred. First when the empirical data have been checked the analysis has started. An additional concern is the usage of coding that has increased reliability by facilitating the chain of evidence. This implies that when observers go through the paper it's possible to trace evidence and assumptions at either direction in the paper, from research questions to conclusions. By the use of coding it's also easy to trace evidence from conclusions back to analysis, the empirical work, interview guide and theoretical framework.

3.4.1 Data analysis

It's argued that every case study should follow some sort of general analytical strategy in order to define what to analyze and why (Yin, 2009). One of the most outstanding strategies, which the current paper is based on, is relying on theoretical propositions. It implies that the research is based on previous propositions that reflect both research question, the literature review and hypotheses. It further influences the plan for data collection and constitutes the base for how the choice concerning applicable analytic strategy is made.

In comparison to quantitative data analysis any clear developed technique for analyzing qualitative data has so far not been developed. Those approaches that are currently most in practice are analytic induction, narrative analysis and grounded theory, were the later technique is the one the current paper will make use of. Among the three most applied techniques for qualitative data analysis is grounded theory the most famous one. The fundamental undertaking behind the concept is that theories are derived from data, further features of the concept are that systematical data collection, analysis and theory development have a joint relationship. Another attribute associated with the concept is

that the systematical data collection with analysis and theory development constitutes an iterative process, which means that it is a process that aims to generate an improved theory development while data are collected.

A key process in all approaches is the concept of coding, which implies that data as soon it is collected is broken down into smaller components where they are given different names. The aim of coding is to facilitate future analysis where the researcher more easily can find, restructure and analyze the data given. Except for the opportunity of making use of coding, researchers have three different approaches to choose from; open coding, axial coding and selective coding (Bryman & Bell, 2007). Instead of breaking down the data into smaller components after being collected, the interview protocol was designed in such a way that the data where allocated to specific codes simultaneous as the data were collected. Later on when the data was analyzed the codes with the same sort of data from all the interviews were put together and analyzed in a way that facilitated cross-case comparability.

4. Case studies

The current chapter will outline the five case studies selected for the present inquiry. Each case consists of two parts, one part focusing on general firm information, and the second part focusing on corporate entrepreneurial behavior in radical innovation projects.

Cases that were selected for the current research are such firms that fit the criteria:

- The firms had existed for more than 8 years
- The firms had engaged in radical innovation project(s)
- The firms had fewer than 50 employees

An overview of the chosen cases is presented in Table 3.

Table 3: Overview of case studies and innovation projects

Organization	Areas of activity	Age in years:	Size: number of employees	Innovation project
Alpha inc.	Development and production in biotechnology	9	50	Development of a particular drug product
Beta Inc.	Development and marketing of reverberation chambers	10	10	Development of a software product that is part of a reverberation chamber
Gamma Inc.	Development of embedded software systems	10	46	Development of an add-on to a previous developed steer by wire combined with a joystick
Delta Inc.	Developing and manufacturing systems for automation, communication and control	15	12	Development of a smoke control system
Epsilon Inc.	Developing and manufacturing systems for the electron microscope market	11	21	Development of a specialized holder for electron microscopy

An overview of the chosen firms' level of innovativeness is presented in Table 4.

Table 4: Overview of level of innovativeness

	Alpha Inc.	Beta Inc.	Gamma Inc.	Delta Inc.	Epsilon Inc.
Significant (30-50%) reduction in costs	Yes	Yes	Yes	Yes	No
New to the world performance features	Yes	Yes	Yes	No	Yes
Significant (5-10 times) improvement in known features	Yes	Yes	Yes	No	No

4.1 Alpha Inc.

Company information

Alpha Inc. is a company that focuses on technology for research and drug discovery. The company, which was founded around ten years ago, works globally and is now world leader in its business. The head quarter is located in Sweden while the company also has an office abroad. The growth in the company has been significant the last few years, and the turnover has increased from 30 million SEK in the year 2007, to 40 million SEK at the year 2008 and will for 2009 approximately be around 50 million SEK. During the same time the company has increased the number of FTE employees from 27 in the year 2007 to approximately 50 in the year 2009.

The organization is considered to be relatively flat with three main units below the CEO, one of them is the operation unit that includes research and development and production. Another is business development including marketing and sales and the third is finance. Alpha Inc's. core business is research, development, patenting and drug discovery. Since the firm is very concentrated towards R&D and production of outcomes from R&D is most leverage allocated to the chief scientific/operating officer. The different units below the chief operating officer are considered to have lot of autonomy in their research projects, still the chief scientific/operating officer has the overall responsibility.

In the year 2003 a new CEO was engaged, and he realized that in order to avoid financial difficulties Alpha Inc. needed to focus on something that could make money in a shorter term. The company was restructured and started to focus on one of their currently two main research projects that concentrate on developing and producing drug discovery products, which is based on a unique set of technology and makes the project unique. For that reason Alpha Inc. has a unique position in the market at present, as they are currently the only provider of the product. The market value of the product is today, before their final update is launched, estimated to several € Million, and is expected to increase because of the increased usability of their product. The project has recently delivered and completed the second phase and is currently working to further develop the third generation. Their main competitor is approximately two years behind in research and the project's ambition is to deliver further products on the market before their main competitor. It's thus important to be first in the market in regard to applying for patents.

Their main customers' constitute and belong to the segment of both global and national pharmaceutical companies, contract research providers and also platform providers. The geographical market is considered to be USA, Europe, and Japan. What's of most importance and priority for these customers is the additional value in terms of increased usability of the product that Alpha Inc. provides. The current product increases usability in the way that you can apply and conduct tests directly on relevant material in laboratories and therefore reduce the number of pre-tests and pre-stages on animals before it could be applied on humans. Besides increased usability and faster time-to-market the product provides significantly more information through the tests than prior products. So the present product adds value by partly providing a product that significant reduces costs for the customer, it also provide significantly improved features and it's finally completely new to the world.

Alpha Inc. characterize themselves as an innovative company that are flexible and quick

to respond to new market demands. They see advantages of being small in order to have nearness to the market. And they claims that one additional advantage in comparison to their larger competitors is that they have a high adaptability to market demands. Since Alpha Inc. is a small company with a limited amount of resources they have developed a strategy that implies that they put large efforts into different kind of collaborations and utilize external sources of knowledge. In that way they manage to compete with large firms that have a large amount of resources, and have afforded to fund in-house R&D. They consider themselves a firm that has good strengths in establishing collaboration. Since they have a unique competence and a unique approach in their business it makes them an attractive partner.

The radical innovation project

The present radical innovation project concerns the development of a particular drug discovery product. The advent of the project was at the same time as Alpha Inc. engaged a new CEO and implemented a firm restructure in order to become profitable. When the company was founded several professors developed a unique set of technology that Alpha Inc. based its operation on. Simultaneously Alpha Inc. recognized through research that there was a gap and demand of this particular product. After Alpha Inc. had the new technology and an external need of the product was realized, the project took off. What's important for the large positive outcome, so far in the project which is currently working for the third generation, is the ongoing combination of hard work that has been permeated in the project. What's further been of high importance for the project's progress are several collaborations the project is engaged in. Universities, large pharmaceutical companies, small companies and future customers have been present during the whole process and are contributing with a lot of high technical competence.

Table 5: Degree of innovativeness

Significant (30-50%) reduction in costs	Yes
New to the world performance features	Yes
Significant (5-10 times) improvement in known features	Yes

Corporate entrepreneurial behavior

Pro-activeness

The initiative to the project was taken by the management of Alpha Inc. when they came in contact with the specific unique set of technology: *"We realized that this particular piece of technology could be used for this certain application and that there was a need for this application since products on the markets are not delivering what they should".* So before the project took off they checked with potential customers if there could be a future business and a need for the project.

Risk-taking

Risk-taking is related to the large uncertainty and unfamiliarity the project faced, when Alpha Inc. had no experience of similar projects. Both the financial return and the success of the project was and is still uncertain, no one knows if the project will succeed fully or not. Whether Alpha Inc. should engage in the project was completely determined and based on the market potential. The management of the company in collaboration

managed the decision-making procedure concerning amount of resources allocated to the project with the project leader. The decision-making criteria were a combination of market potential and the level of need associated with the technical issues in the project.

In order to evaluate whether they should engage in the project only basic and primitive financial techniques were considered. In order to limit the amount of risk in the project different planning techniques presence were present, for instance Gantt charts, which aimed to bring knowledge about the project's progress. At the same time as planning techniques were present management involvement has also to a certain extent been present during the whole process. Still there are objectives that the involvement will be improved, by having more meetings and a closer contact, for the remaining phases of the project.

Autonomy

The project has a pretty flat organization consisting of the project manager and his team, consisting of several senior people. The project manager has the overall control but within the project have each and everyone specific responsibility and control of their tasks. They have flexibility to take own initiative and develop own ideas to some extent. But the project is tied to certain guidelines and patent perspectives that give certain direction of where to go with the project on demands of our customers.

Since the project is currently the most important project for Alpha Inc. is it very important for the project manager to report on a regular basis up to management and chief scientific officer. Which further report to the board of directors on monthly basis.

Aggressiveness

The purpose of the project was to enter a new market. Before the project took off Alpha Inc. examined the market, they discovered that any similar product was not anticipated and concluded that the market potential for the particular drug is the largest and is therefore chosen. In order to verify that there was a need and a gap in the marketplace did Alpha Inc. made contact with several customers both in Sweden and abroad. Since Alpha Inc. was unique with their technology no examination of competitors' strategies and objectives was ever done.

4.2 Beta Inc.

Company information

Beta Inc. is a company that is located with their head office in Gothenburg. The company's turnover amounted to 10 million SEK for the year 2009 and engaged 10 employees. The organization is argued to be pretty flat, consisting of the management at the top, which are the CEO, vice president, chief technology officer (CTO) and the manufacturing director. Below the management team are software developers and technicians. The power structure is also very decentralized where each member of the management team has an individual responsibility for a respective area.

Beta Inc. provides specific chambers containing numerous software programs that aim to measure all kinds of technology that works wirelessly and possesses different kinds of antennas. Among those firms that still use the old technology Beta Inc. approximately have only 3% of the market, where a large US company holds 50% and a French company holds 30% of the market. But by looking at the market with the new technology that Beta Inc. provides they hold 90% of the global market, since they are pretty alone, except for one Spanish company that bought their first standard chamber and are now trying to copy their new chamber. The firm's customers include all companies developing, evaluating, and using our manufacturing products that have enclosed wireless antennas.

Most of their customers are in the industry of mobile phone manufactures. The industry prioritizes the development time of new mobile phones. Many of the mobile manufactures release 5-10 new models each year, so the time-to-market is very important simultaneously as the quality needs to be very high for competitive reasons. Thus, it is Beta Inc's. mission and objective to improve their customers' time-to-market with a significantly lower cost and high quality. The firm is characterized as quick to respond to the market and its ever-changing demands. It's further characterized as a firm that has a good capability of developing external networks with academia and industry. In comparison to their competitors that are large established firm, perceive Beta Inc. that "*smallness is an advantage that makes the firm flexible and mobile, but at same time as we grow it becomes more challenging to maintain this advantage".* It's further argued that it's more favoring to innovate in their small firm in the way that they have less bureaucracy and formal structures in their decision-making concerning new product development.

> *"For making radical innovations it's more beneficial being a small company. The advantages are much higher than the disadvantages. Large companies are making radical innovations as well but they need to fight more to get through all the processes and get resources to the project. The advantage of developing radical innovations in large companies is that if you fail you still have your job but in a small company the company could go into bankruptcy if you fail and then you don't have any job".*

They further find advantages by having new products with new technology without established caseloads. Their large competitors with established caseloads are continually trying to improve old technology and old products rather than trying to develop new ones. *"Since our competitors have established caseloads they have difficulties in developing more radical and new products*, i*t's thus more favorable to innovate in our small company than it is in our larger competitors companies".* It's argued that

established caseloads bring maintained focus to established products and causes limitations in new product development.

The disadvantage of smallness is that their customers have difficulties in relying on their survival and that they manage to complete their contracts. With a limited amount of resources it's also difficult to convince their customers to wait for deliveries because no one wants to wait, everyone will sell products. On the contrary, they don't perceive difficulties, either by finding new markets or by attracting external capital for new investments. They have recently engaged in several research projects with both universities and companies that are in front edge in the field and don't see any obstacles of being small when attracting new partners. It's perceived more to the contrary, that it's easier to attract partners when you are a small firm.

The radical innovation project

The current project concerns a software product that is part of a larger product. The trigger of the project is a combination of internal business opportunity recognition with an external push in terms of potential demand recognition. With the experience of the CEO, Beta Inc. recognized development potential when the company came in contact with a new set of technology. At the same time contact with potential customers was established, and after a positive response the project took off.

The product was launched in collaboration with a large mobile phone manufacturer, which was really good and important for the project, because it attracted interest for the product, which would be very difficult to achieve without the good reputation the cooperation partner brought. The success behind the project is partly because of their pro-active behavior in terms of approaching collaboration with this large mobile phone manufacturer. The risk-taking in the project was also of significance since they allocated a lot of resources to the project even if they didn't know whether it would succeed or not. Afterwards, they realized the importance of trusting their gut feeling about the project's success, in the decision-making for resource allocation.

Two years after the project was closed, Beta Inc. believe they have a lot of advantages compared to their large competitors, that they do not need to sacrifice resources and efforts on bureaucracy, dense formal communication channels and management teams that possess a lot of power but with less technical insight, which are issues that bring slowness and a long market response. Beta Inc. argue that their competitors will not catch up for a few years, they are still struggling with their old technology that they are trying to make improvements on, instead of developing new technology, something they think will favor Beta Inc., when customers continually make new requirements on their products are their competitors having more difficulty in keeping up the competition. And claims that you can't continue to do improvements forever. Finally you need to develop a completely new technology, something radical.

The present product is characterized and fulfills the criteria of a radical innovation accordingly:

Table 6: Degree of innovativeness

Significant (30-50%) reduction in costs	Yes
New to the world performance features	Yes
Significant (5-10 times) improvement in known features	Yes

Corporate entrepreneurial behavior

Pro-activeness

The CEO took an initiative for the project when he came in touch with a new set of technology. Right after Beta Inc. investigated whether was any potential external need of the product in the marketplace, when it was confirmed and recognized took the project off.

> *"We developed this because we believed it was possible".*

Risk-taking

The risk-taking in the project is partly defined according to the uniqueness of the project for Beta Inc. The company had no experience of similar projects, and the financial outcome of the project was doubtful. The decision-making procedure concerning resources was only decided and based on management assumptions.

The criteria that was used in order to decide to engage in the project or not was that there was potential for the product. If the project succeeded it should bring good return on investment in the near future and that it should bring good publicity for the company. The project team, that contained more or less the whole management team, worked pretty closely. For that reason was any planning techniques were unnecessary and argued to be a waste of time.

Autonomy

The CEO was the project manager of the project but dropped off pretty early and delegated most of the responsibility to the CTO. And then it was the CTO who ran the project. Much responsibility and authority was further delegated to the different members in the project. The flexibility in the project team was significant. Members where free to test new ways and find new paths and solutions on their on initiative. There were never any formal deliveries between the project team and the CEO, or between members in the project team. All communication proceeded orally through short meetings.

Competitive aggressiveness

The objective of the project was entry into new markets. Research was made before the project started. Beta Inc. were out and talked to different organizations, companies and contacts, talked to suppliers as well as the market in general about their technology. Any specific search mechanisms in the research were never done. There was more of basic research such as Internet and common discussions and conversations with different people in different industries that were carried out.

> *"We found that our technology was unique and decided that we should go for this project, that our technology was of better quality and faster time to market. And we would manage to do this".*

Before the project started they also looked both at our competitors' strategies and their objectives. They argued that they had completely wrong strategies and objectives in

their business, that their competitors technology they were using was very old fashioned and inefficient.

And they argued that they are presumably continuing to stick to this old technology and will probably try to improve it, instead of using the completely new technology that they developed. They argued that sooner or later they must change their strategies, and that is because their customers will continue to bring forward new requirements, and with the old technology it's getting more and more problematic to adopt these new requirements to the old technology. *"When they realize this our product with the new technology has significantly better quality, and will produce at significantly lower costs and with significantly better performance".*

4.3 Gamma Inc.

Company information

In the year 2004 the Swedish and Gothenburg located company Gamma Inc. had a turnover of 50 million SEK. Since then has the growth of the company been significant. For the year 2008 the company's turnover had reached 150 million SEK. The growth in the number of employees increased from 19 at the end of 2005 to 46 at the beginning of year 2009. The company that was founded year 2000 is a company that is active in the industry that provides embedded software, also called embedded systems for the vehicle industry. Their niche market is safety critical functionality solutions in harsh environments for the marine industry. Gamma Inc. has an organization with few organizational levels. They strongly emphasize soft values such as social interaction, involvement and commitment. They further stress organizational structures that are non-hierarchical; currently they have three levels where the CEO is at the top and is followed by the CTO (chief technical officer), CFO (chief financial officer) and the marketing director. Most of the employees are product developers and are directed under the CTO.

Gamma Inc's. market, the vehicle industry could be divided into three segments, which are the marine industry, the vehicle (land vehicle) industry and the industry-application. Their largest segment is the marine industry where they are serving the marine industry with computer network based vehicle control systems. Gamma Inc. holds approximately 70% of the market. The competition in the market is pretty limited to only three competitors that are all larger than Gamma Inc. What's characterizing the market competition is that it almost requires that you in some way have close collaboration or a partnership with your customer, since much of the development is managed in close collaboration. Gamma Inc. has approximately five large global customers, located in Europe and Asia, most of them are inside a large vehicle development company. Their additional customers are other vehicle development companies that are in need of safety critical systems.

For the customers, in a historical perspective, the time-to-market has been of highest priority but today it has to some extent changed. And now, together with time-to-market, is basic functionalities and usability of importance. Gamma Inc. is characterized as a company that are very flexible and good to combine technology with end-user benefits, examining what the end-users want and managing at combining that with different set of technologies. Gamma Inc. argue that one advantage of the firm is that they are good at seeing their part in the supply chain from a holistic perspective, with the end-user in focus. And that is partly an effect of a lot of focus on customer benefits and customer value. In order to understand what the customer value is all employees are closely integrated and involved in the contact with their customer's real applications. A lot of efforts is allocated to learn and understand the customer's applications, business and industry. In that way they get to know what is value and what is of importance to their customer and their customer's customer. Most of their projects and their product development are results from where they started to recognize the basic need for the end-user and then tried to demonstrate what's possible to do with technology, and bring what would be appreciated by the end-user with the basic need they have. What can give additional value, that's what they strive to provide. The advantage of being a small-established firm is that they are more innovative than their competitors is perceived. That is because they are smaller and have less bureaucracy,

less formality and the processes in the organization are much faster and more efficient. That makes their organization fast and quick to respond to changing market demands. At the same time as their larger competitors are slow and static.

Because of the fact that Gamma Inc. is partly owned by a large vehicle company, the firm obtains additional stability and credibility in their businesses. The positive effects of the ownership structure are generated from their owner's long-sightedness. When they have that kind of long-sightedness in their ownership structure their customers relies on their survival and engage in a position of dependence with them, something they think would be much more difficult if they where a small company. *"I believe that our owners will not let the firm go down. If it goes really bad they might introduce a turnaround but in some way they will keep us alive".* That is something that might subconsciously influences their risk-taking regarding projects with financial uncertainty in an unfamiliar environment. But explicitly and consciously it's argued that it doesn't influence daily operations and level of risk-taking in projects. Gamma Inc. acts and behaves independently. Their owners are very little governing the firm and don't provide any additional resources in comparison to what other independent firms possess. The large benefit, besides stability, that comes with the ownership is invaluable advantages in terms of legitimacy that they make use of when they meet their customers and launch new products.

> *"The legitimacy that is a side effect of the ownership structure is invaluable for our business, as our customers put faith in our owner structure ".*

The radical innovation project

The present project that considers Gamma Inc's. development of a radical innovation concerns a project that started in 2004 and ended 2006. The current innovation is an add-on to a previously developed steer by wire combined with a joystick that is used to steer marine vehicles for the purpose of increasing safety, adaptability and flexibility. The product fulfill significant improvements in known features of prior similar products, at the same time as it is argued to be totally new of its kind. Further, the product will save 30-50% in costs for the end-user. The project was initiated by Gamma Inc. after basic needs from the end-user where realized. The management team, consisting of CTO, CEO, CFO and marketing director, realized that they could bring additional value to the product by the competence and the technology Gamma Inc. possessed. One critical factor for the success in the project was the tight and close collaboration and partnership with the customer. Which provided knowledge and insight about the needs of the end-user.

Table 7: Degree of innovativeness

Significant (30-50%) reduction in costs	Yes
New to the world performance features	Yes
Significant (5-10 times) improvement in known features	Yes

Corporate entrepreneurial behavior

Pro-activeness

The first initiative for the project was delivered by Gamma Inc's. customers', who had a

basic need for the product. When the first need was addressed, Gamma Inc. carried out the management team initiative to develop the product in a way that was beyond their customers' consciousness and basic needs. *"Our objectives was not only to do an improved version of an old product, our ambitions were to do it significantly better than our customer needed. Just because it was possible."*

Risk-taking

Gamma Inc. had experience of the basic technology that was used in the product, which covered the basic need in the product. The unfamiliarity in the project is related to the advanced features in the product that contributed to the significant improvements. The procedures for resource allocation to the project were determined on a daily basis by the management. The amount of resources allocated to the project was governed on daily needs. The project was evaluated and based on its financial and strategic condition. Before the project started a business plan was established. The plan addressed criteria if they should engage in the project our not. The different criteria were constituted by both financial budgets and strategic implications of the project. When the project started was no specific planning techniques anticipated. The project was followed up on daily basis between management and the project manager where the project's progress and emergent issues were addressed. The management was thereby to a large extent involved in the project. They provided support and exchanged information on a daily basis.

Autonomy

The project manager had the overall responsibility that the project met its objectives, and also delegated lot of authority to run the project in the way he preferred. The management was not involved more than necessarily; the level of control was determined according to the project manager's need of advice and support. And he was continually supported to take own decisions and own initiatives without management involvement. All individual initiatives in the project have been supported during the whole project by the management. Parts of the project teams time has been allocated to developing own ideas related to parts in the project. Project members have been supported to participate and be involved in the contact with the customer, and to make them figure out how they should solve and serve the customer by own initiatives and solutions. Management has during the project encouraged individual growth and creative joy through involvement, and supported members to develop an own mindset and challenge. The communication in the project was pursued through short informal meetings on a daily or weekly basis.

Competitive aggressiveness

Before the project started the marketplace was scanned by searching in newspaper archives and article databases. Then customers and suppliers were also contacted about their insight and knowledge in the field, if they had any experience of a similar product. Competitors' strategies and objectives were considered before the project took off, but the insight in their businesses was limited. In order to get more insight a product from one of their competitors was purchased before the project started, for the purpose of investigating shortcomings and opportunities. The product was aimed for a previous project but was used in the present project.

4.4 Delta Inc.

Company information

Delta Inc. is an engineering company located in Gothenburg, Sweden. The firm acts and works in the electronics industry, where it develops and manufactures systems for automation, communication and control. They serve and provide a variety of industries with their value added activities that are not directed towards any specific industry. Delta Inc. have many years of experience and possess a large body of competence in the field. They provide standard products as well as customized models and systems developed in collaboration with their customers. Delta Inc's. turnover has during the latest five years been constant around 15 million SEK. They have also the latest five years a constantly employment of approximately 12 employees. The organization adopts a pretty flat structure with a management team of three to four people with product developers directed below.

The company provides a variety of complex knowledge intense solutions to a large variety of industries, that is solutions that could fit most industries and companies, and that makes it further difficult to specify market shares and main competitors. However, what's most appreciated and of most value for their customers is their outstanding high quality. Delta Inc. is characterized as mobile and flexible, and a firm that manage to respond quickly to market demand and provide customized technical solutions rapidly on customers need. This is appreciated from the market and contributes in putting the company in the front edge.

Most of their research and development is pursued in-house the company has sparse collaborations. Delta Inc. argue that smallness could have a negative effect when approaching new collaborations and examining new market opportunities, but on the other hand, claim that a large resource base is only one factor and other characteristics such as flexibility and high adaptability counteract their smallness, which is an effect of their smallness, that everything goes much faster when you are a small firm. Since the firm is an established firm they characterize themselves as a firm with reasonable amount of resources and a firm with a good reputation. Thus, they generally don't perceive lack of legitimacy.

The radical innovation project

The current project that has developed a radical innovation considers a project where Delta Inc. has developed and provided a smoke control system. The project started at the end of 2002 and took 9 years to establish. The current control system refers to prevent fire and fire gas transmission in buildings. The system controls fire-/ fire gas dampers in such a way that they find the right positions and prevent serious emergency. The system is based on existing technology and is unique in the sense that it provides new solutions that were not previously discovered. The new solutions contributed to significant reduction in costs for the customer. Delta Inc. initiated the project after basic needs were discovered. With a high technical competence as a contributing factor for the project's outcome, Delta Inc. managed through in-house development to exceed basic demands and delivering a product that was beyond their customers' expectations.

Table 8: Degree of innovativeness

Significant (30-50%) reduction in costs	Yes
New to the world performance features	No
Significant (5-10 times) improvement in known features	No

Corporate entrepreneurial behaviour

Pro-activeness

Delta Inc. took initiated the project, the product is an implication of the fact that Delta Inc. grasped the opportunity to develop something because it was possible. And that they believed there would probably be a need for the product after basic needs where realized.

Risk-taking

Delta Inc. had no prior experience of providing similar products, except that they had experience of using the same technology for other objects. Resources for the project where allocated to the project on an incremental basis during the project's process. In order to evaluate the relevance of the project basic financial calculations and strategic analysis was applied, which revealed potential benefits by engaging in the project.

Various planning techniques like milestones were established and checked regularly during its process. As the project was important for the firm the management of Delta Inc. had a significant role during the entire project life cycle. During the project regular updates and frequent communication were pursued in the project team during the whole process.

Autonomy

The project adopted a flat structure with a project manager that got the greatest responsibility, and project members that worked with the development of different parts of the product. The management team of Delta Inc. had regular updates with the project manager and had considerable insight in the project during its process. Still, the project manager delegated authority to a large extent. He had the largest responsibility even though the management team supported him with regular knowledge and information. Delta Inc's. management team supported both project manager and project member initiatives for creativity and new ideas. Part of project members' flexibility included developing new ideas and new paths. The project group was not formally responsible for reporting to management. The cooperation was instead less formal with verbal updates on a daily or weekly basis.

Competitive aggressiveness

The purpose of the project was to introduce a new product in an existing market. And before the project started a competitive analysis was pursued. Delta Inc. scanned competitors' systems and how they were developed. The analysis discovered that no similar system was developed that was based on the same approach and solution developed by Delta Inc.

4.5 Epsilon Inc.

Company information

Epsilon Inc. is company that is located in Gothenburg and was founded 1999. The company has seen a strong growth over the last few years. The turnover has roughly been doubled over the last few years. The year 2007 the turnover was 7 million SEK and the year 2009 the turnover increased to 29 million SEK. The year 2007 Epsilon Inc. employed 12 employees, and the year 2009 was 21 employees employed world wide, 17 in Gothenburg, 3 in US and 1 in Japan. One reason for their strong growth is a change in sales methods, moving from a world wide exclusive reseller to direct sales. The reseller agreement ended in 2006 and it's after this that the strong growth increased. The company has a flat organization consisting of a CEO, who has the highest responsibility, a CFO and a CTO who is responsible for R&D and production.

When describing Epsilon inc's. industry it's easier to describe their customers' industry which is nanotechnology, material science, and semiconductors. All of their customers are researchers in each field either in research centres or at large companies. Epsilon Inc. currently has 70 customers equally weighted to three geographical areas, the US, Japan and Asia, and Europe. The company position themselves as market leaders in holder technique, that is a system for a holder of an electron microscope. Their products are nanotechnology tools for measurement, imaging and manipulation on the atomic scale. Their customers buy a holder and together with the holder bring controller electronics and a software system. It's mainly in the holder where the "know how" and the intellectual property are located and that's what differentiates Epsilon Inc. from their customers. The firm have three products that are based on the same technological platform, and are equally weighted in their business. All the development and the final assembly is located to Gothenburg, the production of components is outsourced to different places in Sweden, Switzerland and Finland. For two of the products they have currently no competition, which implies they have 100% of the market. For the third product they have one competitor and its estimated that Epsilon Inc. has 75% of that market.

What's argued to be of the highest priority for their customers are the products functionality. Since their products are research tools and are used to publish research, it is of most importance that their customers can feel that they can rely on the functionality of the product and get reliable data. It's further argued that as long as the competition is weak, high functionality is of more importance than low price. Pricing is adapted to typical research grant levels on the respective markets. It's those grants that fund their customers' solvency.

Epsilon Inc. is a spin-off company from Chalmers, and is a firm that is characterized as having both a strong academic culture and a strong development culture in terms of developing products. Within the business context of nanotechnology, material science, and semiconductors that is argued to be Epsilon Inc's. industry, smallness is not per se unusual. One implication of smallness is associated with a limited amount of resources that is argued to bring negative side effects such as funding hurdles in business development. Further, implications are difficulties to purse established evaluations of new products potential gains, both for existing markets and for undiscovered markets. The company claims there's a high level of risk-taking about not knowing potential gains before the product is launched. *"Sometimes we develop products just because it's possible*

and not only because we know that someone will buy the product".

When Epsilon Inc. started their business there was no knowledge about their technology and there was no established market for their products. The firm are thus considered to be missionaries in their field. And positioned themselves as market leaders where they created a new market and a need. Additional disadvantages of smallness are related to difficulties that bring smallness and a limited amount of resources. When you should open up a new market our a new category by your own.

Radical innovation project

The current project concerns a product that is a specialized holder for electron microscopy where the researcher can push a sharp tip into the sample and measure the force by which the sample deforms. With the present technology it's possible to measure mechanical properties on single nanometres structures. There could, for instance, be mechanical deformation properties on nanometre particles-, wires or on carbon tubes. With the present product it's further possible to squash single nanometre particles and measure how much force is needed to deform the particles down to nano-Newton scale. What triggered the start of the project was the discovery that it was possible to do so. It was realized in the company that with the technology that they had it was possible to develop this tool to measure physical properties inside the electron microscopy. One critical factor behind the project's outcome was the close collaboration with Chalmers that contributed with knowledge and competence in the field.

Table 9: Degree of innovativeness

Significant (30-50%) reduction in costs	No
New to the world performance features	Yes
Significant (5-10 times) improvement in known features	No

Corporate entrepreneurial behavior

Pro-activeness

Initiatives towards the project were taken by Epsilon Inc's. founder when he realized that it was possible to develop this kind of product. He is currently on the company's board of directors.

Risk-taking

Current project is based on a previous project. In that sense Epsilon Inc. had experience of the technology and the key factors of the project. The level of uncertainty regarding future needs of the product and financial gains of the product was significant since there was no established market for the product, and there was uncertainty concerning how the new product would be received by the research community.

"There were pretty few risks regarding the technology, whether it would work or not. The risk was instead whether this product was a product, we could have ended up with developing something that we could not sell".

Before the project started basic estimates were established regarding what kind of competence was needed for the project and how much money was needed to finance the manpower.

The evaluation criteria for the project were based on basic estimates that focused on how many systems that possibly could be sold, by examining how many researchers were acting in the field. That is how many electron microscopes exist among all researchers. In order to organize and synchronize the project basic planning techniques anticipated during the project's process. The management of Epsilon Inc. where involved in the sense that the firm's CTO was also project manager for the project. In addition, the firm's CEO was in charge of the sales.

Autonomy

The project contained four technology-based fields, and each field was provided with a lot of authority. They obtained basic guidelines and resources at the start of the project, then they were free to develop their different parts in the way they preferred. The project manager's business was instead to synchronize the four technology-based fields in the project in such a way that they interfaced.

Each field had lot of flexibility in the way that they could choose own ideas and solutions without management involvement as long as they developed what they where assigned to do. The project group reported regularly on an informal basis during the project's process. In the latter part of the project the meetings consisted more of status reports, and took place roughly every two or three weeks.

Competitive aggressiveness

The purpose of the project was to develop a new market with a new product. Before the project started a survey was conducted, which investigated whether there were any other similar products. The easiest way to find anything about this kind of product was to examine scientific research reports and approach different research communities, which therefore were in focus and investigated to find similar products.

5. Analysis

The current chapter will address two main concerns, the first consider an analysis of actual firm characteristics with what theoretical propositions argues about the subject. The second focus on analyzing actual firm entrepreneurial behavior with regard to theory.

5.1 Firm characteristics

According to the theoretical framework firms have specific advantages in innovation related to size and age specific characteristics. It's then expected that a specific group of firms, namely small-established firms, share advantages of both large established firms and of small firms. In the empirical work it's revealed that these expectations are correct and the present case studies possess both advantages in innovation of small firms and of large firms. For an overview, see table 10 below. The table is based on data from the interviews; regarding which characteristics that are perceived as most present in each firm. That is what each firm perceives is most characterizing with their firm's characteristics. The table doesn't exclude additional characteristics associated of each firm.

Table 10: Characteristics generating advantages of large and small firms in innovation

	Alpha Inc.	**Beta Inc.**	**Gamma Inc.**	**Delta Inc.**	**Epsilon Inc.**
Small firm characteristics					
Lack of bureaucracy		X	X		X
Efficient internal communication system		X			X
Nearness to market	X			X	
High adaptability	X	X	X	X	
Lack of hierarchy		X			
High capacity of customization				X	
High level of motivation			X		X
Flexibility/mobility	X	X	X	X	
Niche market operations	X	X	X	X	X
Large firm characteristics					
Skilled technical labor	X	X	X	X	X
Rich network	X	X	X		X
Legitimacy	X	X	X	X	
New technology	X	X	X		X

By looking at the case studies from an organizational perspective, it is clear that the companies share several characteristics, which the literature claims are specific for small firms. Freel (2000) and Ackroyd (1995) argue that small firms are mobile and have a high adaptability that rapidly adapts to changing customer demands. These small firms are flexible and have pervious boundaries. And as an effect of high adaptability Nooteboom (1994) and Freel (2000) claim that small firms have a closeness to customers and a nearness to markets. Delta Inc. argues that high flexibility and adaptability, which is an effect of smallness, bring important competitive advantages in

that they manage to react quickly to market demand and rapidly supply customized products.

What's further significant in the case studies is that they find advantages in having low bureaucracy, and efficient internal communication systems that save them lot of resources and energy. By having low bureaucracy and fast, efficient communication systems they are able to more quickly respond to new demands. Gamma Inc. claim that while their competitors are slow and static, they are fast and efficient in their processes as an effect of large informal procedures and low bureaucracy. This provides advantages and makes their organization quick and mobile in responding to changing demands.

Moreover, literature emphasizes that small firms have behavioral advantages such as a higher level of motivation and larger customization opportunities (Nooteboom, 1994; Rothwell, 1989; Sorensen and Stuart, 1999; Carayannopoulos, 2009). These characteristics are conformable in the case of Epsilon Inc. which indicates that both a strong culture of development, commitment and involvement are present in all their activities. And that these characteristics constitute advantages in their businesses and contributes to providing a competitive edge.

Literature indicates that since small firms are flexible, as an effect of lack of hierarchy (Ackroyd, 1995), they have a high compliance and are often very close to customers. This brings implications that they are more suitable for niche market operations. Something that is consistent for all present case studies. It's further argued that these firms have larger qualities in transforming technology in new technology-product-market arrangements (Nooteboom, 1994). Gamma Inc. reason that one of their advantages is their capability to combine technology with end-user benefits. Through high involvement and insight into their customers' business, they manage to transform and rearrange technology in new technological arrangements in a way that brings competitive advantage to their business and increases customer benefit.

What's coherent in most of the case studies is the usage of new technology in their development of radical innovations. It further demonstrates that all case studies possess high technical labor, from university engineers to graduate engineers and scientists. These facts counteracts literature that stresses that small firms lag behind large established firms', in the practice of new technology as one implication of shortage of skilled manpower (Dutta and Evrard, 1999; Rothwell, 1989; Freel, 2000). In this manner it is clear that current case studies possess characteristics of both small and large firms. In the case of Beta Inc. it is clear that the firm benefits from having new technology. When rather larger competitor continually try to improve old technology than developing new one. When they realize the fact that they need to develop new technology Beta Inc. will already have the new technology in new products out on the market. Christensen (1997) highlights and emphasizes these issues of having saddled routines and processes. That many large firms fail by continuing to serve established customers with old products containing mature technologies. That they abandon to focus on the long-term and exploring new paths and new radical innovations.

Besides, it is discovered that in several of the case studies, the firms possesses and utilize additional characteristics specific for large firms. When they contradict theories that small firms have problems in utilizing external networks (Rothwell, 1989; Freel, 2000). According to empirical findings this is something present in several of the case studies. In the case of Alpha Inc. it is part of their strategy to engage in different

collaborations to utilize external sources of knowledge as an effect of limited amount of resources. In this way they manage to compete with large competitors that can afford to fund in-house R&D.

The literature argues that legitimacy is often associated with large firms that more often have a strong reputation and name that bring advantages in ways that makes easier to attract collaborations, external capital and open up new markets. If it's easier to market new products if you are more legitimate, customers are then more interested and listen more carefully (O'Connor and McDermott, 2004; Carayannopoulos, 2009). The concern regarding legitimacy is ambiguous; in some cases present case studies counteract these arguments. Both Alpha Inc. and Beta Inc. argue that smallness is not associated with lack of legitimacy, and don't see difficulties in either attracting external capital or engaging in collaborations. Yet, according to Beta Inc. one disadvantage of being small, and as an effect of having a thin track record of operations, is difficulties to incorporate trust with their customers. In some cases customers' have difficulties in relying on their survival and do not want to wait on contracts. Theoretical propositions claim that firms with a limited amount of resources, which are mostly associated with small firms, are exposed to these issues (Dutta and Evrard, 1999; Freel, 2000; Hausman, 2005). In order to counteract the disadvantage of smallness several of the firms have put efforts in establishing collaborations with larger legitimate partners, which is important for firms with these concerns (Dutta ans Evrard, 1999; Freel, 2000; Hausman, 2005). These concerns have been partly considered by Alpha Inc. but also by Beta Inc. that engaged in a close collaboration with a large mobile phone manufacturer in their development and introduction of their radical innovation. The partnership contributed with both increased interest in the product but also with higher credibility.

5.2 Corporate entrepreneurial behavior

In order to define and measure level of pro-activeness, risk-taking, autonomy and competitive aggressiveness interpretations and translations have been made according to interpretations of Lumpkin and Dess (1996).

5.2.1 Pro-activeness

The level of pro-activeness is measured according to two factors. The first considers who took the initiative towards the project. This reflects firms' inclination to take initiative to capture new business opportunities. The second factor deliberates why the initiative was introduced. Was it because of a specific need? Is the project an effect of problems that have emerged or is it cause of expected changes in the market. It's considered that firms that have a tendency to introduce projects caused by expected changes in the market, are considered to have a pro-active behavior.

Table 11: Degree of pro-activeness

	Alpha Inc.	Beta Inc.	Gamma Inc.	Delta Inc.	Epsilon Inc.
Who took the initiative for the project?	Management	Management	Customer and management	Customer and management	Management
Reasons behind the project?	Expected changes in the marketplace	Expected changes in the marketplace	Specific need and expected changes in the marketplace	Specific need and expected changes in the marketplace	Expected changes in the marketplace

In the case of Alpha Inc. they demonstrated a pro-active behavior when they grasped the opportunity to utilize the unique set of technology they came in touch with when they took on the project. In Beta Inc. the CEO recognized a large market potential when they came in touch with a piece of technology and started to develop a product just because they argued it was possible and thought if they succeed it will reframe the market competition by outperforming incumbents products. Gamma Inc. proved a pro-active behavior when they decided to further develop a control system after indications from the market that there are potential needs for improvements in old design. The product became totally new to the world, and brought both significant improvements and substantially reduced costs. In the case of Delta Inc. similar occurrences arose when a customer indicated a potential need of a general function to a control system. The management allocated efforts and ended up with a system that caused significant reduction in costs. And the reason that it was produced was because it was doable. In the case of Epsilon Inc. neither an established market nor a need was present when they initiated the project. When they saw the opportunity to develop something just because it was possible, they took the opportunity and did so. As a consequence of their pro-active behavior they needed both to create a need and a market for the product during the project's process.

For all the case studies, a degree of pro-activeness is present and significant. What's coherent in all the cases is the way the firms initiated the projects. In all cases they grasped opportunities to develop products for the simple reason that they saw it was possible. Why it turned out that they saw the opportunities is in most cases a combination of firm-specific capabilities, and an available unique set of technology to the firm.

5.2.2 Risk-taking

The matter of risk-taking is based on five factors. The first factor refers to firms' propensity to engage in projects that are unfamiliar for the firms, or in projects with an uncertain return. The second factor is defined according to firms' decision-making procedure regarding resources, for instance how structured the process is. The more structured and rational the procedure is, the more risk averse are the firms. The third factor considers firms' tendency to apply evaluation techniques when they decide whether to engage in the project or not. Firms that practice several or advanced financial-, non-financial evaluation techniques are argued to be more risk averse than others. The fourth factor relates to the present planning techniques applied in the projects'. It's argued that nevertheless the more and advanced planning techniques that are pursued in the projects, the more risk averse are the firms. The final factor reflects management involvement in the projects, that is support, communication and information exchange, firms with a large amount of management involvement are considered to be such firms that are less willing to adopt risk in their projects.

Table 12: Degree of risk-taking

	Alpha Inc.	Beta Inc.	Gamma Inc.	Delta Inc.	Epsilon Inc.
Level of uncertainty and unfamiliarity	High	High	Medium	Medium	High
Procedure resource allocation	Structured	Basic	Basic	Basic	Structured
Evaluation techniques	Basic	None	Advanced	Basic	Basic
Present planning techniques	Essential	None	None	Essential	Essential
Management involvement	High	High	High	High	High

The level of risk-taking in Alpha Inc. is related to the high level of unfamiliarity and uncertainty the project faced. The firm possessed no experience of similar projects and is thus unique for the company. In the case of Beta Inc., they had no previous experience of similar projects. Even though the CEO put faith in the project, any certain financial outcome was highly doubtful. The project was initiated just because it was possible, they did not implement any planning techniques. And they did not perform any financial or non-financial evaluation techniques before the project started. They only believed in the project and that was enough to initiate the project. Resources allocated to the project were only based on daily assumptions.

In Gamma Inc. the firm had some experience of similar projects in terms of the basic solutions to the product. The risk-taking was instead partly defined by the unfamiliarity linked to the advanced elements in the project. In addition, resources were allocated without any specific estimates, it was based on a daily basis and is therefore considered to be risk-taking. What's more risky is that they pursued the project without any planning techniques. The planning was only based on gut feeling. The degree of risk-taking in Delta Inc. is connected to the unfamiliarity of providing similar products. And in addition the non-predefined resource allocation to the project, which occurred on a incremental basis. In Epsilon Inc. the largest risk-taking was in the uncertainty of whether the product would be saleable. There was neither a market nor a need for the product before they started the project. Besides, they where rather risk-averse, they used different estimates concerning the resource allocation. They further evaluated market potential and possible financial payoffs based on the market potential. In addition they applied to some extent different planning techniques. And their CTO and CEO where involved during the whole project.

In general the level of risk taking is severe. What's consistent in the case studies and what's revealed in the table above is that most firms indicate risk taking associated with level of unfamiliarity and uncertainty of the projects. Then all firms signify a different level and a different kind of willingness to take risk.

5.2.3 Autonomy

To investigate the level of autonomy two main factors have been considered. The first factor, which is labeled authority, considers the project's level of independence and the level of delegated authority from management. The second factor considers the characteristics of the project, that is level of informal processes and how much flexibility the project and its members had. The more flexibility the project had, the more

autonomy. If the project was required to deliver formal reports, updates or reviews, it's considered to have a less amount of autonomy.

Table 13: Level of autonomy

	Alpha Inc.	Beta Inc.	Gamma Inc.	Delta Inc.	Epsilon Inc.
Level of authority in the project	Medium	High	High	Low	High
Level of informal processes and flexibility	Medium	High	High	Medium	High

The level of autonomy in Alpha Inc. is partly demonstrated in the independency the project had. Each one had own responsibility for their tasks and had to some extent flexibility to take on initiatives and develop own ideas. The project had certain restrictions due to patent considerations that gave some limitations to the flexibility in the project, which reduced level of autonomy for the project. In the case of Beta Inc. the CEO of the project was dropped after it was initiated, then all responsibility was delegated to the CTO that in turn delegated much responsibility to project members. The flexibility was high and project members were free to take initiative to own ideas and solutions. They had no formal deliveries, instead all communication was performed orally in an informal procedure.

Similar occurrences were present in the case of Gamma Inc. The project had a lot of authority and was supported by management to take own initiatives to find solutions by own experience. The management had no more control or insight in the project than was needed from the project manager. Project members have been supported to participate in the governing of the project and to participate and feel involvement in the project's work. They were further encouraged to develop own mindsets and solve issues through own efforts. The project pursued only informal verbal meetings, without formal deliveries. Delta Inc's. level of autonomy is in part indicated through management support of developing new ideas and new paths. And in part by the informal communication system that was based on oral updates. In the project performed by Epsilon Inc. individual flexibility and authority were very significant. The project manager that had highest responsibility delegated a lot of authority to the project members. They had a lot of flexibility to influence the tasks and the development of solutions in the project. The project manager had more the role of synchronizing the different technology parts in the project, instead of performing control of how each member pursued his or her task.

The level of autonomy in the projects differs to some extent. In the case of Beta Inc, Gamma Inc. and Epsilon Inc. the level of autonomy is significant. What's most visible is the support of creativity and involvement by taking initiates to develop own solutions. In addition, all these firms had a limited amount of involvement by management in the projects, the projects where governed very independently from guidelines, restrictions and management involvement.

5.2.4 Aggressiveness

Competitive aggressiveness is defined and measured according to two factors. The first reflects whether the firms consider their competitive environment and scan the market, whether they, for instance, conducted any market analysis, and how they relate their

own innovation projects to products in the marketplace. The second factor reflects how the firms consider their own acts and behavior. In regard to their competitors' strategies and objectives, in the decision-making of the project.

Table 14: Level of aggressiveness

	Alpha Inc.	Beta Inc.	Gamma Inc.	Delta Inc.	Epsilon Inc.
Efforts in market analysis	Large	Large	Large	Large	Large
To what extent did you consider competitors strategies?	None	Essentially	Essentially	None	None

In Alpha Inc's. case, the firm was in contact with customers both in Sweden and abroad to verify whether there was any similar product on the market. In the case of Beta Inc. aggressiveness is partly defined according to the way the firm scanned the market through contacts with both, organizations, companies and suppliers in the industry. The applied procedure was rather basic with pursued personal discussions and search on the websites. The also considered competitors strategies and objectives of their own. And realized that their objectives where better since they had a unique technology no one of their competitors had. Before Gamma Inc. launched their project they scanned the market by both search in archives, databases and newspapers. They also approached customers and suppliers to get insight into whether some one had experience of their kind of product. Competitors' objectives and strategies were considered but because of secrecy it was difficult to get insight. But as a way of learning about competitors' products one of their main competitors' products was bought in purpose of getting insight about strengths and weaknesses.

The level of aggressiveness in the case of Delta Inc. reflects their strategy to get insight and knowledge about competitors' products. They conducted a competitive analysis before the project took off, and thereby discovered that no similar product existed in the marketplace. Since all new products are published and examined by researchers in the field before they became commercialized, a research report was pursued by Epsilon Inc. before the project took off. The examination contained in-depth analysis into research reports and academic papers in the field. Since there was no market for the product consideration of competitors' efforts was never taken.

The pattern revealed that firms aggressiveness is consistent and indicates that their aggressiveness reflects the way they scan the market for updates and similar products before they engage in any innovation project. It does not reflect their way of outperforming their competitors, it's more to identify whether there are any gaps in the market for introducing new products.

6. Conclusion

The present chapter will start and outline the way the paper contributes to the literature in its field. Subsequently, various tangible and practical managerial implications will be addressed. The chapter will finally focus on a variety of future research proposals.

6.1 Contribution

The objective of the current inquiry is to address and examine the main research question:

What role has corporate entrepreneurship in small-established firms when developing radical innovations?

The literature has for long time emphasized both small and large firms in the way they develop innovations. Both how new ventures, gazelles and large global corporations pursue business development in order to generate innovations. It has been recognized during research that small and large firms bear specific size and age characteristics. It was then expected that there would be firms, small-established firms which adopts both large and small firms characteristics. This particular set of firms has less then 50 employees and is older then eight years. It's argued that the present set of firms' constitute a gap in the existing literature. In the literature review it was argued that small firms possess behavioral advantages and that large established firms possess size specific characteristics generating advantages in innovation. Through a multiple-case study it was demonstrated that current small-established firms possess both large and small firm characteristics generating advantages in innovations.

The empirical work indicates that characteristics associated with small firms are present in current firms, and are both perceived as advantages and drivers in the development of innovations. The characteristics are partly defined through a low level of bureaucracy, lack of hierarchy and an efficient internal communication system. As an effect of prior characteristics they are perceived, as they are very flexible, mobile and got a high adaptability. This further implies that they rapidly manage to respond to changing market demands. Theory argues that small firms because of their smallness are more suitable for niche market operations. From the empirical work it is discovered that the focus on niche market operations is consistent through the case studies.

Except for characteristics associated with small firms, the present case studies also have characteristics linked to large established firms. It's revealed that something that exists in most of the case studies is the supply of skilled technical labor, and that most of the firms' concentrates on new technology. In addition, several of the firms focus on establishing rich networks, both consisting of external companies but also with universities and research centers. Moreover, several of the firms experience that lack of legitimacy is not significant and consistent in their businesses. In some firms it's argued that smallness contributes and brings legitimacy, something that counteracts theories that legitimacy is associated with large established firms.

Throughout the paper, a radical innovation has been defined according to three criteria, significant (30-50%) reduction in cost, new to the world performance features or significant (5-10 times) improvement in known features. The empirical work indicates that three of the firms, see table 15, are considered to be more innovative. What's discovered from the case studies are the main differences between the three firms that

fulfill all the criteria, and those that only fulfill one criterion, which is that they share more characteristics associated to established firms. They experience rich networks with a lot of collaborations and partnerships. Something that turned out to be critical factors in their radical innovation projects. In addition does neither of them experience lack of legitimacy. In the case of Delta Inc. and Epsilon Inc., experience either lack of legitimacy or lack of rich networks.

Table 15: Overview of level of innovativeness

	Alpha Inc.	**Beta Inc.**	**Gamma Inc.**	**Delta Inc.**	**Epsilon Inc.**
Significant (30-50%) reduction in costs	Yes	Yes	Yes	Yes	No
New to the world performance features	Yes	Yes	Yes	No	Yes
Significant (5-10 times) improvement in known features	Yes	Yes	Yes	No	No

Corporate entrepreneurial behavior

The multiple-case study demonstrates that the role of corporate entrepreneurship in the development of radical innovations was apparent throughout the case studies. It was illustrated that pro-activeness, risk-taking and autonomy were of particular importance in the development of radical innovations.

Pro-activeness is defined and the consistent in the case studies through firms' pro-active behavior in the way they took the initiative to grasp new business opportunities because of a mentality to continuity searching for new products and solutions. In several of the case studies they initiated the projects because of expected changes in the market. These concerns are most substantial in the cases of Alpha Inc., Beta Inc. and Epsilon Inc. In both Gamma Inc. and Delta Inc. there are initiatives and reasons behind the projects combinations of several factors. Level of risk-taking is most visible in Alpha Inc., Beta Inc. and Epsilon Inc. In these cases the level of uncertainty and unfamiliarity is most considerable. In both Delta Inc. and Gamma Inc. the uncertainty regarding financial outcome and lack of experience of similar projects is less noticeable. Concerning the level of autonomy Beta Inc., Gamma Inc. and Epsilon Inc. have encouraged independence in the projects, without control of management. And both delegated a lot of authority to a project leader and to a large extent supported individual flexibility. Project members have in these cases possessed a lot of individual responsibility and had the opportunity to influence and structure their individual work. In both Alpha Inc. and in Delta Inc. the management had a higher level of control and involvement. From the case studies it's revealed that the level of competitive aggressiveness is rather fractional, in terms of whether the firms consider their competitors' acts and behavior according to their own. Competitive aggressiveness is more defined and interpreted as competitive preparedness. All firms scanned the market to check for similar products and technologies before they decided to engage in the projects. Only Beta Inc. and Gamma Inc. investigated competitors strategies but because of secrecy and difficulties to receive insight into competitors' business it's difficult to find information and thereby also hard to consider there future strategies.

The multiple-case study illustrates that the role of corporate entrepreneurship is more apparent in firms that have produced products with a higher level of innovativeness. It's thus considered that corporate entrepreneurship is most present in Beta Inc. In Alpha Inc., Gamma Inc. and Epsilon Inc. the role of corporate entrepreneurship is slightly significant in comparison to Beta Inc. In the case of Delta Inc. the role of corporate entrepreneurship is less significant in comparison to the other firms. Yet, they behave entrepreneurially but it's not equally visible. It's thus argued that it's possible to see certain patterns between small-established firms' characteristics, the level of innovativeness and entrepreneurial behavior.

In the introduction part of the current paper it partly presumed the existing literature disregarded small-established firms in the context of corporate entrepreneurship in radical innovation. Moreover, that a particular set of firms' possesses both small and large firm characteristics. The present paper contributed to this theoretical field with a first explorative study. It implies the current paper provided hypothesizes regarding certain correlations between outcomes and certain attributes. The paper partly reflects that the more innovative small-established firms are, the more characteristics with established firms are experienced. In addition, it demonstrates the significance of corporate entrepreneurship when orchestrating radical innovations in small-established firms. In order to develop a theory out of current hypothesizes more research is required.

6.2 Managerial implications

From the empirical examination it's possible to make some recommendations as to how small-established firms can learn, and what behavior pattern that is associated with and characteristic of high innovativeness. Also what characteristics specific for small and large firms that support innovation. The recommendations are based on experience from the five case studies in the current paper:

- The focus on niche market operations.
- Skilled technical manpower and the focus on new technology.
- New business opportunities are found, developed and implemented through the internal and external network.
- The continuous search for new ideas.
- Lean towards individual independence and individual initiative in innovation processes.

6.2.1 Discussion

As mentioned in managerial implications, the paper indicates that most firms are operating in niche markets. It further examined that all firms had skilled technical labor and the most innovative firms, in their radical innovation projects', used new technology. However, it's not clarified what the cause is and what the effect is. Whether the case is that niche market operation, skilled technical labor and new technology brings radical innovations? Or, the contrast that radical innovation brings niche market operation, skilled technical labor and new technology. That is, if firms are in niche market, have skilled manpower and new technology then they develop radical innovations? Or, the contrast if you have developed a radical innovation, it indicates that you have been in a niche market, have skilled manpower and have used new technology? It's argued that the current paper has pinpointed correlation between

attributes and outcomes, and not pinpointed causal mechanisms. These issues need to be considered.

6.3 Future research

The construction of a theory could be divided into three stages; the first stage, the foundation, starts by formulating a description of some phenomenon. It could consist of something that we understand, for instance, what role has corporate entrepreneurship in small-established firms when developing radical innovations? The second stage is to classify aspect of the phenomenon into categories. That is, all companies have different attributes, history and driving forces etc. It's difficult to conclude that some practices that work for some firms will also work for all firms. The last step is then to formulate a hypothesis of what causes the phenomenon to happen and why. In comparison between a hypothesis and a theory, should a theory accomplish to pinpoint causal mechanisms. It should further provide predictability and identify causes behind results and circumstances in which causal mechanism will and will not result in a certain outcome (Christensen and Raynor, 2003).

In the present research it indicates that some outcomes are correlated with certain means but it does not mean that I have pinpointed causal mechanisms. It merely indicates that those means found in the paper are correlating with the outcome. It's thus important to both distinguish between correlation and causation and hypothesizes and theories. The current research paper adopts an explorative approach and is solely at the early beginning of developing a theory. It has provided hypothesizes. In order to establish a theory it thus needs to further elaborate current hypothesizes.

What's needed for further research, is to conduct more in-depth case studies to examine and increase the understanding of what attributes, in both firm and industry level, are correlated with specific outcomes. It is also important to design categories based on right attributes, so what causes outcomes are connected with right categories. To receive high predictability it is important to make deeply analysis in the case studies, not only analyze large amount of case studies, some attributes that generate specific outcomes are impossible to clarify by statistical data, such as culture behavioral, organizational structure, management leadership etc.

The current paper did not considered how each entrepreneurial dimension interplays with each other. It neither has been investigated how entrepreneurial activities interplay with firm characteristics. Thus, it's not enough to investigate and come up with right attributes and behavior that causes an outcome, and increase the understanding of what attributes correlate with specific outcomes, measurable or non-measurable. It is also needed to understand under which circumstances the theory explain/predict specific outcome and under which circumstances it does not. It might happen that attributes/mechanisms produce different outcomes in different situations.

8. Reference list

Ackroyd, S. (1995), *On the structure and dynamics of some small, UK-based information technology firms*, Journal of Management Studies

Acs, Z.J. and Audretsch, D.B. (1990), *Innovation and small firms*, Massachusetts Institute and Technology

Ahuja, G. and Lampert, C.M. (2001), *Entrepreneurship in the Large Corporation: A Longitudinal Study of How Established Firms Create Breakthrough Inventions*, John Wiley & Sons

Bower, J. L. and Christensen, C.M. (1996), *Customer Power, Strategic Investment, and the Failure of Leading Firms*, Strategic Management Journal

Bower, J.L. and Christensen, C.M. (1995), *Disruptive technologies: Catching the Wave*, Harvard Business Review

Bryman, A. and Bell, E. (2007), *Business research methods*, Oxford University Press Inc., New York

Carayannopoulos, S. (2009), *How Technology-Based New Firms Leverage Newness and Smallness to Commercialize Disruptive Technologies*, ET&P

Carrier, C. (1997), Intrapreneurship in Small Businesses: An Exploratory Study, Theory and Practice

Chandy, R. and Tellis, G. (1998), *Organizing for radical product innovation: the overlooked role of willingness to cannibalize,* Journal of Marketing Research

Christensen, C.M. (1997), *The Innovator's Dilemma*, Harvard Business School

Christensen, C.M., Bohmer, R. and Kenagy, J. (2000), *Will Disruptive Innovations Cure Health Care?*, Harvard Business Review

Christensen, C.M. and Raynor, M.E. (2003), *Why Hard-Nosed Executives Should Care About Management Theory*, Harvard Business Review

Covin J.G. and Miles, M.P. (1999), *Corporate Entrepreneurship and the Pursuit of Competitive Advantage*, ET&P

Covin J.G and Zahra S.A. (1995), *Contextual influences on the corporate entrepreneurship-performance relationship: a longitudinal analysis*, Journal of Business Venturing

Craggs, A. and Jones, P. (1998), *UK results from the Community Innovation Survey*, Economic trends no. 539

Dess, G.G., Ireland, D.R., Zahra, S.A., Floyd, S.W, Janney, J.J. and Lane, P.J. (2003), *Emerging Issues in Corporate Entrepreneurship*, Journal of Management

Dess, G.G. and Lumpkin, G.T. (1996), *Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance*, Academy of Management

Dutta, S. and Evrard, P. (1999), *Information Technology and Organization within European Small Enterprises*, European Management Journal

Eisenhardt, K.M. (1989), *Building Theories from Case Study Research*, Academy of Management Review

Freel, M.S. (2000), *Barriers to Product Innovation in Small Manufacturing Firms*, International Small Business Journal

Hansen, J. A. (1992), *Innovation, Firm size, and Firm Age*, Small business economics

Hausman, A. (2005), *Innovativeness among small businesses: theory and propositions for future research*, Industrial Marketing Management

Henderson, Rebecca (1993), *"Underinvestment as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry,"* Journal of Economics

Herrmann, A., Gassmann, O. and Eisert, U. (2007), *An empirical study of the antecedents for radical product innovations and capabilities for transformation*, Journal of Engineering and Technology Management

Kaufmann, A and Tödtling, F. (2002), *How effective is innovation support for SMEs? An analysis of the region of Upper Austria*, Technovation

Koberg, C.S., Detienne, D.R. and Heppard, K.A. (2003), *An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation*, The Journal of High Technology Management Research

Kvale, S. and Brinkmann, S. (2009), *Interviews – Learning the Craft of Qualitative Research Interviewing*, SAGE Publications Inc., Second Edition

Lassen Heidemann, A., Gertsen, F. and Riis, J.O. (2006), *The Nexus of Corporate Entrepreneurship and Radical Innovation*, Blackwell Publishing

Leifer, R., McDermott, C.M., O'Conner, G.C., Peters, L.S., Rice, M.P. and Veryzer, R.W. (2000), *Radical Innovation: How mature companies can outsmart upstarts*, Harvard Business School Press

Leifer, R., O'Conner, G.C. and Rice, M. (2001), *Implementing radical innovation in mature firms: The role of hubs*, Academy of Management Executive

Lokshin, B., Van Gils, A., Bauer, E. (2009), *Crafting firm competencies to improve innovative performance,* European Management Journal

Massa, S. and Testa, S. (2008), *Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers*, Technovation

McDermott, C.M. and O'Connor, G.C. (2002), *Managing radical innovation: an overview of emergent strategy issues*, Product Innovation Management

Miles, M.B. and Huberman, A.M. (1994), *Qualitative data analysis: an expanded sourcebook*, SAGE Publications Inc., Second Edition

Nijssen, E.J., Hillebrand, B. and Vermeulen, P.A.M. (2005), *Unraveling willingness to cannibalize: a closer look at the barrier to radical innovation*, Technovation

Nooteboom, B. (1994), *Innovation and Diffusion in Small Firms: Theory and Evidence*, Small Business Economics

O'Connor, G.C. and Ayers, A.D. (2005), *Building a radical innovation competency*, Research Technology Management

O'Connor, G.C. and McDermott, C.M. (2004), *The human side of radical innovation*, Journal of Engineering and Technology Management

OECD. (2004), *SME Statistics: Towards a More Systematic Statistical Measurement of SME Behaviour.* Background report for the 2nd OECD Conference of Ministers Responsible for Small and Medium Enterprises (SMEs), p.10.

Pittaway, L., Robertson, M., Munir, K., Denyer, D., Neely, A. (2004), *Networking and innovation: a systematic review of the evidence*, International Journal of Management Reviews

Rothwell, R. (1989), *Small Firms, Innovation and Industrial Change*, Small Business Economics

Schumpeter, J.A. (1934), *The theory of economic development,* Harvard University Press

Schumpeter, J.A. (1994), *Om skapande förstörelse och entreprenörskap*, Norstedts akademiska förlag

Sorescu, A.B., Chandy, R.K., Prabhu, J.C. (2003), *Sources and Financial Consequences of Radical Innovations: Insights from Pharmaceuticals,* Journal of Marketing

Tranfield, D., Denyer, D., Smart, P., (2003), *Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review*, British Journal of Management

Stringer, Robert (2000), *How to Manage Radical Innovation,"* California Management Review

Van Dijk, B., Den Hertog, R., Menkveld, B. and Thurik, R. (1997), *Some New Evidence on the Determinants of Large- and Small-Firm Innovation*, Small Business Economics

Yin, R.K. (2009), *Case study research: design and methods*, SAGE Publications Inc.,

Xin, J.Y., Yeng, A.C.L., Cheng, T.C.E. (2009), *Radical innovations in new product development and their financial performance implications: An event study of US manufacturing firm,* Springer Science

Appendix 1

Interview Guide

General firm information

1. Company information
    a. Firm name, origin (i.e. headquarters country).
2. Dimension: turnover, employees, number of plants, market share.
    a. Turnover in (Euro) and growth trend in the last 3-5 years.
    b. Number of employees of the company.
    c. Power structure. Organisation chart.
    d. Market share of the company, structure of competition within the main market.
3. Industry and products
    a. Describe company industry (e.g. ISIC classification).
    b. Market characteristics (type, number of customers, geographic area, ...)
4. Competitive priorities / order winners - qualifiers
    a. Rank the 5 most important priorities for your customers.
    b. Have priorities changed / will they change?
5. Firm characteristics
    a. Describe firm organizational characteristics.
    b. What do you perceive (in terms of firm characteristics) as your advantages and disadvantages in comparison to competitors and/or larger players, with focus on innovativeness and development of radical innovations?

The radical innovation definition

The product or process needs to meet one of three criteria:

- Significant (30-50%) reduction in cost
- New to the world performance features

- Significant (5-10 times) improvement in known features

The radical innovation project

1. Project information
    a. What type of innovation have you developed (i.e. product, process, paradigm)
    b. What triggered the start of the project (i.e. did you internally develop a need for the product, or was it cause of external request)
    c. Can you short describe the execution of the project (that is stages and responsibilities)
    d. Can you give examples of critical factors for the outcome in the project (i.e. support, entrepreneurial behaviour, risk-taking, pro-activeness, autonomy, competitive aggressiveness)
2. Corporate entrepreneurial behaviour
    a. Pro-activeness
        a. Who and when took initiative for the project?
        b. How would you describe causes and reasons behind the project? Is the project an effect of problems you have faced or on specific needs you have perceived, or is it cause of expected changes in the marketplace?
        c. Can you give some additional example of pro-activeness?
    b. Risk-taking
        a. What was the level of uncertainty and unfamiliarity of the project?
        b. How was the decision-making procedure concerning resources (people, time, financial commitment) to the project?
        c. How were your evaluation criteria (financial, non-financial) when deciding to engage in the project?
        d. How important was the use of planning techniques (i.e. Gantt charts, milestones)?
        e. How involved was management in the project, that is support, communication and information exchange etc.?
        f. Can you give some additional examples of willingness to take risk?
    c. Autonomy

a. How was the project structure (that is level of control, hierarchy, and delegation of authority)
b. Can you specify project characteristics in terms of level of centralization, level of formalization, and level of flexibility?
c. Can you give some additional example of autonomy?

d. Aggressiveness
    a. What was the purpose of the project? Entry in new markets? Improve current position?
    b. Before the project started, did you scan the competitive environment? What kinds of search mechanisms were utilized?
    c. How important was time-to-market?
    d. In the decision-making of the project. Did you consider competitors act, strategies and objectives, in the existing marketplace, according to yours?
    e. Can you give some additional example of competitive aggressiveness?

Open questions if the time allows:

1. If you have several radical innovation projects. Do you have some similarities/differences between the projects (e.g. critical factors)?
2. What are, according to you and your experience, the most important differences/similarities in managing and organizing (discontinuous/radical) innovation processes between small organizations and larger organizations?

Appendix 2

Search for radical innovation; Scopus

TITLE(radical innovation) AND TITLE(sme)	Scopus	0
TITLE(radical innovation) AND ABS(sme)	Scopus	0
TITLE(radical innovation) AND ABS(large firms)	Scopus	21
TITLE(radical innovation) AND ABS(small firms)	Scopus	3
TITLE(radical innovation) AND ABS(gazelle firms)	Scopus	0
TITLE(radical innovation) AND ABS(established small firms)	Scopus	0
TITLE(radical innovation) AND ABS(start-up firms)	Scopus	1
TITLE(radical innovation) AND ABS(large firms) AND KEY(characteristics)	Scopus	0
TITLE(radical innovation) AND ABS(large firms) AND KEY(definitions)	Scopus	0
TITLE(radical innovation) AND ABS(large firms) AND KEY(smallness)	Scopus	0
TITLE(radical innovation) AND ABS(small firms) AND KEY(smallness)	Scopus	0
TITLE(radical innovation) AND ABS(gazelle firms) AND KEY(smallness)	Scopus	0
TITLE(radical innovation) AND ABS(start-ups) AND KEY(smallness)	Scopus	0
TITLE(radical innovation) AND KEY(small firms)	Scopus	0
TITLE(radical innovation) AND KEY(large firms)	Scopus	1
TITLE(radical innovation) AND KEY(established firms)	Scopus	0
TITLE(radical innovation) AND KEY(gazelle firms)	Scopus	0
TITLE(radical innovation) AND KEY(start-ups)	Scopus	0
TITLE(radical innovation) AND ABS(corporate entrepreneurship) AND ABS(radical innovation)	Scopus	0
TITLE(radical innovation) AND ABS(corporate entrepreneurship) AND ABS(sme)	Scopus	1
TITLE(radical innovation) OR TITLE(corporate entrepreneurship) AND ABS(entrepreneurial orientation)	Scopus	0
TITLE(radical innovation) AND ABS(entrepreneurial orientation)	Scopus	4

Search for radical innovation; Business Source Premier (EBSCO)

TI radical innovation and AB large firms	Business Source Premier (EBSCO)	18
TI radical innovation and AB large firms	Business Source Premier (EBSCO)	3
TI radical innovation and AB established small firms	Business Source Premier (EBSCO)	0
TI radical innovation and AB gazelle firms	Business Source Premier (EBSCO)	0
TI radical innovation and AB start-ups	Business Source Premier (EBSCO)	0
TI small firms and AB radical innovation	Business Source Premier (EBSCO)	22
AB SME and AB radical innovation	Business Source Premier (EBSCO)	10
AB SME and AB radical innovation or KW radical innovation	Business Source Premier (EBSCO)	75
AB small firms and AB radical innovation and KW small firms	Business Source Premier (EBSCO)	1
AB start-ups and AB radical innovation and KW radical innovation	Business Source Premier (EBSCO)	0
AB gazelle and AB radical innovation and KW radical innovation	Business Source Premier (EBSCO)	0
	Business Source Premier (EBSCO)	
TI corporate entrepreneurship and AB radical innovation	Business Source Premier (EBSCO)	2
TI corporate entrepreneurship and AB radical innovation and KW radical innovation	Business Source Premier (EBSCO)	0
TI corporate entrepreneurship and AB radical innovation and KW corporate entrepreneurship	Business Source Premier (EBSCO)	0
TI corporate entrepreneurship and AB entrepreneurial orientation and AB radical innovation	Business Source Premier (EBSCO)	1
TI entrepreneurial orientation and AB radical innovation	Business Source Premier (EBSCO)	2
TI entrepreneurial orientation and AB small firms	Business Source Premier (EBSCO)	16