CHALMERS

Collaborate to accomplish breakthrough innovation

Identification of success factors within breakthrough innovation collaboration

Master of Science Thesis
in the Management and Economics of Innovation Programme

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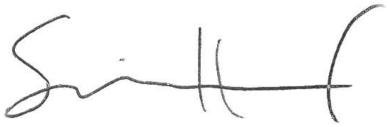

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Abstract

As the globalization is affecting the worlds market with increased competition firms need to be innovative in order to sustain or accomplish competitive advantage over time. To be highly competitive, firms should pursue breakthrough innovations, as they will give the highest payoff if they succeed. However, it is not easy to create breakthrough innovations as it forces organizations to act outside of their ordinary scope of activities. Therefor, the creation of breakthrough innovation requires an effectual mindset and funding over time, which few organizations possess by themselves.

The new paradigm, open innovation, affects the competitive environment by favoring collaboration above purely self-developed products/services. It makes firms keener to sustain or accomplish competitive advantage by collaborating with others. If firms and startups collaborate by using both the resources of the firm as well as the effectual characteristics of the startup, they could together be better off. However, their differing natures makes them hard to join. This study will therefore identify and investigate the success factors for collaboration between firms and startups when doing breakthrough innovation.

This study is based on a literature review and interviews of firms and startups. The focus of the literature review is in the combined area of open innovation, breakthrough innovation, collaboration, firms and startups. The study used a qualitative method for collecting data where in-depth interviews were conducted. In total 19 cases involving 30 firms and startups were identified, including projects with both commercialized and un-commercialized breakthrough ideas. When analyzing the data, an iterative method was applied, in which theory and data were compared to get an understanding of the cases.

This study provides an overall understanding of what factors that are of importance for succeeding with breakthrough innovation collaboration between firms and startups. 17 factors were identified as important for success, out of these 5 factors were more important and were therefore seen as more vital. The result contributes to the theory by filling the gap between open innovation, breakthrough innovation, collaboration, startups and firms. In practice the result can be used to increase understanding of breakthrough innovation collaboration projects and help managers directing their efforts.

Keywords: breakthrough innovation, open innovation, collaboration, firms, startups

Definitions

Open innovation: A way of using external solutions, knowledge and/or capabilities in combination with internal competencies in creating value for customers and consumers (Chesbrough, 2006).

Breakthrough innovation: This term is defined by three criteria; the invention must be novel; it cannot be similar to previous inventions. The invention must be unique; it cannot be similar to existing inventions. The invention must be adopted; it should influence the content of future inventions (Dahlin and Behrens, 2005).

Collaboration: The definition means that participants within a collaboration share risks and gains to accomplish their mutual goals (Järrehult, 2011).

Startup: A temporary organization used to search for a repeatable and scalable business model (Blank and Dorf, 2012). Using an effectual logic of reasoning when making decisions (Read et al., 2010).

Firm: An organization set-up with the purpose to create and capture value by exploiting an existing business idea. Using a causal logic of reasoning when making decisions (Read et al., 2010).

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1. Introduction

This chapter will provide a first insight into the report by presenting background, problem description, purpose, research question, scope and delimitations. Further, it will provide an outline of the remaining parts of the report.

1.1. Background

The globalization is increasingly affecting the world's markets and the products and technologies therein. This is making the markets bigger and putting companies in increased competition (Tidd, 2005). To sustain competitive advantage over time, innovation has been identified as one important source of success (Grant, 2013). Companies in general, pursue three types of innovation, core, adjacent and/or transformational (Nagji and Tuff, 2012). In this report it will be referred to incremental, adjacent and/or breakthrough for the ease of understanding. The first is continuous improvement of an already existing product/service in the firm. The second is when companies expand their core business into adjacent markets and/or products & services. The third is when either products/services new are introduced or or new markets are found or both (Nagji, and Tuff, 2012). When doing incremental or adjacent innovation firms usually generate continuous and slow to moderate increasing income, due to the steady renewal of existing or similar products. However, in markets with increased competition firms need to be highly innovative to sustain or accomplish competitive advantage making breakthrough innovation more effective. This since, breakthrough innovation generates discontinuous but rapidly increasing income (Baumgartner, 2009).

When firms have grown into a mature phase they rarely come up with any breakthrough innovations. There is a rich set of studies explaining why. One of these concerns the value network, where breakthrough innovations might generate a shift, making existing relations to customers and suppliers useless (Rosenbloom and Christensen, 1994). A second reason is the competence destroyed by breakthrough innovations by demanding new competence and making the old competence useless (Tushman and Anderson, 1986). A third reason is related to the higher degree of risk involved in breakthrough innovation, making risk-averse managers avoiding them. This is because an objective loss is subjectively experienced as three times worse than an objective gain (Kahneman, 2011). Even though firms have problems with generating breakthrough innovations they usually posses a large set of resources to commercialize ideas.

Opposed to firms, startups still search for a product-market-fit. This means that they are still searching for how the product/service will be formed and for which market it will be used. When figuring this out they commonly use a search methodology called Customer Development. Doing this, they are continuously searching, trying to validate their product-market-fit by interviewing the market (Blank and Dorf, 2012). Some of the best practices of doing this, is being fast to avoid spending too much capital and/or letting someone else commercialize it before you (Blank and Dorf, 2012). This way of working has been proven to be suitable when creating and validating breakthrough ideas.

Today an open approach of doing innovation has become increasingly popular, where the focus is on sharing knowledge from one firm to another. This approach is named open innovation

(Chesbrough, 2006). Doing this firms usually build alliances with other firms, where they as a group increase their number of innovations and competitive advantage (Neyens, et al., 2010). If firms and startups could collaborate likewise, when doing breakthrough innovations, they could gain a lot of advantage. This for example, by letting the breakthrough innovation get funding and knowhow from a firm and speed and creativity from a startup. However, the differing natures of working methods and cultures make them hard to join (Tushman et al, 1996).

1.2. Problem description

As argued throughout this background, firms and startups should collaborate when pursuing breakthrough innovations when creating or sustaining competitive advantage. However, obstacles in collaboration startups and firms are plenty and not fully addressed. Moreover, it has been shown that breakthrough innovation collaboration rarely succeeds mainly due to the contingencies on how to manage them.

1.3. Purpose

The purpose of this master thesis is to create a greater understanding of the factors within collaboration between startups and firms to increase the success rate of innovation collaboration projects. The purpose is to identify the factors characterizing breakthrough innovation projects. Furthermore, it aims to understand the factors' interdependence in order to clarify whether some of them are of more or less importance.

1.4. Research question

In order to fulfill the purpose described, two research areas have been identified. The first area of study is regarding the factors behind successful breakthrough innovation collaborations. The second area will focus on the interdependencies between the factors identified to see if some of them are more important. Doing so, one could prioritize the resources between the factors and create a better ground for breakthrough innovation collaboration. The areas of study have been translated into two research questions in order to fulfill the purpose:

RQ 1: What factors characterize the success of breakthrough innovation collaboration projects between firms and startups?

RQ 2: How are the identified factors´ interdependence related to the commercialization of breakthrough innovations when firms and startups are collaborating?

1.5. Scope and Delimitations

This master thesis will address the gap within the field of open innovation and theory of breakthrough innovation, collaboration, startups and firms, see figure 1. The scope of this thesis is to find success factors within collaboration between startups and firms when pursuing breakthrough innovations. Moreover, to understand how these factors are interdependent the purpose is eventually to sort-out more vital ones. The study is solely looking on and using the terms as defined in the report. Further, this study is focused on Swedish organizations operating in international or national markets.

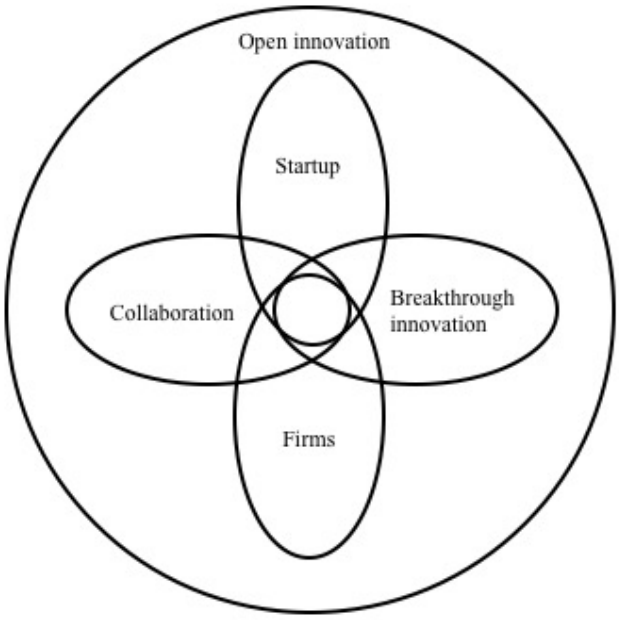

Figure 1. The study´s scope.

1.6. Outline of the report

Chapter 1: Creates an understanding regarding the background and the purpose of this master thesis. Furthermore, the research questions and the scope are presented.

Chapter 2: Identifies the published literature within the subject of research in order to collect relevant empirical data and to be able to analyze it later. The subjects of literature are open innovation, startup, firms, collaboration and breakthrough innovation.

Chapter 3: In chapter three are the used research methodology presented to fulfill the purpose. Moreover, it is described how the data was collected and analyzed which finally are discussed regarding it quality.

Chapter 4: The section about the empirical findings is presenting the findings from the investigated cases. All the cases are presented in a shorted summery which ends with key findings and the researcher's' own reflections of each case.

Chapter 5: Within the result analysis the findings are analyzed together with the theory from the literature section. First the dynamics behind successful cases are analyzed, where 17 success factors were identified. After that their interdependence was analyzed to find the factors which to a higher degree contributed to a successful outcome.

Chapter 6: In the discussion the validity and the generalizability of the empirical findings are discussed.

Chapter 7: The conclusion is presenting the answers of the research questions. It also presents a framework where five main factors are identified. After that the implications to practice and the contribution to theory are presented.

Chapter 8: Lastly, the suggestions to further research are presented where four possible areas of research are identified.

2. Literature

This chapter will review the theory of open innovation, breakthrough innovation, collaboration, firms and startups. The purpose of doing this is to get an initial understanding of the topics and to get a theoretical base for the study. How the theories are interrelated can be seen in figure 1 where open innovation can be exemplified by the field in which breakthrough innovation collaboration takes place. Breakthrough innovation can be explained as the desired outcome and collaboration the means to reach that outcome. Startups and firms are the players participating in the breakthrough innovation collaboration projects.

2.1. Open innovation

The theory and term Open innovation was described by Chesbrough, (2003) and the field in which breakthrough innovation collaboration takes palace. The theory describes how the industry is facing a new era of openness where firms need to adapt to this new paradigm. To get an understanding of what this means this part will describe and compare the "old" closed with open innovation.

2.1.1. Closed vs. open innovation

The term, Closed innovation has been described throughout the literature as the traditional R&D process used during the last century (Chesbrough, 2003). The companies using this process view their environment as hostile, where they try to squeeze both suppliers and customers (Enkel et al., 2009). Further, the competitors are only seen as those to fight against. With this attitude companies kept their knowledge by themselves and hence internal R&D was critical for creating new innovations (Almirall et al., 2010). This attitude can further be described as follow:

- Hire the smartest people in the field to put into the process
- When supplying the market, a company needs to discover and provide innovations by themselves.
- The one supplying the market with an innovation first wins the competition.
- To lead the market, you need to have a leading R&D department.
- To protect innovations and profits therefrom a company needs intellectual property.

Working according to the points above prevents companies to expand into new markets (Chesbrough, 2006). This since they will only be able to provide products to their current market as illustrated with a close innovation funnel in figure 2.

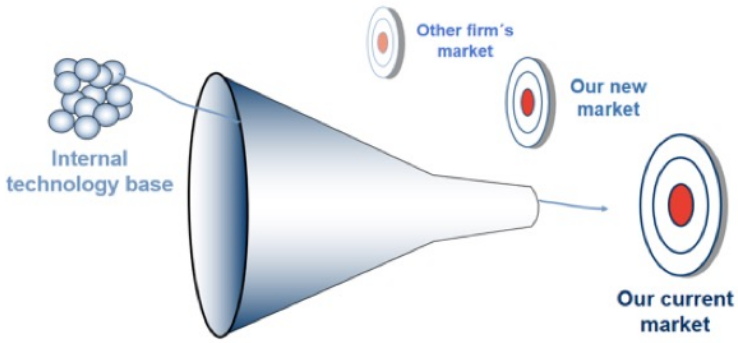

Figure 2. The closed innovation tunnel. Source: Chesbrough, 2003

Compared with closed innovation, open innovation views the environment as friendly (Sawhney et al., 2005) where the firm should use both internal and external knowledge from customers, suppliers and competitors to increase their innovation capabilities (Gassmann, 2006). When working this way firms assume that the environment can be trusted and they can collectively share rewards and risks. Firms who are working this way, are characterized by the following points (Chesbrough, 2003):

- The smartest people in the field are outside the company and therefore external competencies should be used.
- Internal R&D is used to capture value and external R&D is used to create.
- Improving the business model is more important than supplying the market first.
- Internal ideas and experience complemented with external is a winning recipe.
- We will profit from others when they use our intellectual properties, in the same way we will profit from theirs
- By letting other profiting from our intellectual properties we can profit from theirs as well.

By using power from both internal and external knowledge firms are able to provide both their current and new markets with innovations as well as helping others doing the same. This way of working can be seen as a funnel with several of ways in and out, as illustrated in figure 3, (Chesbrough, 2006).

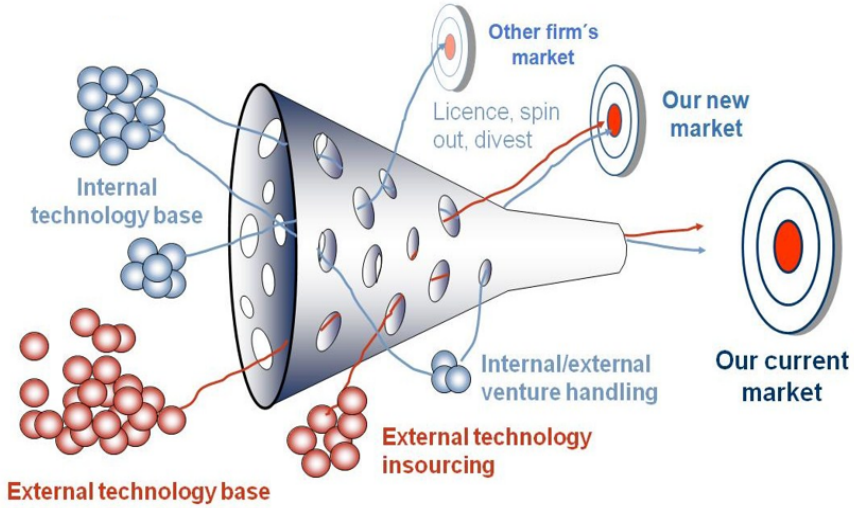

Figure 3. The open innovation tunnel. Source: Chesbrough, 2003

2.1.2. Types of open innovation process

When working with open innovation there are different ways of processing ideas and projects through the funnel. These processes are called outside-in, inside-out and coupled. The first, outside-in, is the process in which firms are using the external environment such as suppliers, customers, competitors and research institutes to increase their own knowledge base. This process shows that the knowledge creation of an innovation not necessarily needs to emerge from the same place as the innovation itself (Enkel, et al 2009). The second, inside-out, is the process in which firms are earning profit by providing knowledge to the external environment. This could be done by selling IP or multiplying technology. This transfer of knowledge from inside to outside the company boundaries means that they are letting others exploit their ideas in the market (Enkel, et al 2009). The third, coupled, is the process in which firms are creating innovation with others, by combining knowledge from inside and outside of the firm. This means that partners jointly develop and commercialize ideas to the market. This could be arranged in several forms such as alliances, cooperations and joint ventures (Enkel, et al 2009). Commonly these partners are consumers, lead users, research institutes and partners from other industries.
However, the number of co-creation projects has shown to differ depending on industry, where in the fast clock-speed industries such as high-tech ITC companies, 50 % of the R&D projects are jointly developed compared to 20 % in the slower clock-speed industries such as the Pulp and Paper Industry.

2.1.3. Pros & cons with open innovation

As result from searching the external market for new ideas, the focus in innovation is shifting from only doing internal R&D activities to doing external R&D as well. This reinforces the collaboration advantages further and forms a structure that can be seen as a network and is usually present in many high-tech industries (Saint-Paul, 2003). This kind of network has been shown to increase the number of innovations up to 9 times for the participating firms. Thus everyone not participating is

facing competitive disadvantages and might even reduce their long-term knowledge base (Koschatzky, 2001).

However, not all things are positive with open innovation. Companies are facing higher degree of risk, which might prohibit them from profiting from their initiatives. Studies have been made showing that firms and start-ups encounter increased risks of loss of knowledge, higher coordination costs and more complexity when doing open innovation (Enkel, et al 2009). In line with this firms might become too dependent of their open innovation network and might encounter risk of losing their innovation capability if the other parties withdraw (Adner, 2006). Moreover, firms are facing more internal barriers, such as finding the right collaboration partner and difficulties balancing daily activities with the ones of open innovation. (Enkel, et al 2009). Thus when opening up for the external environment one needs to be aware of the new risks and take corrective action not to lose control.

2.1.4. Hampering factors

As mentioned above pursuing open innovation implies new risks and internal barriers. These factors can explain why some open innovation initiatives fail. A survey made in the Dutch industry identified a set of internal and external factors that hamper firms from pursuing open innovation. These factors are as follows, table 1 (Meer and Han, 2007):

Table 1. Hampering factors.

External factors
Enterprise's innovation potential (e.g. R&D, design, etc.) too small
Lack of skilled personnel
Lack of information on technologies
Lack of information on markets
Innovation costs are hard to control
Resistance to change in the enterprise
Deficiencies in the availability of external technical services
Lack of opportunities for co-operation with other firms and technological institutions
Lack of technological opportunities
No need to innovate due to earlier innovations
Innovation too easy to copy
Legislation, norms, regulations, standards, taxation
Lack of customer responsiveness to new products and processes
Uncertainty in timing of innovation
Internal factors
Too little commitment
Too little time available
Too few resources
Wrong innovation strategy

Source: Meer and Han, 2007

As can be argued from the factors above the challenge for firms entering open innovation is to handle their business models in an open way. To open up the business model one have to combine internal with external activities this has shown to be hard, and was a big barrier in the Dutch industry (Meer and Han, 2007).

The challenges mentioned above have successfully been managed by firms, which further proves the advantages of open innovation. One of these was when P&G managed to increase the efficiency in their R&D activities by 60 % and simultaneously increased their success rate of products by 50 % (Enkel, et al 2009). To overcome barriers and minimize risks of open innovation firms need to re-orient their organizational structure. In other words, firms need to figure out how their traditional business model could be altered to fit into the new environment. Where sharing of knowledge and resources is a rule and innovation activities are done both within and outside the organization, open innovation thrives (Abouzeedan and Hedner, 2012).

2.1.4.1. Organization structure and environmental factors

The environmental factors that should be considered to successfully reorient the organization are the uncertainty and the non-routine of technology (Ismail and Monsef, 2012). Where the former is the degree to which managers are informed about uncertainties in the environment. The latter is, the degree to which technology and process are formed/produced differently time to time in the environment (Ismail and Monsef, 2012).

However, when doing a re-orientation to an open innovation a successful structure per se should consider factors such as formalization, centralization and complexity of the organization (Ismail and Monsef, 2012). Formalization refers to the degree which workers are provided with rules and procedures that increases or decreases learning, autonomy and creative work. Centralization concerns the importance of the right degree of decision-making authority personnel should have in relation to their position. Complexity stresses the importance of having the right amount of subsystems supporting and not hampering activities (Ismail and Monsef, 2012).

Moreover, depending on if the firms want to acquire intellectual property or innovation capability and how the inter-organizational relationships look like; one can further reveal a successful structure (Feller, et al., 2009). This structure is either mediated by a third party or directs towards a solution or solver market (Feller, et al., 2009).

2.1.4.2. Top management

Another success factor for open innovation is management support to make it sustain over time. To get management support the teams need to get oversight into the field of open innovation and understand why it will be of importance for long-term value creation. Further, to make open innovation sustain over time top management needs to be committed and avoid letting long-term goals suffer from short-term wins (Kiron et al. 2015). This could be done by letting boards articulate a meaningful story about the importance of open innovation in achieving long-term goals and communicate that story to the market (Kiron et al. 2015).

2.1.4.3. Types of Process and capabilities

To succeed with open innovation firms needs different kinds of capabilities depending on the type of open innovation process. These capabilities can be structured as follow see table 2.

Table 2. Type of open innovation process and capability.

Outside-in	Absorptive capacity important to capture value
Inside-out	Multiplicative capacity, transforming internal ideas to external reality
Coupled	Relational capacity, how to build partners and alliances

Source: Gassmann and Enkel, 2004

2.1.4.4. Type of company

Not all types of firms are perfectly suited for using open innovation, however the ones best suited have the opportunity to reap the most benefits and succeed. The characteristics of these firms are as follows (Gassmann and Enkel, 2004):

- A high product modularity
- High industry speed
- High tacit knowledge required to innovate and a complexity of interfaces
- Companies that can use positive external effects (spill-overs) by licensing their IP
- Having network-effects important for the innovation to gain value

The concept of open innovation is very wide and can be connected to several other concepts. In this study we will focus on the coupled process of open innovation and connect it with breakthrough innovation and the differences between firms and startups.

2.2. Breakthrough innovation

The next section of theory is breakthrough innovation and is the desired outcome of breakthrough innovation collaboration projects. The aim of likewise projects is to create something new that will establish the participants' positions in the industry.

2.2.1. Definition of breakthrough innovation

As the industry dynamics have shortened the product life cycle, companies need to innovate in order to keep pace and be competitive (Grant, 2013). To be ahead of competition one should focus on doing breakthrough innovation. The success rate of breakthrough innovation is low but when succeeding it allows companies to keep their market position and/or become market leaders. Conversely companies will ultimately die if they not innovate at all (Chesbrough, 2006). The degree of radicalness determines the earnings from each innovation. Companies succeeding in making unprecedented innovations will enjoy Schumpeterian rents and establish a leading position (Schumpeter, 1934). The field of unprecedented innovation could be divided into several areas depending of an innovation's characteristics. Researchers write about innovation with disruptive, breakthrough/radical and discontinuous characteristics. All characteristics have different impact of

industries and the companies within it. A disruptive innovation destroys existing technology utilities, discontinuous innovations do not build on existing products and breakthrough/radical innovations either create new products or markets or both (Christensen, 1997; Leifer et al., 2001; Michel et al., 2008). Moreover, breakthrough/radical innovation is defined by three criteria (Dahlin and Behrens, 2005):

- Criterion 1: The invention must be novel; it cannot be similar to previous inventions
- Criterion 2: The invention must be unique; it cannot be similar to existing inventions
- Criterion 3: The invention must be adopted; it should influence the content of future inventions

Criteria one and two define radicalness while criterion three defines success. This means that the first two criteria can occur at any time, whereas criterion three only occurs if the market, cultural and sociological forces are aligned (Dahlin and Behrens, 2005). The innovations must fulfill all three criteria to be defined as breakthrough or radical (Norman and Verganti, 2014). Furthermore "a radical innovation is a product, process, or service with either unprecedented performance or familiar features that offer significant improvements in performance or cost that transform existing markets or create new ones" (Leifer et al., 2001). The life cycle of a breakthrough innovation is long term, non-linear and unpredictable. Furthermore, breakthrough innovations are also dependent on corporate culture as well as informal networks accelerating projects (Leifer et al., 2001). In contrast to breakthrough innovation, incremental innovation describes upgrades or optimization of existing products/services or processes following a linear and predictable process. To complete the spectrum of innovation ambition, adjacent innovation is found between the two previously mentioned extremes (Nagji and Tuff, 2012). Due to the differences in character, managers of the three types of innovations must take strikingly different paths within organizations to succeed.

2.2.2. Innovation ambition matrix

As described before innovations can be divided depending on ambition, i.e. are they incremental, adjacent or breakthrough. These definitions were originally referred to as core, adjacent or transformational by Nagji and Tuff, (2012), but to ease understanding incremental, adjacent or breakthrough will be used. The ambition level is divided in two categories, market and product, which each has a scale from existing to new. Depending of the innovation's character it is positioned within the different areas shown in figure 4 (Nagji and Tuff, 2012).

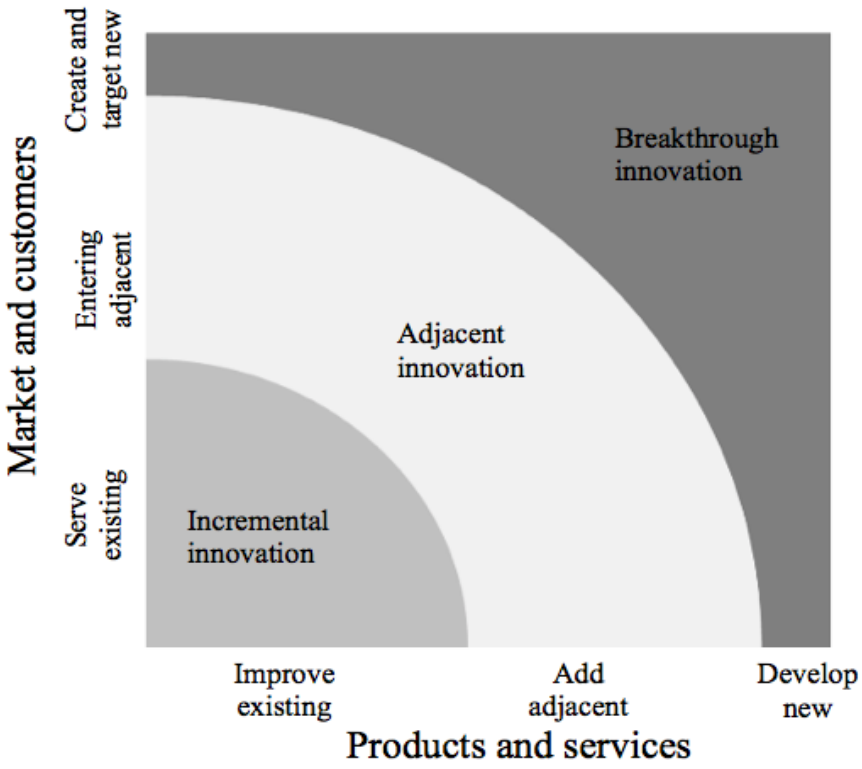

Figure 4. Adapted three types of innovations. Source: Nagji and Tuff, 2012

As can be seen in figure 4, the degree of radicalness is increasing as the innovation is positioned further from the bottom left corner of the graph. The incremental innovations are incremental changes of existing products to serve existing customers. The innovations are usually called optimized products or upgrades and are operated within the core activities of the firm (Nagji and Tuff, 2012). An adjacent innovation on the other hand is on a strategic level seen as the next generation business. This is for the company new territories in either product or market and will expand the company's scope. This involves pushing something the form dose well into a new setting, market or product (Nagji and Tuff, 2012). In the area furthest from the bottom left corner of the graph, breakthrough innovation, companies generate new business by either creating new products, markets or both. This area is also known as the transformational area, which implies that companies transform themselves to make something new (Nagji and Tuff, 2012).

Moreover, the innovation ambition matrix is not only a tool to categorize innovations but also a tool to manage firms' product portfolios (Nagji and Tuff, 2012). It is argued that it is important to have an innovation portfolio including all three areas of the ambition matrix. Finding the right balance between the areas is essential in order to have a successful business over time. In general, companies having an innovation portfolio with 70% incremental, 20% adjacent and 10% breakthrough innovations have essential higher success rate over time than companies with higher degree of incremental innovations, see figure 5 (Nagji and Tuff, 2012). This because it is shown that the 10% of breakthrough innovation will in the long term grow to 70% and become the core activities for the company. Without the 10%, companies do not have the right portion for future growth and will stagnate. Nevertheless, having breakthrough innovation projects within an innovation portfolio does not necessarily mean that companies will have future growth; they have to succeed with the breakthrough innovations (Leifer et al., 2001).

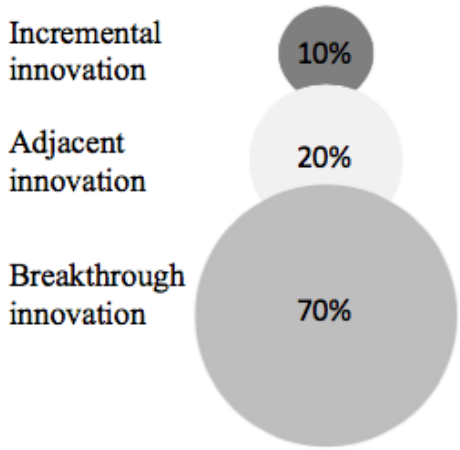

Figure 5. Adapted, long term revenue streams. Source: Nagji and Tuff, 2012

Succeeding with breakthrough innovations are essential for future business. However, the success rate within the innovation ambition matrix is declining when the distance to the bottom-left corner of the graph is increasing, especially when firms are entering/creating new markets, see figure 6 (Day, 2007). Moreover, this explains the desire to avoid innovations in the upper right corner of the matrix. Thus, a trade-off between avoidance of uncertain high-risk breakthrough innovations and future survival exist. Knowledge about the nature of breakthrough innovations will increase the success rate of such innovations and are therefore of greatest concerns for business managers (Govindarajan and Trimble, 2005). By looking at why some breakthrough innovations fail and other succeed one could find the nature in which breakthrough innovations are made.

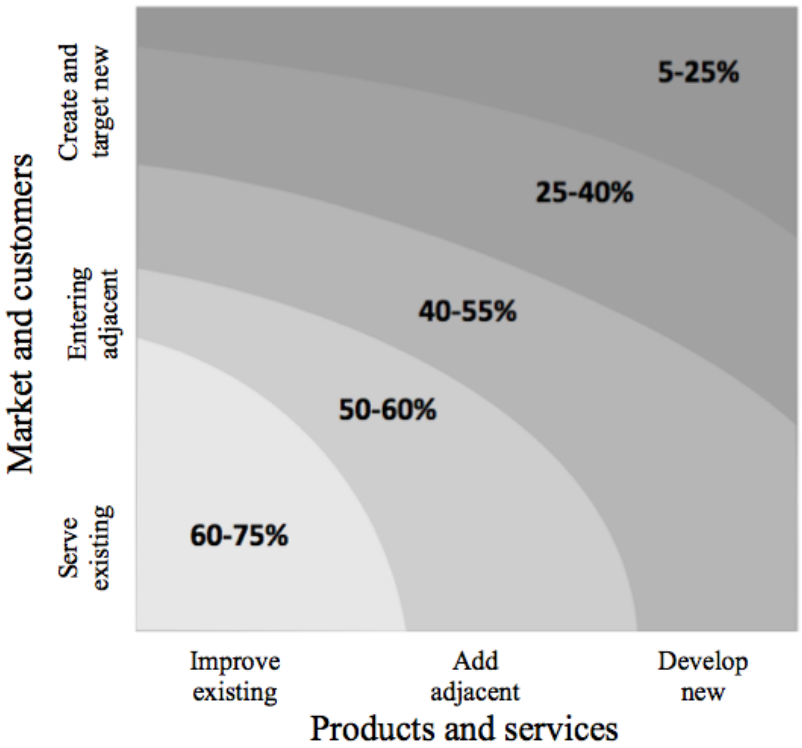

Figure 6. The success rate of innovations. Source: Day, 2007

2.2.3. Breakthrough innovation challenges and how to overcome them

Many studies have been made in the field of innovation theory, which have identified several reasons behind failed projects. Furthermore, the environment in which innovations are created is dynamic which makes it hard to categorize the factors by importance. Due to this, five factors have been identified which are not categorized by importance but by entity and the uncertainty involved at each level. The first factor is the value chain of the innovation and the major challenges within it, the second is the organization in which the innovation is created and the methods used is the third. The fourth factor is considering the people involved in an innovation project and finally the overall uncertainty is considered.

2.2.3.1. Innovation ecosystem

Innovations or ideas separated from their environment in which they are used, are useless (Adner, 2006). An innovation's environment is called the innovation ecosystem and could be explained by thinking of a car's utility without roads and gasoline. Thus, breakthrough innovations are by character radically new and the importance of their innovation ecosystems are more critical (Adner, 2006). Often the innovation ecosystem is created or influenced by other actors, which generate new set of risks, dependencies. This means that companies are dependent on others for their own success with breakthrough innovations (Adner, 2006). The more actors that need to adopt the innovation, both upstream and downstream in the value chain, the more important strategic decisions become. Even though several actors could be involved in strategic decisions, one is of greater importance than the others, namely technology/product complements. When technologies and products work together, companies create value that no single firm could have created alone. This implies that companies need to have passion when releasing innovations, making the technologies and products complement each other better (Adner, 2006).

2.2.3.2. Organization

When breakthrough innovations are created inside bigger organizations they face challenges (Koen et al., 2010). To start with, bigger organizations are driven/controlled by their resources. Resources in this setting are all external factors contributing to internal decisions (Pfeffer, 2003). Moreover, this creates lock-ins when creating radical innovations because they are given incremental improvements rather than radical ones. Another factor is resource allocation; it is hard to move resources from the market currently giving the company its market position to a new breakthrough idea, which probably will fail (Pfeffer, 2003).

The next challenges with creating breakthrough innovation within established organizations are cannibalism of existing divisions/products and complementary goods currently hindering new entrance of competitors into existing business (McDermott and O'Connor, 2002; Tripsas, 1997). When treats of survival grow for existing divisions and/or products, resistance against the breakthrough innovation will rise from middle managers within the organization. These managers will do everything in their power to stop the new project threatening to kill their division (McDermott and O'Connor, 2002). This can be avoided by placing the breakthrough innovation project in an ambidextrous organization making the middle managers powerless over it (O'Reilly and Tushman, 2004). Top managers on the other hand are more concerned with the role of complementary assets. These are hindering new entries from competitors into the current business

and removing them will drastically increase this threat (Tripsas, 1997). Thus, as the breakthrough innovation needs to move these assets literature writes about the importance of champions and sponsors protecting the project (McDermott and O'Connor, 2002). Both the sponsor and the champion should be on c-level or close, where the sponsor secures financial means and the champion protects the project from being shut down with every available mean.

The last organizational challenge is the complexity of organizational structure. A complex organizational structure can kill every attempt of breakthrough innovations with its bureaucratic ways of working and slow decision-making. Such organizations also weaken the focus of radical innovativeness and will in the long run affect the innovation culture towards supporting incremental innovations only (McDermott and O'Connor, 2002). Once more, the ambidextrous organization structure minimizes these risks, not letting the breakthrough innovations projects become too much influenced by the mature organization and instead letting them forget its way of working (Govindarajan and Trimble, 2005; O'Reilly and Tushman, 2004).

2.2.3.3. Work method

Working processes when creating incremental vs. breakthrough innovations look completely different. Mature companies have to a large degree, during their maturity phase, standardized most of their working processes, even their new product development (McDermott and O'Connor, 2002). Stage gates and standardized methods characterize the incremental innovation processes and are therefore commonly used by mature companies. In contrast to incremental innovation processes, breakthrough innovations are created in spiritual settings with high degree of freedom (McDermott and O'Connor, 2002). Due to these dissimilarities, mature companies often struggle as they try to accomplish breakthrough innovations as they apply incremental methods (Govindarajan and Trimble, 2005). Moreover, it is argued that mature companies need to forget old ways of working which includes, planning templates, business models, norms for individual performance evaluation and performance measures, in order to become more radical (Govindarajan and Trimble, 2005).

Exactly how breakthrough innovation methods look like is determined by the settings in which it is created, but characters have been identified which are necessary for success. Firstly, a breakthrough innovation process is not a linear process focusing on execution but an iterative process focusing on exploration (Norman and Verganti, 2014). Such process is driven by a problem solving culture and failure is needed to proceed. The process iterates between problem solving, experimenting, analyzing and resolving, until a scalable business model is found from the product-market-fit (Blank and Dorf, 2012). Due to the iterative way of working, the process is time consuming and needs to be accepted by top managers who need patience in order for it to work properly (Day, 2007).

Secondly, creativity is seen as a cornerstone in breakthrough innovation processes (Klijn and Tomic, 2010). Therefore, it is important to understand the features of how creativity is created to be able to make breakthrough innovations. Some factors that increase creativity are, independence of judgment, trust, playfulness and causal reasoning (Klijn and Tomic, 2010). Furthermore, creativity can be divided into two levels, individual and organizational, where organizational

creativity is superior in importance to individual. However, companies having both will have a higher level of innovativeness (Bharadwaj and Menon, 2000).

Thirdly, when making breakthrough innovations in mature companies Radical-Innovation Hubs (RIH) play a central role (Leifer et al., 2001). Their function is to reduce uncertainty without increasing bureaucracy for the breakthrough innovation team. This is done by, training, information gathering, advising, resource allocation and lobbying between the innovation team and the rest of the organization. The RIH are by doing this increasing the performance of the innovation team and at the same time keeping the organization informed and more open to innovation incubators (Leifer et al., 2001).

2.2.3.4. Innovation team

There is nothing new to the fact that it is the people within an organization who create innovations. Thus, the people within a breakthrough innovation team are of greatest concern. Furthermore, mature organizations struggle with locating people with the right experiences and perspectives that are not too much influenced from the organization present practices (Koen et al., 2010). Although it seems logical to choose the most intelligent people from an organization to participate in a breakthrough innovation team, managers have to re-evaluate that decision. Besides entrepreneurial expertise, the breakthrough innovation team should only borrow resources and capabilities giving them their competitive advantage (Govindarajan and Trimble, 2005). Everything else creates lock-ins and prohibits radical innovations. Except from choosing the right participants to a breakthrough innovation team, five elements increase the team's ability to become more radical. These elements could be seen in Table 3 with a short description of each.

Table 3. The five elements of the innovation team.

Shift members	Avoid group thinking and keeping the flow of new ideas
Create friendship atmosphere	With high degree of trust people dare to try and test new things
Heterogeneous background	With complementary backgrounds and breadth of experiences rather than depth, navigating within the blue ocean strategy increases
Leadership	Create a shared vision, make the participants committed and articulation support form attempts
Informal networking	One of the team members should have worked in the organization for more than 15 years and have informal access to both knowledge and resources within the organization

Source: Klijn and Tomic, 2010; Leifer et al., 2001

2.2.3.5. Uncertainty

The creation of radical innovation contains a high degree of uncertainty (Koen et al., 2010). As described before managers within mature organization prefer options with low uncertainty where confident predictions could be made. By lowering the uncertainty or making the managers more comfortable in uncertain environments, the focus for breakthrough innovations will increase (Shane, 1994). One way of achieving this is to use different risk measurement tools for incremental vs. breakthrough innovations projects to get a fairer evaluation (McDermott and O'Connor, 2002). Another way is to divide breakthrough projects and "make less fast" showing quick results (Govindarajan and Trimble, 2005). Doing that, one will not face all uncertainties at once, making the project seem less uncertain (McDermott and O'Connor, 2002).

2.3. Collaboration

The third part of the theory is regarding the method used to accomplish breakthrough innovation between startups and firs, namely collaboration. The understanding of how one should collaborate will increase the chances of succeeding with breakthrough collaboration innovations.

2.3.1. The collaboration terminology

The term collaboration is often incorrectly used to describe when two or more persons perform something together that is associated with work, school or the everyday life. Even within academia the term has incorrectly been used as researchers have used their own separate definition or generally misused the word. Collaboration is often used as a general word of working together, replacing coordination and co-operation. In fact, the terminology of collaboration implies that two or more people/organizations work together to accomplish shared goals (Selsky, 1991). The key point in the definition is shared goal, which the other two forms of co-working do not include. The definition means that participants within a collaboration share risks and gains to accomplish their mutual goals (Järrehult, 2011). Therefore, when talking of general co-working collaboration can be misused because people can work together and achieve separate goals.

However, research has identified two different types of views when entering collaborations, egocentric and altruistic, classic liberalism vs. civic republicanism (Perry and Thomson 2004). Thus, a shared goal does not imply that the participants enter collaborations with the same views, which add a psychological dimension to collaboration. Organizations with a classical liberalistic view, choose collaboration as a means to emphasize on private interest as they use their bargaining power to influence the common goal supporting them (Thomson and Perry, 2006). In contrast, companies entering collaborations with a civic liberalistic view, see collaboration as an integrated process with mutual understanding, sympathy and trust. Moreover, the two views make it more complicated to achieve good results by collaboration:

"There is a fine line between gaining the benefits of collaborating and making the situation worse" (Huxham and MacDonald, 1992, 50).

One of the explanations behind this quote is the mentioned difference in views of the participants making the decisions differ within a collaboration. Another explanation is game theory, which put

the collaborators in a difficult position as they do not know the other participant's view and they could therefore not trust the other party. By not trusting the other participant, the egocentric view increases, making collaboration hard to accomplish. Furthermore, in order to get collaboration to work the aggressive elements of formal contracts and organizational roles must be replaced by informal commitment, psychological contracts and personal relationships (Ring and Van de Ven's, 1994). Making this transformation may be the key of sustaining successful collaborations.

2.3.2. Collaborations between organizations

Collaboration could, as have been said, take different forms depending on settings and participants. As the competitive landscape has increased in the world due to globalization, companies have been forced to collaborate over company boundaries in order to maintain or gain their competitive advantage (Chesbrough, 2003). Moreover, this forces companies to go outside their comfort zone of outsourcing and build long-term relationships inside collaborations. Building personal relationships is not enough to succeed; one must understand the complete collaboration process (Thomson and Perry, 2006). The collaboration process could be divided into three parts; antecedents, process and outcome, everyone including the variable dimension's managers must know and manage in order to collaborate effectively (Wood and Gray, 1991). The first part, antecedents, identifies preconditions where collaboration is suitable, while the process highlights critical dimensions of collaborations in order to reach the preset outcome, see figure 7. This process is not to be seen as a linear but an iterative process where a collaboration's process changes over time (Thomson and Perry, 2006).

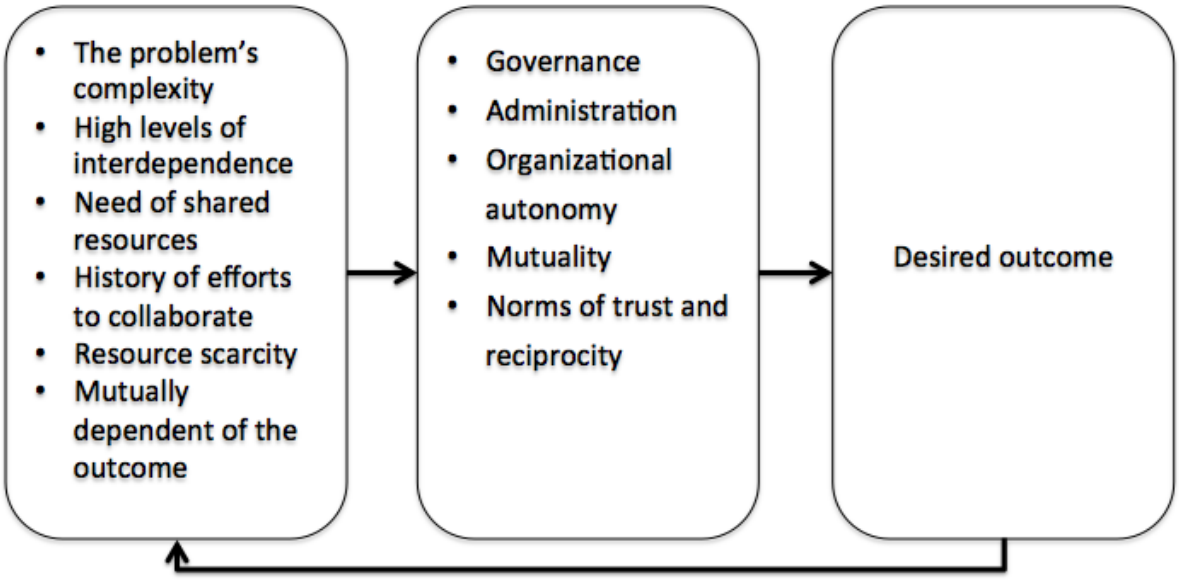

Figure 7. The collaboration process. Source: Thomson and Perry, 2006

2.3.2.1. Antecedents

It has been identified that collaboration is not suitable in every situation, partly due to the nature of collaboration. Organizations should therefore consider to collaborate when:

- The problem's complexity makes it impossible to solve it alone (O'Toole, 1997)
- The participants face high levels of interdependence (Logsdon, 1991)
- Resources and risks need to be shared (Alter and Hage, 1993)
- Historical track record of collaboration (Radin et al., 1996)
- Each partner possesses resources that other partners need (Thomson, 2001)

This does not imply that organizations only should collaborate when all these factors are fulfilled, but having only few of them fulfilled make it harder to let collaborations be successful (Thomson and Perry, 2006).

2.3.3. Process

Managing the five dimensions within the process stage is more critical than the preconditions explained before. With bad preconditions one could still accomplish good collaborations when management is handling the five dimensions of collaboration well. Therefore, they are of biggest concern for all parties when collaborating (Thomson and Perry, 2006). The five identified dimensions are, governance, administration, organizational autonomy, mutuality and norms of trust and reciprocity. Of these dimensions governing and administering are structural in character, mutuality and norms represent the social capital and organizational autonomy the agency dimension. Managers are better prepared to engage in collaboration activities if they understand the variable and complex nature of each dimension. Given the complexity of the collaboration process, collaboration for collaboration's sake only is likely to fail (Thomson and Perry, 2006). Besides the management of the five dimensions, collaborations are costly in time and energy, which cannot be excluded. Finding an equilibrium among the five dimensions that contributes to short term-wins, time acceptance and development of trust are necessary for the long-term wins. Furthermore, every situation is unique and demands a unique equilibrium among the five dimensions making the situation optimal for both participants (Thomson and Perry, 2006).

2.3.3.1. Governance

Collaboration is about jointly making things together for a common goal, thus the participants need to create structures for reaching agreements when they make decisions regarding the rules that will govern their behavior. Seen as a process, governance is not static but a dynamic process changing over time (Bardach and Ebrary, 1998). Governance implies that people emphasizes openness in information sharing as well as a respect for others' opinions (Thomson, 2001). Furthermore, the participants must be aware that they must impose decisions on themselves and together be responsible for reaching an agreement (Gray, 1989). This further guides the participants to accept that other have legitimate interests, such as the outcome (McCaffrey et al., 1995). The key to success is the participant's willingness to impose trustworthy sanctions on noncompliant participants and their willingness to monitor each other and themselves. If the participants are unwilling to do so, the credibility is lost and with it the ability to make joint decisions. With a shared established vision, the focus will shift from a problem blaming towards a problem-solving atmosphere (Thomson and Perry, 2006).

2.3.3.2. Administration

For the collaborations to achieve their purpose some kind of administrate structure must exist, moving governance into action. One major reason behind getting things done in collaborations is to find the right balance between administrative and social capacity (Thomson and Perry, 2006). In this setting administrative capacity is referred to coordination and elements of hierarchy whereas social capacity is referred to relationship building. This could be done by coordination through "relationship managers" making sure the specific task is performed and at the same time manage inter-organizational relationships (Sagawa and Segal, 2000).

2.3.3.3. Organizational Autonomy

The organizational autonomy captures both the potential of and the frustrations within collaborations. This since collaborations imply that the participants have two identities, one shared and one individual. Moreover, balancing between the two identities creates conflicts if the self-interest does not go in line with the collective-interests or vice versa (Tschirhart et al., 2005). If such conflict occurs it is likely that individual missions will trump collaboration missions, which makes the individuals forming the collaboration team of big importance. Shared control increases the involvements by the participants and doing so increases the willingness to share information. Information sharing for the good of the partner is a unique characteristic of collaboration and increases the partner's understanding of the problem you jointly are solving (Himmelman, 1996). Furthermore, a common understanding makes it possible to create a shared vision at both the organizational and the individual level.

2.3.3.4. Mutuality

As have been mentioned before, information sharing is a foundation making collaboration happen. However, without mutual benefits, the shared information will not lead to collaboration (Thomson and Perry, 2006). Mutual benefits, either in different or shared interests, are a must when organizations collaborate (Powell, 1990). Different interests describe situations where parties enter collaboration networks and agree to abstain self-interest at the expenses of others. Furthermore, this occurs when one party need or could benefit from the others party's unique resources, experiences, market channels or money. Thus, collaboration can happen as long as the participants can satisfy each other's need without loss of their own, mutual benefits (Wood and Gray, 1991).

2.3.3.5. Trust and Reciprocity

There are two different types of reciprocity, one long-term rooted in sociological obligation and one short-term based on group belonging (Ostrom, 1990; Powell, 1990). Partners within collaboration often express the same willingness of reciprocity as the other part is expressing, I-will-if-you-will mentality. Moreover, in the long run, rationalized myths will be developed forming the willingness of reciprocity that is perceived as critical factor for the collaboration itself (Thomson and Perry, 2006).

Closely associated with reciprocity and the second aspect of norms is trust. It is an important ingredient within collaboration since it reduces transaction cost more effectively than other forms of organizational structures. Trust is defined by three characteristics namely, a common belief among group members that the other in the group will (Cummings and Bromiley, 1996);

- Behave in line with any implicit and explicit commitment
- Act honestly in every negotiation
- Not take advantage of another, even if an opportunity arises

When the degree of trust supplements formal organizational roles and psychological contracts substitute legal, collaboration could be sustained (Ring and Van de Ven 1994).
Collaboration can't be rushed. [It is] very energy intensive. You have to be willing to invest inordinate amounts of time at low productivity to establish relationships and trust building. Organizations don't initially start with a cost – benefit analysis. They start with a kind of idealism. Then, as they start to accomplish things, they realize that they're going to have to pay a cost. When organizations are willing to take the costs that is when you have moved to collaboration. (Thomson, 2001, 93)

2.3.4. Positive aspects of collaboration

Despite the difficulties of conducting collaborations and the fine line between failure and success, companies put down effort to make it happen. This is due to the belief that collaboration can lead to a greater sum of positive gains compared with doing it alone. Such gains may include:

- *Increased scope and scale of activities*; sharing complementing technologies creates synergies and more widely applicable products. Moreover, collaborating partners share markets, thus expanding each other's market scope (Alter and Hage, 1993).
- *Risk and gain sharing in uncertain environments*; in uncertain environments with rapid changes and unknown futures, the risks of doing it alone could be shared and as well the future gains (Chesbrough, 2003).
- *Increased flexibility and effectiveness*; collaborations in networks provide the participants with rapid and effective sources of information and solutions. (Dodgson and Rothwell, 1994)
- *Improved capability to deal with complex problems*; an organization's innovation capability increases within collaborations because the technological integration between firms enables them to deal with multiple sources of information (Chesbrough, 2003).

Furthermore, many organizations have tried and are trying to gain these positive outcomes of collaboration. However, there are no single best practices within the field of collaboration. Nevertheless, success factors have been identified and their impact of collaboration, which will help managers, increase the success of collaboration, see table 4 (Mora-Valentin et al., 2004). The table below is showing ten factors contributing to successful collaborations and their impact. They are split in degree from one to three, where three is high impact and one is low impact.

Table 4. Factors influencing collaboration.

Factor	Impact
Previous cooperative experiences	2
Partners' good reputation	1
A clear definition of objectives	3
Degree of institutionalization	1
Greater proximity between partners	1
Degree of commitment	3
Degree of communication	2
Level of trust	3
A low level of conflict	2
Greater dependence among partners	3

Source: Mora-Valentin et al., 2004

2.3.5. Dynamics in small groups

When working in a small group the total performance and motivation will vary during time. This because the persons involved will go through different phases known as forming, storming, norming and performing as can be seen in figure 8.

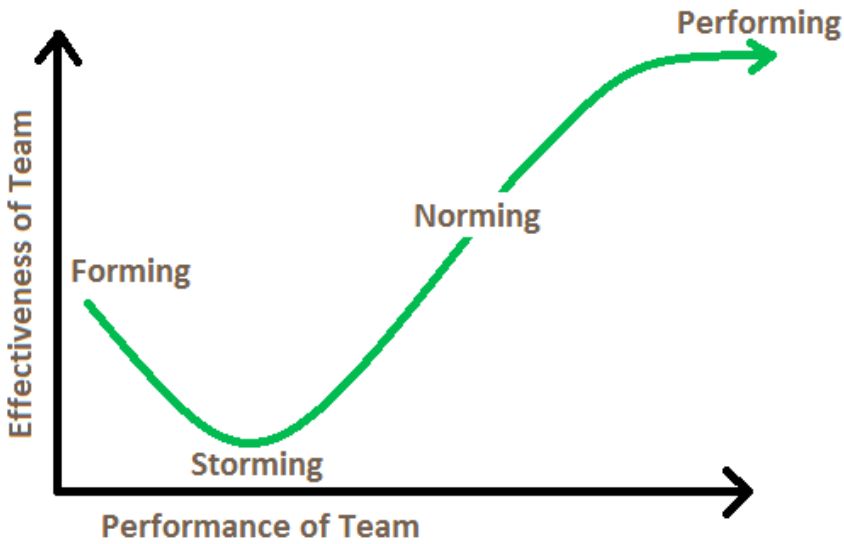

Figure 8. Team and group development. Source: Tuckman and Jensen, 2010

The performance of the group will initially be moderate, followed by a decrease and increase (Tuckman and Jensen, 2010). The main characteristics, management tasks and objectives in respectively phase are as follow:

2.3.5.1. Phase 1 forming

The first phase is characterized by moderate to low performance, absence of structure, organization, where objectives and roles are formal or vague (Tuckman and Jensen, 2010). The participants are confused and search for safety and acceptance (Wheelan, 2005). This usually makes people inclined to talk a lot and make jokes, trying to have fun and like each other. They therefore rely a lot on the leader's ability to communicate work and push the group forward (Tuckman and Jensen, 2010). The leader needs to take responsibility set objectives create structure, clarity, give feedback, help and represent the group externally. These with the objective to create security and enable communication between all participants (Wheelan, 2005).

2.3.5.2. Phase 2 storming

This phase is characterized by very low performance in which the participants are searching for their roles (Tuckman and Jensen, 2010). As a result of increasing confidence the participants are challenging each other and the leader (Wheelan, 2005). This usually emerges in conflicts; dissatisfaction and the state of the group might even become chaotic (Tuckman and Jensen, 2010). The task of the leader here is to create space for constructive discussion helping problem solving and making conflicts impersonal. The objective for the leader is to develop methods helping the group to manage and discuss the diverging opinions (Wheelan, 2005)

2.3.5.3. Phase 3 norming

This phase is characterized by increasing performance, where the participants are task oriented, getting a better picture of goals, roles and feel more trust for the group (Wheelan, 2005; Tuckman and Jensen, 2010). Moreover, it is allowing diverging opinions and possesses abilities to manage conflicts. The tasks of the leader here are to be supportive when needed, to delegate work and to give feedback. The objective for the leader is to increase participation and clarity (Wheelan, 2005; Tuckman and Jensen, 2010)

2.3.5.4. Phase 4 performing

This phase is characterized by a high degree of performance, where the participants have shared a clear goal. They are prestige less and feel a high degree of motivation and satisfaction (Wheelan, 2005; Tuckman and Jensen, 2010). Moreover, they know each other’s abilities and divide work accordingly. The tasks of the manager are to serve the group, to let go of control and to show trust, stepping down and becoming a group equal (Tuckman and Jensen, 2010). The objective here is to sustain high performance over time in both task and relationship (Wheelan, 2005).

2.4. Firms and startups

The last section of theory will cover the players within breakthrough innovation collaboration. Within the scope of this study they are firms and startups. This section will create a better understandings of the players' characteristics and will end with a summation of their differences.

2.4.1. Firms

A company is an organization that is set-up with the purpose to create and capture value by exploiting an existing business idea. The logic of decision making in firms are causal reasoning (Read et al., 2010). That implies having a pre-defined goal to guide decisions towards (Read et al., 2010). In practice this can be explained as aligning your whole business to achieve a desired goal and choosing the decision that brings you closest to that goal (Sarasvathy, 2001).

2.4.1.1. Innovation method

In line with the causal decision-making in companies, new product development is aimed at fulfilling that goal (Sarasvathy, 2001). With this logic firms are trying to develop products that can fulfill a predictable need in the future. The process when developing new products in existing firms is usually linear and divided into seven stages where one stage has to be completed before proceeding to the next. The seven stages usually include following activities: discovery, scoping, build business case, development, testing & valuation, launch and post-launch reviews, as can be seen in figure 9. (Cooper, et al., 2002). When following this process firms usually end up with incremental improvements of existing market or product/service or expansion to adjacent (Cooper, et al., 2002).

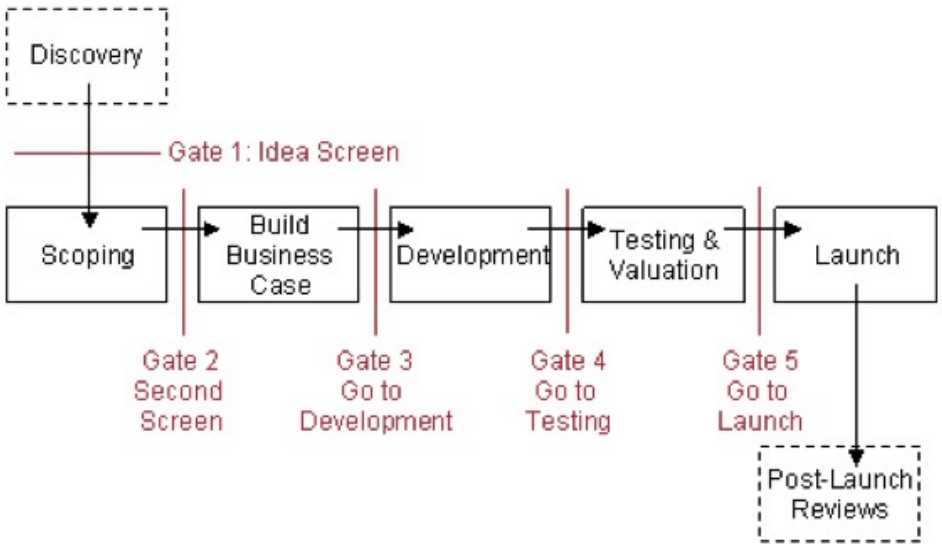

Figure 9. The stage-gate model. Source: Cooper, et al., 2002

2.4.1.2. Organization structure and product

Existing companies already have a set structure since they are selling products/services. This structure of doing activities is mirrored by the components and the architecture of the existing products (Henderson and Clark 1990). This includes several aspects such as role definition and information channels. This implies two things; first, people have specific duties in relation to the product and work in different departments aimed at achieving a specific task. Second, communication channels are filtering information to match the already existing competencies of the company (Henderson and Clark 1990).

2.4.1.3. Culture

To maximize the competitive capacity of organizations firms should align their strategy and culture. The stronger culture supporting the strategy is, the more advantage you get (Cabrera and Bonache, 1999). Thus, assuming that firms strive to achieve a competitive advantage would imply that the culture is reflected by the competitive strategy. This means that companies letting a causal logic undermine the strategy would as well have a similar causal culture. The causal logic influencing the culture would then be characterized by a controlling logic in which firms are trying to predict the future and exploit knowledge they already possess (Sarasvathy, 2001). Where they, as earlier mentioned work towards pre-defined desired goals.

2.4.1.4. KPIs

The selection and implementation of KPIs in an organization is a very individual process, where the KPIs should be designed to match the desired performance of the specific organization (Slizyte and Bakanauskiene, 2007). In companies using a causal logic the competitive strategy is usually aimed at achieving a bigger market share in existing markets. (Sarasvathy, 2001). Thus the KPIs of companies should be aligned to achieve their desired outcome of reaching bigger market shares.

2.4.2. Startups

A startup is a temporary organization used to search for a repeatable and scalable business model (Blank and Dorf, 2012). The logic of decision making in startups is usually effectual reasoning (Read et al., 2010). That implies building upon the unique means they have today and letting the future state depend on the actions made of those (Read et al., 2010) In practice this can be explained as a way of making decisions and take action, to later see where you end up. The attitude in effectual reasoning is to calculate what risk you can afford or accept, which makes it good to use in uncertain environment in which startups operate (Sarasvathy, 2001).

"To the extent that the future is shaped by human action, it is not much use trying to predict it – it is much more useful to understand and work with the people who are engaged in the decisions and actions that bring it into existence." - *Saras Sarasvathy*

2.4.2.1. Innovation method

In line with the effectual decision-making in startups, their aim is at finding an opportunity to create value. This they are trying to do by finding a need in the market to fulfill with a product/service. During this they are usually focusing on the things they know and can control such as market insight and unique knowhow (Sarasvathy, 2001). This is usually done through an iterative method

called Customer Development. This is a structured way of testing hypotheses fast, where you interview the market to get an understanding whether or not they are true (Blank and Dorf, 2012). Further, if you have validated all the hypotheses you should focus on executing and scaling the startup into a profitable business (Blank and Dorf, 2012). The two phases, iteration and execution can be visualized as follow, see figure 10:

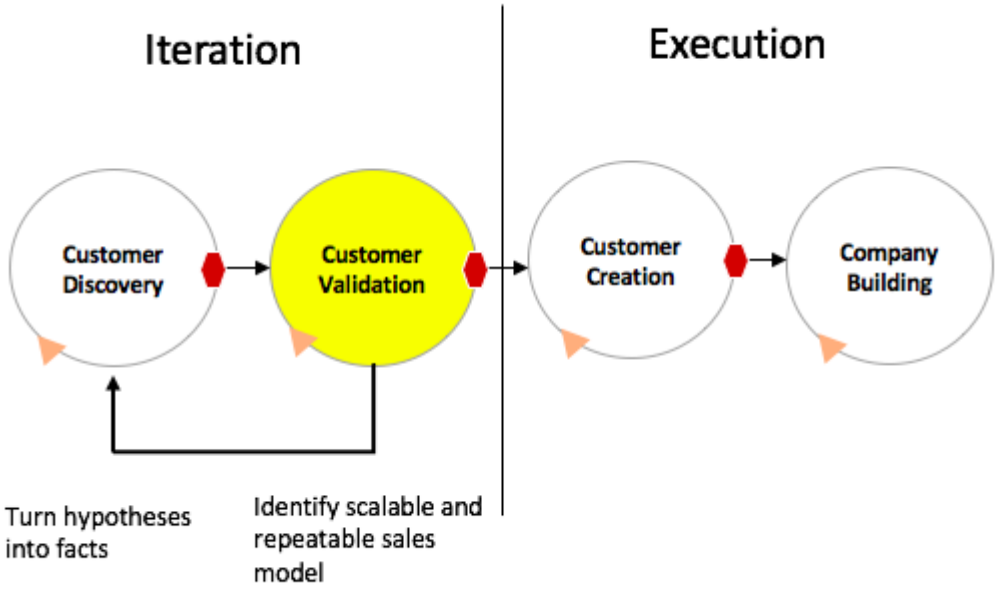

Figure 10. The customer development model. Source: Blank and Dorf, 2012

2.4.2.2. Organization structure and product

Startups are temporary organizations searching for products/services and their market fit. In this phase they have not defined a product/service yet and all people involved should be out in the market searching for one (Blank and Dorf, 2012). Before having defined a product/service and its market fit it is therefore unnecessary and might even be contra productive to define roles and set up departments (Blank and Dorf, 2012). Thus the structure of a startup should be formed to help when searching the market.

2.4.2.3. Culture

As earlier assumed companies strive to reflect the strategy in their culture. Assuming the same for startups would usually imply that their culture is characterized by an effectual logic (Sarasvathy, 2001). This means that their culture is undermined by a logic aligned towards "take action and see what happens"; where you take control of how many risks you can take and accept. Thus startups using an effectual logic would give the employees a lot of space and pushing them to be execute fast and lean (Sarasvathy, 2001). This way of working will call for creative and transformative tactics (Read et al., 2010), which would reflect the culture as well (Cabrera and Bonache, 1999).

2.4.2.4. KPIs

As earlier mentioned KPIs should be designed to match the desired performance of the specific organization (Slizyte and Bakanauskiene, 2007). In startups using an effectual logic the competitive strategy is usually to create new markets through alliances and/or other cooperative strategies (Sarasvathy, 2001). Thus the KPIs of startups should be aligned to creating new markets in cooperation with others.

2.4.3. Firms vs. Startups, causal and effectual logic

When comparing the nature of firms and startups one can see how they differ in their underlying logic, further how this reflects organizational structures, innovation methods, cultures and KPIs, see table 5.

Table 5. Differences between firms and startups.

Type	**Firm**	**Startup**
Innovation method	New product development stage-gate model	Customer development method
Organization structure	Fixed with defined functions	Temporary with no defined functions
Culture	Formed after causal logic	Formed after effectual logic
KPIs/Decision making logic	Causal	Effectual

Where in practice, startups still are searching for a product market fit and firms are exploiting their existing. However, when startups have validated their product and market fit, they should change focus to exploit and scale their business (Blank and Dorf, 2012). This demands a change in underlying logic as well, where startups need to go from an effectual to a causal logic, which might be difficult for the people involved, see figure 11.

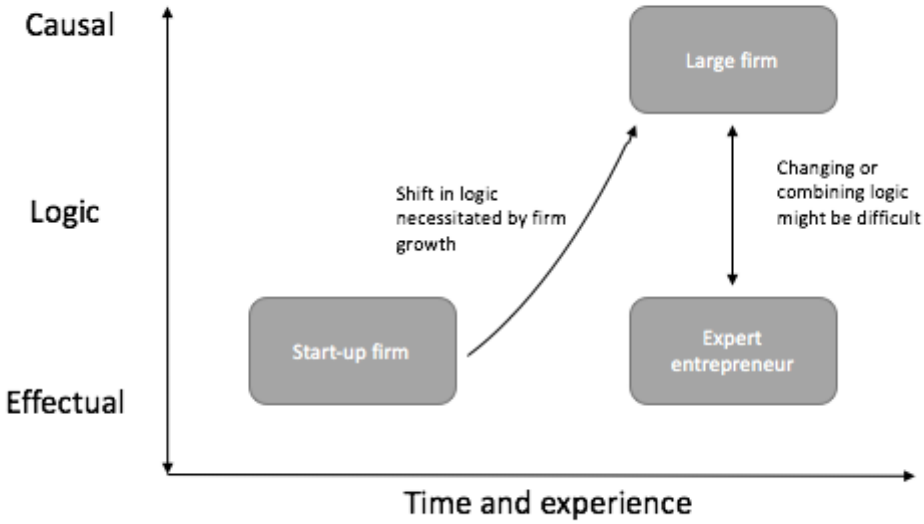

Figure 11. The relationship between logic, time and experience. Source: Sarasvathy, 2001 and Read et al., 2010

2.4.3.1. Innovation method

When comparing the different innovation methods used in startups and firms, one can see that the one in startups is more adapted towards exploring new business. Therefore, one can argue that the method used in startups is better suited for breakthrough innovations, whereas the method used in firms fits better with incremental innovations. However, efforts have been done combining these methods, by letting the innovation method of firms take advantage of the one used in startups which is hard since the firm's old method often influence the combined method too much (Connor et al., 2008).

3. Method

In this chapter the chosen research approach and method are presented, motivated scientifically and discussed. It starts with the presentation of the how and why the choices were done and is followed by an explanation of the data collection. After the data collection comes a description of the methods used to analyze the collected data. Finally, the quality assessment and the methodology are discussed.

3.1. Research approach

The purpose of this study is to create a framework for breakthrough innovation collaboration between startups and firms. The aim is to identify the major factors behind successful as well as unsuccessful breakthrough innovation collaborations and analyses these findings to create a useful framework. The framework will create general understandings of breakthrough innovation collaborations and guide the collaborators in decision-making regarding the structure of their collaboration. Due to the characteristics of a breakthrough innovation collaboration, a suitable research approach will be a qualitative multiple case study (Bryman and Bell, 2011). With the chosen approach, the research questions will be answered by the researchers' perspective of the findings within the studied cases (Easterby-Smith et al., 2012). Furthermore, a qualitative case study is suitable when the research aiming to create new understandings rather than confirming established research, inductive approach, which was the case of this thesis (Bryman and Bell, 2011). The multiple case study approach enables researchers to make within and across analyses of the findings making the knowledge creative more extensive than a single case study (Bryman and Bell, 2011). The finding within and across the cases will be complemented with existing theory to further validate the findings as well as the framework created (Eisenhardt and Graebner, 2007).

3.2. Research Method

The research was divided into three phases in order to properly answer the research questions, literature review and defining the scope, gathering empirical data within and across case analyses. A description of the research method can be seen in figure 12, which gives an overview of the three phases. These phases are not being considered as a linear work process but as an iterative process where gathering of empirical data could lead back to review of the literature and redefining the scope, which is explained by the double-sided connections. This method is further strengthened by the systematic research approach that combines theory and empirical insights in an iterative process in order to generate new theory (Dubois and Gadde, 2002). Even though, the iterative approach is more time consuming, it is needed in order to generate new theory in a more effective inductive process (Easterby-Smith et al., 2012).

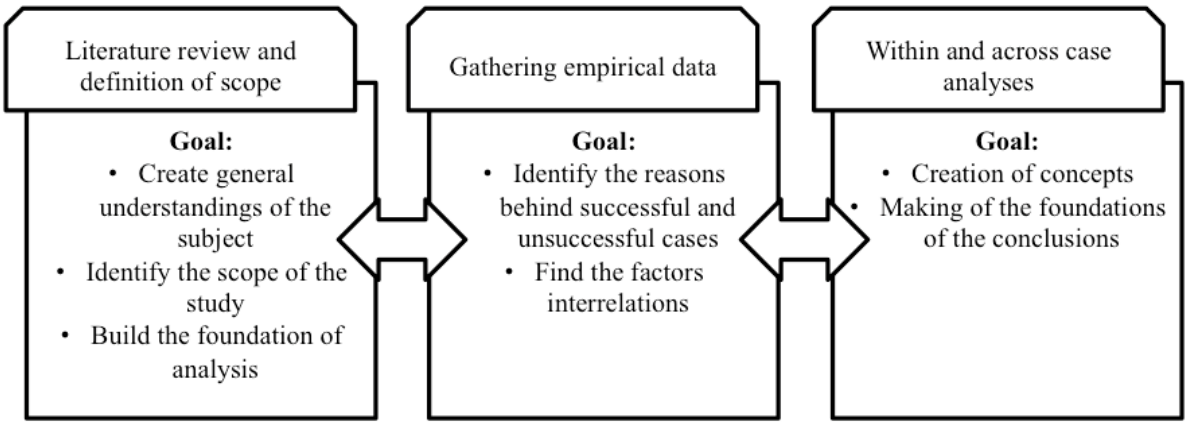

Figure 12. This study's research method

Within the first phase, literature review and defining the scope, the goal was to get familiar with the subject as well as finding the theoretical gap in which the scope was defined. The literature reviewed was done in both the subject of the scope, breakthrough innovation collaboration, and within research methodology to find the most suitable practices. With the methodology and scope defined the gathering of the empirical data started to get an understanding of the dynamics within breakthrough innovation collaborations. This was done by in-depth interviews with more than one participant from both parties of several breakthrough innovation collaborations. This information was later analyzed together with theory and compared across cases to answer the research questions.

3.3. Data collection

To be able to conduct a detailed analysis on breakthrough innovation collaboration, multiple sources of data were collected (Easterby-Smith et al., 2012). In order to provide a deeper understanding of the main theoretical areas, "Breakthrough innovation", "open innovation", "collaboration" and "companies' vs. startups' innovations processes", a literature review was conducted. The empirical data was gathered from interviews within case studies and secondary data from other previous researches. The following section will give an explanation of how the data was chosen, collected and analyzed.

3.3.1. Literature review

The literature review was conducted to get the basic understanding of the topic and how it has developed over time (Easterby-Smith et al., 2012). Furthermore, the review mapped previous research to find the theoretical gap within open innovation when looking at the four dimensions of breakthrough innovation, collaboration, startups and companies, see figure 13, which this thesis partly filled (Silverman, 2010). The review consisted of three main sources of data namely, journal articles, textbooks and company reports. The main sources of information were primarily gathered from Chalmers' Library through the Summon database. To complement the articles that were not found in the Summon database, Google Scholar was used.

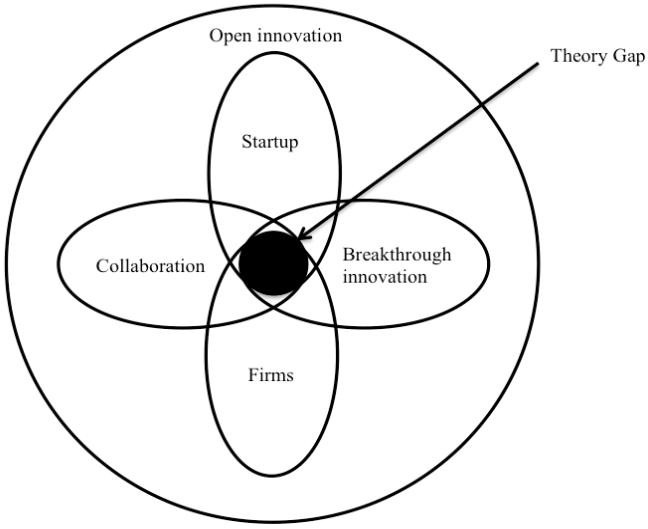

Figure 13. The theory gap

The literature review was done in a four-step model presented by Huff (2009). This model was used in order to get a broad range of sources and at the same time it is interdisciplinary as it highlight cross-disciplinary themes (Easterby-Smith et al., 2012). The first step creates the overview of the topic that is under investigation and recognizes research trends as well as the most commonly used methods. The next step is the critical review of the research area. This process identifies the weakness in published research and by doing that it identifies the theoretical gap. As the gap is identified the next phase is an iterative process between reviewing new literature and gathering of empirical data. This is due to two reasons, published research emerging after the first literature review and new insights emerging from the gathered data (Huff, 2009). The fourth step, a systematic review, has been left out in this master thesis due to its time consuming character and because it is more suitable in a doctoral dissertation (Easterby-Smith et al., 2012).

3.3.2. Case Studies

The primary data was collected from interviews from participants within breakthrough innovation collaborations. In order to properly answer the research questions a multiple qualitative case study approach was used. This perspective enables the researches to make cross cases analyses to find patterns between cases within different settings making the research more valid (Eisenhardt and Graebner, 2007). It could be argued whether this master thesis is conduction one or several case studies. On one hand it could be argued that one case should be defined as one breakthrough innovation collaboration since cases are connected to organizations (Easterby-Smith et al., 2012). On the other hand, it could be argued that all the breakthrough innovation collaborations investigated in the study could be seen as one case due to their uniqueness and similarities in characters (Yin, 2014). Other factors contributing to the decision regarding the definition were internal and external validity as well as generalizability (Easterby-Smith et al., 2012). The aim of the study was to create as high validity as possible and generalization through theoretical abstraction. Due to this, one case will in this master thesis be defined as a breakthrough innovation collaboration, making the multiple case approach appropriate.

19 cases were studied in total to get the wide understanding of the different dynamics within breakthrough innovation collaborations. The breakthrough innovation collaborations were selected between different companies and startups making the perspectives of success and unsuccessful cases wider. The selection was also categorized by industry, type of breakthrough innovation and the stage of the innovation in which the collaboration started, where the aim was to collect a heterogeneous selection of cases. Within each selected case interviews were conducted with several highly involved representatives from the company and from the startup to get the different viewpoints of the breakthrough innovation collaboration (Bryman and Bell, 2011). This was also done to get different perspectives of factors leading or not leading to commercialization.

3.3.3. Interviews

Before the interviews were conducted considerations regarding the constructions of the interviews were resolved (Jones, 1985). This since the information gathered during the interviews is the primary source of data and the most important source of information in a qualitative research (Easterby-Smith et al., 2012). Furthermore, by preparing for the following seven steps one will increase the value of the outcome and the validity of each interview, thematizing, designing, interviewing, transcribing, analyzing, verifying and reporting (Kvale, 2007). Therefore, the seven-step model was carefully analyzed before each interview to ensure the correct interview layout.

The degree of the interview's structures was another thing to consider. One could structure an interview in three different levels, unstructured, semi-structured and highly structured interviews (Easterby-Smith et al., 2012). Semi-structured interviews considered being the most suitable for this study, as the aim was to steer the interviews and dig deeper into certain subjects than others. The time aspect was also a determining factor when deciding upon the interviews' structure. Since semi-structured interviews are more time effective than unstructured, more interviews could be conducted and further validate the conclusions (Bryman and Bell, 2011). Both the interviewees' understandings and experiences were of interest, letting the interviewees use their own words when answering the understandings of the real situation increases (Kvale, 2007).

The interview guide, was prepared before the interviews, was sent out to the interviewees making them more prepared. The same guide was used for the all the interviews only with some adjustment if the previous interview touched upon a new interesting subject. This can be seen in Appendix 1. The interviews were held in two different forms, face-to-face or by video interviews. Regardless of the interview, one of the researchers had the responsibility to ask questions and lead the discussion in the preferred direction as the other researcher made notes. With the permission from the interviewee, the interviews were recorded, making it possible for validation and transcription after the interview. All interviews were optional and none of the interviewees were forced to participate. After each interview, both interviewers summarized the interview and divided their notes in facts and reflections. This was done since the data must clearly be divided in facts and reflections, when making the analyses of the empirical findings (Easterby-Smith et al., 2012). To confirm the findings from each interview, both the reflections and the notes after each interview were compared with theory. With this approach one could verify conclusions with theories from the literature review and at the same time search for new theories fitting the new conclusions. This

iterative process is suitable when making inductive research, which was the case of this master thesis (Dubois and Gadde, 2002).

3.4. Data analysis

When analyzing qualitative data one could choose between several of methods. However, it is important that the researchers bear in mind that chosen data analysis method should be consistent with the methodological assumptions made in the research design (Easterby-Smith et al., 2012). With this said, making the analysis of the collective data the researchers chose an analytic method suitable for an inductive multiple case study approach, namely a grounded analysis with influences of a narrative approach. With the named analysis method, one could use a computer framework or do the analysis manually (Easterby-Smith et al., 2012). A computerized framework will increase the reliability but is due to its complexity hard to understand and is time consuming. Due to the limit in time and the fact that the researchers did not have any pre-knowledge about computer analyses, no computer framework was used to analyze the data. Instead the researchers made all analyzes manually.

Grounded analysis is letting the researcher's intuition guide the development of the data when creating the understanding of the research. This means that the researchers stay closer to the data, making thorough placement analyses of the findings' contexts (Easterby-Smith et al., 2012). Moreover, grounded analyses are suitable when creating understandings of holistic associations within inductive research. In contrast to grounded analysis, narrative analysis includes people's experiences, stories and the way they talk to analyze practices in some form or another (Tsoukas and Hatch, 2001). Furthermore, narrative analysis is a vital requirement when making understandings of a qualitative case study, especially within organizational culture. By combining the two approaches, grounded and narrative analysis, a research could create new understands of the "whole" theoretical gap and at the same time understand the foundations behind the stories told in the interviews (Easterby-Smith et al., 2012).

In order to make the proper analysis the researchers have followed a seven-stage model for grounded analysis with some adjustment for narrative analysis. The model could be seen in Table 6, which also is giving a shorter explanation of each stage.

Table 6. The seven stages of analysis.

Stage	Grounded analysis
1	*Familiarization*
2	*Reflection*
3	*Conceptualization*
4	*Cataloguing concepts*
5	*Re-coding*
6	*Linking*
7	R*e-evaluation*

Source: Easterby-Smith et al., 2012

- *Familiarization*, the researches re-read the notes and the reflections made in connection with the interviews to remind themselves of the focus of the study and what the data suggests.
- *Reflection*, the researchers reflect upon what the data is saying. Does it support or challenge previous knowledge? Does it answer the research questions or what is different?
- *Conceptualization*, the concepts behind what are going on starts to take shape. These concepts are now seen as variables behind the studied outcome.
- *Cataloguing concepts*, Subheadings are created within each concept. This is done to specify the dimensions of a category.
- *Re-coding*, the researchers are moving back and forth between findings, conceptualization and theory to validate the concepts.
- *Linking*, the final framework takes shape. In this stage are patterns and connections explanations between the concepts, which builds the final framework.
- *Re-evaluation*, the framework created is evaluated by the researchers themselves and by other researchers to identify the areas in which more research is needed (Easterby-Smith et al., 2012). During this process, the narrative analysis is used to find patterns and underlying factors in the stories told during the interviews.

The analyses have been done in two separate processes. First, analyses were made within the different cases to find the underlying factors behind an un/successful breakthrough innovation collaboration. Later, these factors were analyzed across the cases to verify the findings. The method used for each analysis was the seven-stage model where the across analyzed more focused on *re-coding, linking* and *re-evaluate* and the within analysis at *reflection, conceptualization* and *cataloguing concepts*.

3.5. Research quality assessment

The assessment of a research study is an internal as well as an external checklist to evaluate the findings within a study and is important criteria (Bryman and Bell, 2011). Depending of the research methodology, criteria are evaluated differently. Four criteria, *internal validity, external validity, reliability* and *ethics*, have been identified and evaluated, which makes the trust in the thesis worthier (Easterby-Smith et al., 2012). The evaluation of each criterion is explained in the following sections.

3.5.1. Internal validity

Internal validity is about increasing the match between the observations and the theoretical ideas generated (Easterby-Smith et al., 2012). In order to increase it, four actions were taken. The most important action was to conduct more than one interview at an organization to avoid the single representative dilemma (Bryman and Bell, 2011). By getting different perspectives from two or more interviewees the trustworthiness and the gathered information increase. Furthermore, the validity was ensured by respondent validation (Bryman and Bell, 2011). This was done as the representatives had the ability to read the final case and confirm or reject what's written. The recorded interviews made it possible for the researchers to go back and listen to the interview several times, ensuring the facts and validate the research. The last action made to increase the internal validity was to triangulate the facts when making the conclusions (Bryman and Bell, 2011). This was done by ensuring that several sources of data, theory and findings, were pointing in the same direction before making any conclusion.

3.5.2. External validity

The external validity indicates to what degree the conclusions could be generalized across social settings (Easterby-Smith et al., 2012). The finding from this research, creating the new framework is to be considered being generalizable within the scope of the delimitations. This means that the framework could be used for breakthrough innovation collaborations between startups and big corporations. Furthermore, the external validity has increased by the analyses made across the 19 case studies. Thus, the study has only analyzed Swedish breakthrough innovation collaborations, making it hard to determine if the framework is generalizable to a different social setting. The primary reason for that is the cultural differences making fundamental changes within collaborations occur (Thomson and Perry, 2006). Due to this the external validity outside the scope of this study is considered to be low. By studying breakthrough innovation collaborations in different countries, the external validity could increase if new findings confirm the conclusions from this study.

3.5.3. Reliability

Reliability could be divided into external and internal factors. The external reliability indicates the degree to which a study can be replicated as the internal reliability indicates the degree of which the researchers' share a common view of the findings (Bryman and Bell, 2011). By saving the notes taken during the interviews, the evaluation of how the participants were selected, recorded interviews and the explanation of the data analysis process, the external reliability increased (Yin,

2014). Listening to the recorded interviews when disagreements occurred when analyzing the data, ensured the internal reliability. Furthermore, the researchers made their summaries of each interview separately before starting the discussion of their observations. Doing so, the different viewpoints could be discussed and by listening to the recorded interview once again a common view was created (Yin, 2014).

3.5.4. Ethics

It is doubtful whether there was ever much truth behind the 'ivory tower' myth, stating that independent researchers who are dedicated to pursuit knowledge carry out academic research (Easterby-Smith et al., 2012). Thus, many researchers have tried to maintain independent, it is shown impossible to separate scholarship from politics. Evaluating the four sources of political influences and following the ten principles of research ethics by Bryman and Bell (2011), the research is done with awareness of its influences as well as performing it in an ethical way (Easterby-Smith et al., 2012). Table 7 is showing the ten ethical principles followed during the research where the first seven is about protecting the interest of the research subject, where the last three ensuring accuracy in the results (Easterby-Smith et al., 2012).

Table 7. The ten ethical principles.

1	No harm
2	Dignity
3	Informed consent
4	Privacy
5	Confidentiality
6	Anonymity
7	Avoiding deception
8	Conflicts of interest
9	Honesty
10	Misleading

Source: Easterby-Smith et al., 2012

Evaluating, the *subject of study, experiences of the researchers, corporate stakeholders* and *academic stakeholders* one cover all four sources possible of influencing a master thesis (Easterby-Smith et al., 2012). When evaluating each influence, the researchers found that the experiences of the researchers were the most influential in this master thesis. This since the researchers had low experiences of conducting academic research and were motivated by excellent results. This may

have resulted in stretched conclusions and the supervision time was therefore extra important to validate the ethics of the study (Easterby-Smith et al., 2012).

3.6. Methodology discussion

The main source of data was collected through interviews to partly fill the theoretical gap identified, thus conducting a qualitative study. When conducting qualitative case studies, access of data could be difficult (Bryman and Bell, 2011). Getting formal access to organizational information is a question of selling in the research's benefits together with personal relationships with key persons. Due to this, before and during the initial contact, five considerations were carefully evaluated and executed increasing the hit-rate of accesses (Easterby-Smith et al., 2012).

- Let the supervisors send an email, telling a short background of the study and that the researchers will contact them soon
- Make sure the gatekeeper understood that the gathering empirical data requested minimal time and recourses
- The study has benefits for the organization
- The study was not political sensitive
- That anonymity was possible if requested

Anonymity

Another risk with qualitative research gathering data from interviews is the answers given by the interviewees. If the interviewee does not see any value or benefits with the interview, overstated or fake information could be given (Easterby-Smith et al., 2012). This risk has been reduced by explaining the benefits of the study, offering anonymity and verifying information by interviewing a second person. Furthermore, the risk has been reduced by always being open and honest when answering questions from the interviewee regarding the study and how the information has been used.

A discussion regarding the chosen sample size is for most studies relevant due to the increased empirical data. More empirical data will further validate the finding in a study both internally and externally (Bryman and Bell, 2011). Due to the limitations in scope and time it was considered enough to investigate 19 cases, in which at least four interviews were conducted, because comparable findings arose validating the conclusions. Furthermore, the sample size is in line with the recommendations from academic literature when conducting a multiple case study (Bryman and Bell, 2011; Easterby-Smith et al., 2012). An alternative way of conducting the study would be to study a lower number of cases more in-depth. Thus, the inductive character of this multiple case study made it more appropriate to use a larger sample size to make the across analyses more valid (Eisenhardt and Graebner, 2007).

However, the number of studied cases is good, it could be argued to what extent the study has used heterogeneous sources of information. Research using heterogeneous sources of information further validates the conclusions (Yin, 2014). Studying international breakthrough innovation collaborations, mapping the cultural aspects of collaborations more in depth, would be one way of increasing the sources of information. Doing so, the external validity would increase and make the

study more generalizable. Thus, the selection of cases could be done differently, increasing heterogeneity, but would request more time gathering empirical data, which was not possible within the scope. Another way would be to use secondary data, internal documents, and/or observations to validate the findings from the primary data, the interviews (Yin, 2014). Being aware of these limitations when making the conclusions, a study's internal validation still would be considered as high, which was the case of this study.

When analyzing qualitative data researchers face the common issue of telling the story behind complex and context-bound data. This results in conclusions not convincing people outside the research team (Easterby-Smith et al., 2012). Properly analyze the data, making sense of the collected qualitative data, is one way of solving this issue. Computer aided analysis is when software tools handle large amount of qualitative data and package it in an accessible way. However, computer aided analysis software is complex and take a lot of time to learn, making them mainly useful in big qualitative studies conducted over a long periods of time (Easterby-Smith et al., 2012). Since no pre-knowledge existed within the research team and the time scope of the total study was six months it was decided not to use computer aided analysis software but instead make the analysis manually. This decision made it harder to package the findings in a storytelling approach, possibly making the conclusions less convincing.

4. Empirical findings

The empirical findings presented in this study are collected through interviews with anonymized representatives in the cases. In total 19 cases were identified involving 30 firms and startups in total. From each case a summary is be presented followed by key takeaways and the researchers' own reflections. At the end of this chapter the findings will be summarized in table 8

4.1. Case 1

This was an innovation collaboration project between Firm A and Startup 1 where the innovation did not reach the market, and is therefore not considered to be successful. The startup that had a former contact with a middle manager at the firm was the one who initiated the project. The startup got the opportunity to present the idea and managed to catch the attention from the firm through its prototype and business case.

The aim was to exploit potential synergies, where the idea could benefit from the existing market channels of the firm. The firm responded by looking how this product could fit within their own structure and market. The middle managers argued that the idea did not perfectly match their existing product structure, was complex to produce and had a limited market potential making the economic potential of the product low. The startup provided additional information in an attempt to strengthen the business case, and responded that the production was challenging but it could not be any problem for the firm. Further, the startup told the firm that this product had a potential market of millions in turnover each year. The middle managers of the firm rejected the argument because it was according to him a waste to use the firm's resources and capabilities to produce this product. Moreover, the firm told the startup, that the business case did not fulfill their expectations of investable innovations.

The startup and the firm did not reach an agreement and they did not clearly have a shared view on the potential of the idea especially around financial expectations and technical solutions. However, the economical requirements were different and the firm did not want to enter into, in their comparison, too small markets. At the end the project, in dialog with marketing and technology directors, was terminated because of the difficulties and different economic expectations. The firm's middle management made the decision to call off the collaboration.

Our reflections and key takeaways from the case:

- It was a good fit though between the two parties' resources and capabilities
- The firm evaluated the innovation by its current synergies rather than by its long term potential
- The project was placed within an existing business unit where the middle managers, not the top management, decided whether the collaborations should continue or not
- The innovation faced internal resistance and did not have anyone with authority (custodian or guardian angel) to protect it
- The firm did not want to invest in "uncertain projects with long payback times"
- One reason behind the low interest from the firm was due to the communication gap between the startup and the firm. The two parties did not manage to bridge this gap

- The future strategic importance of the collaboration's outcome was far more important for the startup than the firm
- The firm did not like to work with an unfinished idea demanding an iterative work process to finish it and did not share the expectations with the startup
- No short term wins were shown throughout the project

4.2. Case 2

This was a collaboration in which Firm A and Startup 2 did not manage to commercialize the potentially breakthrough innovation. The collaboration tried to commercialize a new product line within the firm, currently providing the same market with complementary products. This was the first time the two participants collaborated together and it was the startup that took the initiated contact. The startup's business model was to identify problems within various markets and find solutions to the identified problems. Later the startup sold or worked together with an established firm in order to provide the market with this new product or service. The startup had succeeded with several previous collaborations and had a good track record of breakthrough innovations. The firm had production, R&D, market channels and established business models of complementary products. Thus, collaboration between the two would complement each other weaknesses and strengths as the firm would get technical knowhow and the startup would get market access.

As written before, the startup took the initial contact and pitched a future collaboration between the two. At the time, the firm did not have an organizational structure suitable for these types of requests. Therefore, a team of internal stakeholders was put together to analyze whether the collaboration should continue. After the initial contact, the firm started to investigate how the product would fit the existing organization and creates synergies. Asking the affected managers whether they saw potential in the innovation within their business unit was the major decision basis. The firm came with the proposition to make a pilot sale, testing how their customers felt about the innovation. The pilot sale was chosen because it enabled a low amount of investment from the firm and could in return lower the risks of further collaboration. The startup did not accept this proposal due to the low commitment by the firm. The firm on the other hand was not willing to put in more effort since the risks compared to the investment would be too high.

However, before any decisions were made, the firm began a major re-organization forcing the collaboration to be put on hold until the restructure were done. After the restructure the collaboration started once more. The first to be done was a sourcing within the new organization to find the best fit and the most synergies. After this, a team was created to explore the financial, market and brand potentials with the collaboration. This evaluation came out positive and the two parties entered into a discussion about future collaboration. In these discussions it became clear that the two parties had very different views on the value of the innovation and did not manage to reach an agreement. Therefore, the top-managers decided not to continue with the innovation project, but instead to continue with another existing project. Due to these factors the decision was made not to continue with the collaboration and to quit going forward with the idea.

Our reflections and key takeaways from the case:

- The 2 parties' resources and capabilities complemented each other in a good way

- Both parties understood the radicalness of the innovation
- The two parties did not establish a high degree of trust
- The collaboration outcome was more strategically important for the startup, same as its expectations
- Top management of the firm did not have the patience to invest in project with payback time over three years
- There was no manager within the firm who protected the innovation internally
- The innovation's potential was evaluated by the current fit in the firm
- It was hard to implement an exploratory working method within the firm
- No short term wins were shown

4.3. Case 3

This was a successful innovation collaboration project between Firm A and Startup 3. The project was initiated by the startup that contacted a salesman of the firm and presented their idea. The salesman forwarded the idea to his manager who forwarded the proposal to the R&D department. Since the proposal was addressing a well-known problem area for an existing customer segment it was decided to investigate it further. This task was given to a small technical team.

At the firm they had a doctor employed who had looked at a similar solution earlier but did not manage to solve all the technical issues. The investigation team decided to visit the startup to see if they had managed to solve the technical obstacles. At the meeting they saw that the startup had managed to overcome the technical issues and had come far with the developed of the innovation. This was reported back and together with the marketing and sales a pre-study started to evaluate the financial potential. As the result came out positive it moved on to a discussion with the startup about potential collaboration, which ended in an acquisition of the startup.

The startup and the firm saw a bright future together, in which the firm could bring in the product as a complement to their existing once and the startup by taking advantage of the firm's sales and marketing channels. Moreover, they shared expectations of the future in which they could exploit each other's advantages. They decided to go further and exploit the mutual advantages and to become strategically dependent. To arrange the collaboration, they decided to merge, in which the firm purchased the idea, acquired two people and production equipment from the startup, which brought in technical knowhow. Later, the newly employed people together with the sales/marketing department jointly build and launched the product.

Where, they only used resources and capabilities that brought competitive advantage. They did this by branding the product with the firm logo, putting it into the firm's existing, market and sales channels. Further, they started to produce the product with the newly acquired production equipment, since the existing manufacturing equipment could not be utilized.

This innovation collaboration project developed joint expectations of the future and unfolded in a great innovation, where the parties complemented each other in several ways. The product is still selling and brings profit to the parties, however it is not a big portion of the total of the firm, but it adds to the firm product portfolio and how the future will unfold is hard to know.

Our reflections and key takeaways from the case:

- Resources giving the collaboration an advantage was only used from the firm
- It was hard to unify the different cultures but the differences were accepted by both parties
- Both parties were interdependent of the collaboration's outcome and evaluated the strategically importance equally
- Top management secured resources for the project and was enthusiastic over its outcome
- The two parties' resources and capabilities complemented each other
- The participants established a shared vision and could together work in that direction
- The firm evaluated the innovation's potential by its present synergies with the organization
- It took time for the firm to accept an agile working process due to the absence of short term wins
- No one in top management protected the innovation from middle management, thus the middle management decided whether the collaboration should continue or not

4.4. Case 4

This case is an example of an idea leading to a breakthrough innovation, born within Firm A. The idea was developed and successfully commercialized to a new market together with Startup 4. The two participants knew each other from previous collaborations, but were then creating completely different products. The idea was a result from a structural change within one of the firm's existing markets where the innovation created a competitive advantage for one of the firm's customer segment. It was on the other hand not possible to develop the idea without the help from the startup who could translate the idea to a prototype and later to a commercial product.

At the firm, it was a team with the function to explore new idea and trends that identified the market opportunity due to the structural change in the market. The team started to define the new opportunity's future potential by defining technical and economical specifications. As these looked promising, the team made the decision to continue to explore the opportunity by reviewing possible technologies supplying the need. Market research and concept testing were the central components of this review. The results from these tests showed that with a newly developed technology the firm could supply a new product giving their customers a competitive advantage. Succeeding with that would secure future funding for the firm. However, the firm did not possess the technical capabilities to develop the new product by itself. Furthermore, to complement their capabilities they started to screen the industry for a collaboration partner.

Together with the technical partner a prototype was developed, which was tested with a customer. This was done in close collaboration between the three parties in an iterative way.

Based upon the result from this collaboration a choice was made to take the product to the next level and commercialize it. For this purpose, a new team was collected consisting of seven employees from various function areas within the firm and that had worked at the firm from one to over ten years. The employees had worked together before and could with the guidance from the team leader within a short period of time perform at a high level, especially after the unified vision

was set. The diverse combination of employees made it possible to collect a large amount of knowledge and at the same time access diverse resources and capabilities within the rest of the firm. It was especially the employers who had worked at the firm for a longer time who gained informal access to the resources needed outside the team. However, resources outside the team were only used if strong synergies were created otherwise the team worked adjacent to the firm.

The team got top management support and a completely new business team was created. The mission of this team was to put the product on the market. This new business team cooperated with existing local market organizations and the original team. A purpose with this whole set-up was to enable adaptation and optimization of the business model.

After five years of collaboration, the product and market fit was found and the firm started to build a scalable business model in the new unit. According to one participant small investment in the beginning was a success factor for reaching this far. The investments increased during the project, which made it easier for the top management to handle and enabled the project to accumulate a high total amount. Another explanation was the quick returns showed of each investment, not in money but in customer satisfaction or insight. This created the patience needed to build the innovation.

Today they are still working to scale up the business model. However, the radical innovation has, due to the collaboration, reached the market and the project is therefore seemed to be successful.

Our reflections and key takeaways from the case:

- When trust was established, the team could perform on a high level
- The team worked with agile processes in order to find the product-market-fit
- Both parties saw great potential in the innovation and were equally engaged to commercialize it
- The team participants had diverse and complementary capabilities
- Top management was eager to commercialize the innovation and trusted the team manager. This resulted in a high degree of freedom for the team who could take the necessary time to finalize the product
- The team reported directly to top management and continuously showed progress and positive results. Due to this they secured financing throughout the project
- Initially few resources were needed to verify uncertainties with the radical innovation which was critical for the project to be accepted by the top managers
- Throughout the project, the team only used resources from the firm which created strong synergies
- The innovation was evaluated by its future potential rather than its synergies with the established organization

4.5. Case 5

This case was a successful innovation collaboration project in which Firm B collaborated with Startup 5. They collaborated during a long period of time in which they focused on research and to develop high-end competitive technology. It was not the first time the two parties collaborated; they had developed various high-end technologies before. These collaborations had over the year

built up a high degree of trust and the parties know each other well. Their complementary knowhow made the collaborations successful and both parties gained from the outcome. All these ingredients were, according to the parties, fundamental for the collaboration to work and their choice to continue to collaborate.

When choosing collaboration partner the firm was eager to be strategically aligned, to make sure the parties involved are aiming at the same objective. After having found a partner they agreed and signed a frame contract specifying the terms and conditions of the collaboration. The attitude of the participants during the project was characterized by enthusiasm, creativity and pride, where everyone felt that they were in the same team. Furthermore, the firm had a well working method of handling radical innovation projects where every commercialized innovation went through three phases. This method was proved to be effective in exploring opportunities of radical innovations, find a product-market-fit and finally scale it into a business.

The project explored new technology fields in which the parties utilized each other's resources and capabilities. Where the firm secured the project with funding and the external part with technical knowhow. Further, they used an iterative working method to guide their way forward, in which the project had case specific measures with milestones. These had to be fulfilled in order to achieve further funding and support from research and top management. As a radical innovation started to take shape and the technical feasibilities were approved, the project went into the next phase where the market focus increased to find the market fit for the technology. The team rather quickly found a suitably market within one of the firm's existing business units where prototypes and later products were developed. The project finally resulted in a new technology that enabled an existing product to become radically smaller with improved performance. During the second half of the innovation process, as the invention began to be implemented at the firm, it was of biggest concern for the innovation to be protected from various threats. This was accomplished by, getting the managers of the business unit engaged in the innovation and seeing the potential. This made the idea stronger against internal resistance and increased the likelihood of commercialization.

Our reflections and key takeaways from the case:

- Continuous communication made the parties understand each other and at the same time send information back and forth enabling the agile working process
- The parties' interdependence of the project's outcome made them committed and the shared understanding of what the innovation could become simplified the work
- The team participants did not know how the innovation should be used at the market when the collaboration started
- The firm earmarked resources for radical innovation, meaning no return of investment was expected during the first five years
- No middle managers had the authority to shut down the project and the team reported directly to top managers
- The team was careful when using the firm's existing resources and tried to develop their own if the exiting not gave them great advantages
- Within the collaboration a new and shared culture was created which increased the performance of the participants
- The participants established a high degree of trust

- The firm understood the importance of an agile work processes in order to create radical innovations but if the innovations initially required a large investment it hindered financing
- When new radical innovation opportunities were identified they were evaluated by its future potential and the existing organization adapted itself to the innovation, not the other way around

4.6. Case 6

This case illustrates a collaboration resulting in a new production technology opening up several new market opportunities. The Firm C, was in this case contacted by Startup 6 which created the new manufacturing technology that enabled creation of a new material. The two partners had at the time not worked together before but needed each other in order to utilize the technology. The technology needed production equipment and market access to further be developed, which the startup believed the firm possessed. The firm on the other hand became curious about the new technology even though they did not know where they could apply the new material. Due to these factors, it was decided that the two parties should collaborate to utilize each other's strengths and develop the technology further.

After the initial contact the firm sent a team of four persons to confirm what the startup had told but also to explore future possibilities of collaboration. The team involved one technician, one marketer, one salesman and one business developer. These employees evaluated the technology and realized that with small investments, one of their own production lines could be reconstructed to manufacture according to the new technology. This insight made it more interesting for the firm to continue with the collaboration. The team pitched the new possibilities resulting from the collaboration and the CEO together with the CTO liked the idea and approved the collaboration. This even though the payback time of the investment was expected to be over five years. However, the top management saw this as a future investment securing future business and strengthened their innovative brand. In addition, a shared vision of what the technology could create was a fundamental ingredient making the collaboration happens. Furthermore, the two parties signed a collaboration contract saying that the firm got access to the technology and the two parties should together develop it further.

The first thing to do for the new collaboration team was to explore the market opportunities. The firm's access to market made it more natural for them to perform the exploration. During the same period of time, the startup worked with prototypes and developed the new material further. This way of working required continuous and clear communication accomplished through honesty and trust. Furthermore, the collaboration worked well due to a shared working process and explorative and working culture. However, the participants believed that it would have been more effective not to work within an existing business unit but separated from the firm and just add knowledge and resources when needed.

As the market and product fit began to take shape, the production technology was implemented at the firm by rebuilding one of the existing machine lines. At this point the collaboration faced their first bigger challenge, the mill manager and the team operating the machine resisted to change their

working procedure. This since they were expected to produce current product portfolio with old technology and at the same time doing experiment with the new technology. To resolve this problem, executive management team showed commitment for the project and used their authority to change the current KPI's for the affected production line and operating team making them less resistant for change. When the resistance was decreased the work could once again proceed.

Some years later, according to initial plan, when the production of the new material at the firm was up and running and a handful of markets were identified, the firm bought the intellectual properties securing the production technology. This outcome was earlier agreed in the collaboration contract and both parties were satisfied. The new material has been introduced and has created various new products and new markets for the firm. Due to this it considered to be a successful breakthrough innovation collaboration.

Our reflections and key takeaways from the case:

- They managed to develop mutual understanding of the project, which made them trust each other
- The success of the project was equally strategically important for both parties
- The parties found a good fit between the resources and capabilities
- The participants played with open cards, which made the communication clear and enabled the team to show quick wins
- The expectation of the outcome was shared
- The team had similar entrepreneurial working culture during the collaboration project
- The group constellation was solid, reflected in the right competencies and personas
- Top management supported the idea throughout the project
- The project had people that believed in the idea and stood up for the project
- No excess resources and capabilities were used
- The idea was evaluated according to its future potential, more than its current synergies
- The firm accepted the radical nature of the technology, when they initially did not require large investments
- The firm's willingness of change as well as the innovation's timing were essential for the success
- The firm was a bit slow in accepting the iterative, agile working procedure

4.7. Case 7

This was an innovation collaboration project between Firm C and Startup 7 in which the innovation never become commercialized. The startup contacted and presented an idea for the firm. The idea was a replacement for an already existing product in the market. The idea had an unclear business model but it was patented and had clear advantages compared to existing products. However, the startup was lacking production equipment, knowhow and needed help. The firm possessed the resources and capabilities he needed and became a natural choice to pitch the idea for.

The startup tested the idea jointly with potential customers and employed students, helping to compare and measure the advantages of the product. The proposed role of the firm was to compile and sell a system solution, with their existing resources and capabilities. An innovation manager from the firm got involved in the project; he conducted an internal investigation to see if they could

produce the system. The system demanded resources and capabilities from three different business areas that had to work cross-functionally in order to compile the solution. When pitching the product for the responsible managers of the different business areas the innovation manager encountered resistance. They thought the returns from this new solution should be less than the returns from their existing products, making this new idea a very low priority

During the collaboration it arose that the patent did not provide coverage for the material used in the product. Moreover, the technical knowhow behind the patent was not particular high, which arguably means that the startup was more dependent on the firm than vice versa, making the collaboration lack mutuality. Moreover, the firm provided the collaboration project with funding when searching for the product and market fit, which further strengthened the arguments.

As stated above the business model was unclear and so was the vision from the startup. When the innovation manager felt that he could not pinpoint the desired goal of the startup, it created discrepancy within the project. This emerged doubts about the collaboration project and the innovation manager did not get further support from the top management and felt he lacked incentives to push the project forward. At the end the innovation manager terminated the collaboration project due to the internal resistance and uncertainties together with lack of top management support. However, he thought that the collaboration project would still have been alive if firm structure was less rigid, where the firm instead earmarked resources and capabilities for new ideas like this one.

Our reflections and key takeaways from the case:

- The startup had developed the innovation for a long period of time without decreasing uncertainty and in order to continue it required external funding. The innovation manager was pleased to make such investment to test the idea better
- Top managers' patience at the firm decreased mainly due to the absence of short term wins
- The environment in which the innovation should be used was not ready for a change and none in the collaboration could affect this. Due to this, the external uncertainties evaluated to be to high
- The two participants had different expectations of what the innovation could become and they did not succeed to convince the other part of their view
- The business areas at the firm, mainly sell material today, and this innovation required a system approach not familiar enough to the existing business to establish buy-in
- It was not a good match between the parties, resources and capabilities in order to commercialize the innovation
- The parties did not share all information and future plans they had with the innovation, that hindered a trustful environment
- The collaboration did not work in an agile working process since both the startup and the firm were locked-in in old habits
- The startup was much more eager to succeed with the innovation and did not succeed to transfer this eager to the firm
- The contact person at the firm did not have the authority to make decisions in business areas affected by the innovation. Hence, these other areas' managers hindered the innovation's development and decided to stop it

4.8. Case 8

This is a successful breakthrough innovation collaboration project between Firm D and Startup 8. The firm faced increased cost in one of their operations and believed that these costs could drastically be decreased by new technology and digitalization. Due to this, an external startup was contacted who had experimented on the specified technology and the two together created new software enabling cost reduction. The firm had not earlier collaborated with the startup and the two met each other the first time at a fair. The startup was experts at software development and the firm had experiences and money. The new software solved the increased cost the firm faced and created a new market for the startup. Both parties saw this collaboration as successful, since they together created a radical innovation and at the same time gained of its creation but in separate ways.

The initial idea of creating a new solution from an existing operation demanding numerous of man-hours came from a newly created cross-functional C-level role at the firm. The new C-role should source the firm's external environment in order to identify new digital solutions and implement them at the firm to maintain their competitive advantage. The manager found a technology at a completely different market that could solve this operational problem. For the startup, a newly developed product should open up new market opportunities as the product could be sold to other firms facing the same difficulties. Due to these factors, both parties were eager to find a product-market-fit for the hypothetical product. However, new software needed to be developed and several verifying tests were necessary for the technology to become useful. Therefore, the manager made the initial contact with the startup and they started to develop the new product together.

The manager at the firm had a separate budget earmarked for innovations and was able to fund the collaboration. Due to this, the managers secured the control of the collaboration and did not need to convince someone else at the firm. At the same time the collaboration gained patience because the managers saw the future potential of the innovation, which always is hard to transfer to others. The process of finding the product-market-fit was an iterative process where the team went back and forth between software coding and testing. The team had two different locations, making the communication play a key role for the collaboration to succeed. The two parties had continuous communication through videoconferences making them understand the other ones' needs and struggles. Moreover, to make the process decrease in time, the technology was brought to both locations making the iterations go faster. The team consisted of technology experts, user and innovation managers who all used their competences in order to create the solution. It was important to not include too many people because it would slow down the working processes and hinder creativity. During the process, a shared culture was created where everyone felt, it was acceptable to share and test crazy ideas.

The collaboration did not use much resources from the firm since it could be developed without then. This was an active choice made by the team leader and was made due to the time savings. Only the most necessary resources were borrowed, like access to test equipment and operators using the present product. The product could in the beginning be developed with small means of resources, which increased in the same proportion as the payoff. This was according to the manager

one key reason for the successful collaboration. With the innovation commercialized the firm could decrease their cost drastically and the startup continued to verify the innovation's business model.

Our reflections and key takeaways from the case:

- The team worked according to entrepreneurial principals
- Communication was essential for the collaboration
- A shared culture was established
- Top management had patience and evaluated the innovation by its future potential and was ready of change
- The project secured funding by low initial investment and by short term wins
- The two parties equally evaluated the strategical outcome of the collaboration which contributed to a shared vision
- The project was protected and sponsored by the C-level manager who only gave access to the most necessary resources within the firm
- The match between the firm's and the startup's resources and capabilities were good
- The team participants complemented each other and created synergies

4.9. Case 9

This was an innovation collaboration project, inhibited by internal resistance at the firm. The collaboration was between Firm D and external part, Person 9. The external part was a specialist within a topic unfamiliar to the firm. The firm and the external part have collaborated many times before and had a partner relationship. The relationship was characterized by a high degree of trust, where the parties had strong informal contact and felt that they could give and take mutually from project to project.

The idea came from the firm, where they would like to digitalize one department to make it more efficient. When doing this firm needed to develop a software that could handle the needed functions. The firm saw synergies between them and their partner in which the firm could use and their partner sell the software developed. As stated above the parties already had a good relationship from previous collaboration project, which served as a good prerequisite for this project. This made the parties feel safe and no one were frightened to be overused or disrupted. Moreover, the high degree of trust enabled the parties to clearly communicate, which eliminated asymmetrical expectations and made no one suspicious about the other parties' actions.

The team constellation consisted of a C-level innovation officer, a leader from the involved department and it-experts from both the firm and the partner. The group was balanced and worked well, where they had similar working methods and culture. The working methods were agile, iterative and characterized by an entrepreneurial culture. The parties had complementing resources and capabilities, where the firm supplied the project with the functions that the software needed and the partner with knowledge of how to construct them. Moreover, they were eager to pinpoint that recourses not adding competitive advantages should not be used, where in this project the firm were very keen when choosing participants to the project. The firm could clearly see huge cost savings if the project succeeded, both in short and long term and was ready to do initial investments.

However, when the project proceeded the firm saw that the department in focus where more in need of other solutions at the moment, and the responsible middle manager said that they were not ready. The others in the project team did not stand up against this argument and decided to put the project on ice. As earlier mentioned both parties could take advantage of this project, however, the external partner had more benefit of the outcome than the firm and therefore the one being more strategically dependent on the project. This since they could potentially sell the software through their existing sales channel to a large number of customers compared to the firm. Moreover, since the department in question at the firm did not prioritize the need of becoming more digital.

Our reflections and key takeaways from the case:

- High degree of trust enabled good communication, which in turn made the expectations of the project clear. Moreover, a shared culture was established during the project
- The parties had complimentary knowhow about needed functions and how to build them. Moreover, they did not put more resources in the project than needed
- An acceptance for iteration between developing and testing is important when creating the product
- Low initial investments increased the acceptance for the idea
- The people in the project consisted of a c-level officer and technicians with the right knowledge, where they knew each other before and shared an entrepreneurial culture
- The project was stopped by a middle manager even though it possessed C-level authority. This since their willingness of change was low
- The innovation's potential was evaluated by the created synergies within the firm
- The external partner was more strategically dependent on the outcome in comparison to the firm

4.10. Case 10

This was an innovation collaboration project between Firm D and Startup 10 that was stopped after the idea has been tried in the field. The parties had a high degree of trust towards each other after have been working together number of times before and no one felt frightened of being mistreated.

This time, the firm contacted the partner with a mission to develop a digital system. The purpose of the system was to help increase efficiency in their current operations, where they saw potential for cost savings immediately. The partner came up with an idea, which got support from the top management of the firm. During the project they had good communication, high acceptance for each other´s culture and joint expectations of the outcome.

The project had a quite linear process in which the partner developed the idea into a digital system. The firm tested the system and encountered some technical issues and they encountered resistance from the middle managers that were going to use it. The top management and members of the project did not stand up against the internal resistance. They arranged a meeting concerning the emerged resistance and thought that it might be too much work using the system for the middle managers involved. Later, top management decided to stop the project.

However, due to the fact that the middle managers resisted the solution and top management did not force them using it, one can argue that the strategic importance of this cost saving system was

not that high. Conversely the partner lost a big sales opportunity and knowledge making the partner more strategically dependent of the outcome than the firm according to the interviewed.

Our reflections and key takeaways from the case:

- A high degree of trust was established before the collaboration started and also their communication practices
- The team was careful when they borrowed resources from the established business
- The expectation of what the innovation could become was shared by the participants as well at the acceptance of cultural differences
- The team worked in a liner working process making it hard to explore radical solutions
- Top management were not fully engaged when the internal threats raised, enabling middle management to stop the project due to unpleasant changes
- The investment made by the firm was made because the managers saw synergize with the existing organization
- It was hard for the project to show progress and positive results due to bad timing
- The business impact and the strategically interdependence was not balanced between the two partners

4.11. Case 11

This case clarifies a collaboration between Firm D and one of their startup partners, Startup 11, together creating a radical innovation rationalizing the processes for one of the firm's customers. The participants had worked together in several previous projects. The projects included products/solutions for both parties where the other party contributed with expertise and resources if necessary. The complementary character in their resources and capabilities was according to them the number one reason behind the continued collaboration. These previous collaborations had created a high degree of trust between them, making the iteration between them go faster. In this specific case, the firm had during some years faced increased competition and decreased returns. Due to this they felt forced to change and make something radically new. Thus, the partner was contacted because they had done similar solutions but for different markets and could help the firm with those experiences. The two succeeded to create a radical customer management system, which have increased the firm's returns once more.

Top management saw great potential with the innovation initiated the project. Furthermore, top management allocated a budget for the organizational change resulting from the implementation of the radical innovation. However, the collaboration team did not feel that they had any obligation to perform within a certain time period. This made it possible for them to explore and experiment to come up with the "best" solution. Furthermore, the team worked beside the rest of the firm with a direct communication to top management. That enabled the team to keep the speed and not make decisions creating present synergies but those who could have future potential. Much inspiration came from the existing solution made by the partner as the team explored them more in depth. As the idea began to take shape and more technical feasibilities could be done, minimum solutions/prototypes were made that could be tested. The results from these test guided the work forward. Furthermore, the team had a saying, "fail fast and cheap", exemplifying their way of guiding decisions and proceeds forward. The individuals within the team were not afraid to try new

thing and searching for outstanding solution. This nature of working came from the acceptance of cultural differences and playfulness.

Specific people were selected to participate in the radical innovation project. They were selected on different criteria such as technical expertise, internal connections, entrepreneurship experiences etc. The mix of personalities made it possible to continue on a path of high uncertainty without losing the track. Another reason behind the succeeded collaboration was the relatively low investment needed every time new tests where required. Furthermore, the positive results resulting from the test showed progress even though the project took several years to complete. Therefore, the team performed smaller but more tests in the beginning to gain patience and show progress. At the end bigger tests could be performed that required bigger investment. Thus the payoff of each investment could be shortened as the amount of investment increased during the project.

As the team found the product-market-fit the solution was implemented in small-scale parallel to the old system. Thus, continuous improvements could be done through input from both users and operational personnel. A short period of time after the pilot program, the new customer management system was implemented throughout the firm. The solution pushed the firm toward a competitive position within their market and the external partner unlocked new markets where similar solutions were needed. Both parties agreed that this case created a win-win situation where both firms, thanks to the collaboration, succeeded to increase their market position.

Our reflections and key takeaways from the case:

- The parties have through continuous collaborations build up high degree of trust and good communication practices
- The team was well composed and had an entrepreneurial culture with differences that were acceptable
- Both parties' top management saw great potential with the innovation
- When top managers realized the future potential of the innovation it gained protection from internal threats, despite its need of high investment
- The team worked with iterative working processes, testing crazy ideas until the right solutions were found. This made the team less dependent of external timing as they iterated until they found a match
- The payoffs from each investment made it possible for the team to allocate the required resources
- The firm carefully collocated the team participants to match the collaboration vision
- The complementary characters of the partners' capabilities enabled continued collaboration
- The team worked beside the ordinary organizations to minimize their negative influence and hindrance

4.12. Case 12

The case illustrates an innovation collaboration project between Startup 12 and Firm D that is an ongoing case, but has so far been successful. The firm needed a new safety solution to their operations initiated the project. The firm did not possess the knowledge needed to develop this by them and they could not find any current solutions on the market. Instead they searched after an external part to co-develop the solution with, and found one with the resources and capabilities needed to go forward.

The project team consisted of a C-level innovation officer from the firm and technicians from both the firm and the external part. The collaboration went smooth and they had a similar entrepreneurial culture and working method, where one of the parties had an innovation lab. The parties developed mutual trust and could clearly communicate their expectations of the project. The external part helped with knowhow on to solve the technical obstacles and the firm mainly served with testing of the solutions. They had an iterative way of working where, they developed and tested the solution until they found a good one.

This project is estimated to need quite big initial investments before it pays back, already today they have invested a big portion in the project and it is expected to continue a year more. This because the top management is eager that this project is going to succeed. According to the interviewed this determinism steaming from the firm's values, where they never compromise on safety, is seen as an investment for future sustainability. However, due to this determinism from the top management no one within the firm could stop the project from going forward. Likewise, the success of the project is important for the startup as well as it can gain lot of sales and knowledge from developing this solution.

Our reflections and key takeaways from the case:

- The parties shared an entrepreneurial culture and similar iterative working methods
- Both parties were open and could communicate clearly, which made it easy to share and create joint expectations as well as a trustworthy environment
- The startup had complementary knowhow and resources in comparison to the firm of how to develop the product, where no excess resources are used
- Both parties had a significant strategic dependency of the project outcome
- The collaboration constellation had a good mix of knowledge and entrepreneurial capabilities
- The top management of the firm was determined and had patience, no middle manager had the authority to stop the project
- The firm evaluated the project from its future potential
- Top management was determined that the project should succeed, urgent to change, which allowed the initial investments in the project to be high

4.13. Case 13

This is a case illustrating how Firm E utilized the external Startup 13 to help them see potential in a undeveloped segment within one of their existing businesses. The firm sourced for an external partner possessing complementary capabilities and resources. Succeeding with this the firm used

an innovation portal where they posted their problem and what kind of solutions they were open for. Out of the answers the firm found a potential solution. The next step was to verify a proof of concept. The firm turned to a startup they had worked with before and who they regarded as having the right competence to do this. After negotiating the collaboration form and contract scope, the two parties started to explore the solutions within the field. During the negotiations the parties realized they were not equally dependent of the outcome, where the startup was more eager to succeed.

Due to the unknown characteristics of the innovation, the collaboration team worked iteratively with an explorative mid-set. Moreover, an agile working process characterized the team where a shared vision was established. Everyone worked towards the same goals of what the innovation could become. The shared view was established through internal communication, willingness to work in the same pace and by sharing the same methods. However, the team members did not share the same culture but respected each other's differences and treated it as an advantage.

The project did not result in any product of significance and stopped quite early, thus no heavy investments were made. Moreover, the innovation at that time was too costly to produce in the existing business unit and was regarded as too complex for the intended use. No other choices of production possibilities were considered and the current synergies was not enough to proceed. Furthermore, the firm lacked incentives, as no one at the firm saw the future potential of the product and the project was closed down.

Our reflections and key takeaways from the case:

- Resources and capabilities complemented each other well
- A common expectation of the outcome and a shared vision of what the innovation could become were established. One reason behind this was the excellence in communication
- With acceptance of each other's cultural differences, mistrust was not created within the collaboration
- The team worked with an agile working method but did not manage to show short-term wins
- Top management evaluated the innovation based on the synergies created with existing business
- The parties' differences in strategically interdependence created power differences among the other parties
- The project indicated an absence of top management support. When top management at the firm was not supporting the project, no patience, money or protection came from them
- As earlier indicated, the project was initiated without top management support and failed as the required investments increased. This further strengthens the fact that the project actually lacked sufficient support

4.14. Case 14

This case illustrates an innovation project between Firm E and a number of external partners who jointly created a new material that later replaced a material of an existing product in the firm. The partners consisted of startups, entrepreneurs and researchers from the local university. Some of the partners had been collaborating before and knew each other´s pros and cons.

This project was initiated by an external part that came to the firm with a project idea and thought that this could be of interest for the firm. The firm was very interested and saw that this was an interesting area to explore for use in existing products. The parties agreed to go forward with the project. This was an easy choice since they trusted each other from previous collaborations and could thereby clearly communicate and share expectations of the project.

During the project they jointly researched and developed the material through an iterative approach of trial-and-error character. The members of the project consisted of researchers both from the firm and the external partners. They complemented each other weaknesses and strengths, where the external partners shared knowledge about the structure of the material and the firm about the business utility. This was as well similar to the incentives for participating in the project. This made them strategically dependent on each other's success, where the external part could gain prestige of applying their research in products and the firm profit from new abilities of the products. Furthermore, the project did not need heavy initial investment and the top management could see how the potential of the material unfolded during the project time. This kept the economic risks low and the need of the outcome in pace, which made the partners feel motivated and patient during time. Moreover, it made the top management keen in keeping this project alive.

Our reflections and key takeaways from this case:

- They had a high degree of trust that enabled clear communication about expectations.
- Both parties invested important knowledge into the project
- They had different strategical wins of the project but they were strategically aligned
- Top management from the firm saw need of the outcome during the whole project and the investments were initially low
- Top management saw potential in the project and secured its existence
- The different parties had similar and iterative ways of working during the project which showed progress and positive results
- The idea had good timing, where material could fit and replace the ones in existing products
- There was an absence of a joint entrepreneurial culture

4.15. Case 15

This is an example of a successful innovation collaboration where Firm F and Startup 15 together created a radical innovation. The parties had at the time not been working together before and met via an intermediary. One of the firm's customers was in need of a future solution for one of their operations and top management at the firm realized this new market opportunity. However, the firm did not have the capabilities to alone solve the problem and create a new product. Thus, they contacted an intermediary to investigate the external possibilities for a partner who could complement the firm's resources and together create the radical innovation. After a short period of time, the intermediary had designed meetings with a number of potential startups. All the startups got the opportunity to meet the firm and pitch themselves and the ideas they had. With this done, the firm selected to collaborate with one of the startups, which they believed, could co-create the innovation with them. Both the firm and the startup worked close to the intermediary and trusted their judgment of the other party. Due to this, the two parties quickly established a high degree of trust with was essential for the collaboration to work.

The participants had scarce resourced to contribute to the collaboration, which were critical for the innovation to be commercialized. The firm had market access and the capability to build business models. Besides from this, the firm had resources to realize the innovation, which the startup did not possess. However, the startup possessed the technical expertise essential for the innovation. This made them mutually dependent in the collaboration. Good communication made it possible to utilize the, in theory, good match in practice. Due to the radical characteristics of the innovation, the team worked in an agile way to explore the product-market-fit. Even though none of the participants knew where the innovation would end up, they shared the expectation of what their collaboration could create. The shared expectation created an acceptance of the parties' differences in culture and a clearer realization of the interdependence between the parties.

The initiative to explore the external collaboration possibilities to realize the market opportunity was anchored at top management level at the firm. The manager saw the innovation's potential and realized what it could result in for the firm. Furthermore, top management saw synergies with the existing business, minimizing the initial investments and maximizing its returns. Together with this realization from top management came their patience, earmarked money and protection from internal resistance. Their support continued as the collaboration showed progress and return of investment in terms of customer need, prototypes and pilot tests. With all these factors in place the collaboration succeeded to not just create a breakthrough innovation but commercialize it as well. Thus, this is considered to be a successful breakthrough innovation collaboration.

Our reflections and key takeaways from the case:

- The parties' resources and capabilities complemented each other and communication enabled them to utilize them
- Trust was established and created a foundation for success
- A shared vision of what the collaboration could create was established
- Top management support secured resources and a freedom to explore the unpredictable development

- The team worked with an entrepreneurial method that enabled them to be agile and open to new findings
- Timing in technology development, market need and the startup's business model was essential for the collaboration to happen
- The firm was willing to invest in an unknown project since they had realized the market need and the innovation's long term potential
- Even though the time to market was long and unpredicted, the project survived due to the short term wins showed
- The team had a mix of technical and market expertise, and entrepreneurial reasoning derived the people involved. The core of the team was not changed during the project

4.16. Case 16

This case exemplifies how Firm G and two startups, Startup 16 and Startup 17, successfully came together and collaborated to commercialize a radical idea. The participants had at the time not been working together before, but knew of the other's existence. To be able to commercialize the innovation all participants' capabilities and resources were necessary. It was the firm who realized the new market opportunity and possessed the technical capabilities to create the platform that would be the market foundation. However, the platform in itself was useless as the firm needed competences to transform t he platform into a product. Thus, the firm searched for external partners and found two startups that faced the opposite problem; they had ideas for products but not a setting to use them. In theory everything looked good for a collaboration and it was therefore decided to become partners. Before the collaboration started a common vision was set of what the project could become and methods to reach that vision. According to the participants, when the vision was set the team began to trust each other and could start the "real work". After years of development and adjustment, the collaboration team commercialized the radical innovation that totally revolutionized the market.

Within the firm, it was a middle manager that took the initiative to explore the new market opportunity. This manager, later the project leader, had direct contact with top management who liked the initiative and gave the middle manager their support to build a new business unit. This decision together with the direct contact, were not popular among the rest of the managers who lost interest in their divisions. However, the top managers protected the new initiative and secured resources for the project. The project leader managed to pitch a future business scenario where the firm would be dependent on the new market opportunity. With that done, top management thought long-term with their investment and evaluated the initiative by its future potential. Nevertheless, the initial investments were low and the progress clear and promising, making the decision easier.

Since the ideas were in an early stage and the components needed to fit the platform, the team worked with the entrepreneurial culture. This implied that they were open to adjustments and strived to find the correct product-market-fit. Apart from the entrepreneurs from the startups, the firm contributed with a project leader and technical experts to the team. This enabled the team to be flexible and quickly make decisions. Another way of doing this was not to put the team within one of the firm's existing business units, but in a new business unit. This was done by only borrowing resources from the firm that were essential for the innovation to be commercialized. Several years with numerous pivots and adjustments the innovation could be commercialized in

small scale. The work with business model correction and scaling of the business is still in place. The collaboration is considered to be successful as the radical innovation is commercialized.

Our reflections and key takeaways from the case:

- The parties were mutually dependent of the collaboration's success and complemented each other's resources and capabilities
- Top management protected and supported the project
- No middle manager had the authority to shut down the project
- The team worked with an entrepreneurial structure and working method. It was a well formed group with complementary characteristics
- Only key resources were used from the firm
- The innovation was evaluated by its future potential and required low initial investment
- The innovation was right in timing in terms of its innovation ecosystem and business need
- Due to the newly created business unit, the team got the freedom to operate and established a common culture
- Within the team was a high degree of trust among the participants established
- A shared vision and how to reach it made the team unified

4.17. Case 17

This is an example of a potentially breakthrough innovation collaboration between Startup 18 and Firm H that did not reach commercialization. The startup had come up with a prototype together with an idea of how the market could be revolutionized. However, the prototype needed more resources to be further developed and the startup needed access to the necessary market channels. Thus, they screened industries to find a firm with complementary resources. After that the startup would give them the opportunity to have exclusive rights to the innovation if they collaborated and helped them to commercialize it. When the startup pitched their prototype for top managers at the firm, the managers got engaged. They saw how this innovation would revolutionize one of their biggest markets if they would succeed to commercialize the idea. Furthermore, the managers realized that the investment would have a huge payoff if the succeeded. Due to this, they accepted the collaboration terms and were willing to give the startup resources and access to their market channels. Despite these circumstances, the innovation did not reach the market and ended up as a prototype.

After the initial pitch, the firm began to prepare themselves for exploring of the opportunities of the radical innovation. Since the startup convinced top management at the initial pitch, they had earmarked resources necessary to commercial the innovation. They had also realized that this project would take time and that ordinary product development with exciting stage-gates would slow down the project. Due to this, the collaboration would work beside the ordinary R&D unit and adapt an explorative and agile working method. This was also done to interest the startup since their working within the firm would be free and attractive. Furthermore, this way of working would not influence the rest of the everyday activities at the firm. With everything set, the collaboration started.

After a period of time, it started to be clear that the people within the startup were not unified on what the innovation should become. The majority owners of the startup, who were researchers and

had come up with the innovation as a part of their research, had no business ambitions and wanted to continue their research. The minority owners, entrepreneurs brought in as a university project to explore the market opportunities, saw how this innovation could become "the next thing". As bad communication prohibited the minority owners to convince the majority owners to look at the situation their way, they become powerless in strategic decisions. At this stage, the firm started to contact the majority owners and asked what they could do to make them more engaged. They offered better collaboration terms, recourses and sales deals, but without results. The majority owners were not interested in commercialization of the innovation. They were absorbed by their research, and without their technical expertise it was impossible to continue. Thus, the collaboration ended with a prototype ready to revolutionize a market but with a decision to not continue.

Our reflections and key takeaways from the case:

- Top management at the firm was eager to develop the innovation and secured resources for it to happen. Furthermore, did the managers reorganize their organizational structure to an ambidextrous organization structure
- The firm saw the potential of the innovation rather than its synergies with existing business
- The collaboration was right in time and the technology for realization, market need and market channels were all in place. At the same time the participants complemented each other and created synergies together
- The firm was willing to make such risky investment since the urgency of commercialization was bigger than the sacrifice
- The participants did not manage to create a shared vision of what the innovation could become
- The startup team was not correctly composed for breakthrough innovation commercialization
- The firm was more dependent of the collaboration to succeed than the startup was
- Bad internal communication led to late and different understanding by the members of the startup which made it impossible to agree on the same picture of what was to happen

4.18. Case 18

This case illustrates a collaboration project where Startup 19 contacted Firm A and pitched an idea of a radical innovation complementing one of the firm's existing markets. However, the innovation never reached the market since the participants, after years of development, decided to go separate ways. The two parties had at the time not collaborated before, but both parties realized the potential of a collaboration project. Furthermore, the startup had experiences within innovation collaboration since they identified new solutions for existing markets and tries to implement it at firms. The startup's track record together with the synergies created by the collaboration, made the firm interested. With the two participant's resources and capabilities, a new business model canvas could be created. This since the participants' resources and capabilities complemented each other in a good way. The startup contributed with technical knowhow and the firm possessed resources to develop the idea further and the necessary market access. Due to these positive aspects a collaboration contract was signed.

In the beginning of the project, the collaboration team worked to find a product-market-fit suitable for the existing market channels. They worked with an iterative working method to explore the most suitable solutions. At this time, the innovation manager, a manager's who allocated the R&D budget, was eager to succeed with the project and protected it from the internal resistance Due to this, the team had the top management's attention and got the necessary resources. Besides from the support, the innovation manager secured that the Right mix of people participated in the project. Those were people with entrepreneurial ambitions who understood the complexity of radical innovation. The team participants established a high degree of trust and verified hypotheses fast and efficient. Everybody shared the vision and knew how to reach it. The participants talked openly about everything and shared all information, contributing to the establishment of trust. During this journey, changes were made in the initial business model to better supply the market. The major modifications affected the distribution channels, but the team did not see this as a problem since they believed this could be changed.

However, after a period of time, key top managers changed positions or left the firm. During the same period of time, the firm changed its participants within the collaboration twice. No new vision or trust could be established, lowering the team's performance. Additionally, these factors drastically changed the dynamics within and outside the collaboration team. Suddenly the firm did not prioritize the collaboration project as they did before. The information exchange decreased, making the participants' distrust the each other. Moreover, it became harder and harder to secure resources and the belief in the change shaded away. Furthermore, the new business model would cannibalize of an existing product, making the internal resistance of that division increase. Without the proper management support, the resistant become too large and no one in the team could do anything about it. This slowed down the working pace, and the team could not perform in the same way they did before. Instead of an explorative approach the team adopted a linear stage gate approach. This way of working was slower and the entrepreneurs'' patience finally ended. As these difficulties increased and the entrepreneurs' patience ended, the two participants decided to go separate ways and not continue with the commercialization of the innovation.

Our reflections and key takeaways from the case:

- The team worked according to an entrepreneurial methodology
- The innovation was right in time, both in terms of firm urgency and innovation ecosystem
- Initially the two parties were equally dependent on the collaboration outcome, but as the firm's sense of urgency decreased, so did their dependency
- The participants' resources created synergies, enabling collaboration in the first place
- The information sharing between the parties both established trust, when it was open, and mistrust, when it decreased to become closed
- In the beginning the two parties shared the vision of what the collaboration should become, that slowly changed over time, creating mistrust
- When top management changed, the support, protection and patience of the collaboration was lost, the absence of short term wins also contributed to this
- It was much easier for the firm to initiate the collaboration project since it initially did not imply that much investment.
- The shifts of personnel made it impossible to maintain trust and a common culture

4.19. Case 19

This was a successful innovation collaboration project between Firm I and Startup 19, where the firm demanded expertise to develop one of their existing products further. The firm screened the market and saw that the startup was ahead of competition with its techniques. The firm then contacted the startup, presented their idea and made a request of collaboration. Doing this they were very humble and open about their intentions, which enabled a straightforward communication.

The members of the startup were not used to work with firms, but they thought that the firm was reliable and that they could match its request of collaboration with required resources and capabilities. Moreover, they saw an opportunity to create a win-win situation, by complementing each other's qualities, where the firm possessed the abilities to put a business around the startup's knowledge. With this both parties could clearly change and share expectations of the project outcome and made an agreement to collaborate. After having agreed, the firm acknowledged that their expectations of the outcome were even higher in terms of market impact and level of the requirement. However, they were still humble and knew that this was a big challenge for the startup, which in turn did not resist the new directions of the agreement.

The project team consisted of people with broad market and technical knowledge from both companies. The project was well anchored in both organizations, where the firm had a project leader with a lot of autonomy to act and a lot of informal contacts in the firm who backed him up as well as the project. In the startup this was not a big issue either and the top management supported the project during the whole time. During the project they had an iterative way of working in which they jointly tested the new techniques in the product and developed production capabilities of how the firm could do this by themselves. This required a lot of effort from both parties in which the firm took the bigger part in terms of human resources, where they on a regular basis had more people from their side involved in the project, which resulted in kind of big initial investment.

However, without losing the core of the team, the people involved from the firm were replaced during the project time. According to the person interviewed a key of the project success was that they kept the core people in the team, which secured continuity and speed. Further, the project members could see the result from what they did fast and the whole project was completed after roughly one and a half to two years.

Our reflections and key takeaways from the case:

- Straight forward communication and humbleness created a trustworthy environment
- Trust and shared expectations built confidence to collaborate
- The win-win situation and complementarities of qualities made them being mutually dependent of the project
- The parties accepted each other's culture
- The project was well supported and consisted of people well trusted of top management who as well could see the future potential of the project

- Top management was determined that the project should succeed and no middle manager had authority terminating it
- The core of the team was competent and participating consistent during the whole project
- The team acquired diverse knowledge from other people in the bigger organization when needed
- The project showed short-term wins and was completed after 18-24 months
- The project used an iterative way of working when testing the new techniques in the product
- The firm did big initial investment even though the outcome was of the project was not 100 % sure to become accomplished
- The timing of the project was good, where the firm had some kind of need to change their product and the startup developed the capabilities to do this

4.20. Summary of findings

In table 8 the findings of the found characteristics of breakthrough innovation collaboration could be seen. In total were 17 characteristics identified which will be further analyzed in the following chapter, result analysis.

Table 8. Characteristics of breakthrough innovations collaboration projects.

Identified characteristics
A. Synergies
B. Top management support
C. Patience
D. Initial risk
E. Short-term wins
F. Willingness to change
G. Internal resistance
H. Usage of resources and capabilities
I. Right mix of people in team
J. Culture acceptance
K. Communication
L. Trust
M. Timing
N. Mutual dependence
O. Entrepreneurial way of working
P. Shared vision
Q. Future potential evaluation

5. Result analysis

This will analyze the empirical findings in order to be able to answer the research questions. This is done by identifying the common ingredients within successful collaborations and compares these with theory. To complement this information, factors behind cases with un/commercialized breakthrough ideas will be analyzed. After that where the findings analyzed from three angles to find interdependencies among the factors. Lastly a cluster analysis was made to further validate the result.

5.1. Commercialized innovation projects - 17 factors of success

Out of the 19 investigated cases in this master thesis, 11 of the potential innovations were commercialized. By the definition used, they were considered to be successful. Within each case, reasons behind why the innovation was commercialized are found within the key takeaways and reflections. The key takeaways are a summary of the interviewees' understanding of the collaboration outcome and are unified with the researcher's' reflections. When analyzing these factors, it was found that several of the key takeaways repeatedly were an explanation of why the innovation was commercialized. Out of all the key takeaways from the 19 collaborations, 17 different factors were identified in total. To understand the factors further they will be analyzed together with theory as can be seen below.

5.1.1. Factor A, Synergies

If the idea in the collaboration project would be put into a business model canvas, successful cases would show that synergies were created between different parts in the canvas when the participants collaborate. Often the synergy is created between the value proposition and the customer relation, distribution channel and customer segment. However, sometimes it could be like in case number 6, where the idea was in need of production equipment and thereby the synergy was created between the value proposition and key resources. Within collaboration theory, one of the factors making a collaboration easier is that the parties create synergies of each other's resources and capabilities as to be seen within the business model canvas (Thomson, 2001; Thomson and Perry, 2006). Furthermore, synergies created in the business model canvas increases scope and efficiency (Alter and Hage, 1993; Dodgson and Rothwell, 1994). However, the literature is not stating that the creation of synergies is a must, rather something nice to have.

5.1.2. Factor B, Top management support

In almost all of the cases presented, commercialized or not, the collaboration project faced opposition. The amount and form of opposition differed between the cases but at some point it occurred. In theory similar patterns can be found in breakthrough innovation projects (McDermott and O'Connor, 2002; Meer and Han, 2007). When it happened, the outcome varied, depending if the collaboration had a sponsor and a champion or not. With their commitment, the internal resistance did not affect the project as hard and allowed it to continue in the current direction (McDermott and O'Connor, 2002). However, the cases were showing that the champion and the sponsor did not have to be a c-level officers but they needed to have their own dedicated budgets and authority to decide over personnel. Moreover, the findings are showing that the sponsor and

the champion often were the same person and that they both had an entrepreneurial mindset. The entrepreneurial mindset made it easier for the manager-level officer to become committed mainly due to the understandings of radical innovations. Furthermore, a direct contact with the firm's c-level made it easier to lower the resistance due to authority signaling.

5.1.3. Factor C, Patience

This factor can be divided into two types, either the patience of the top management at the firm, or patience of the entrepreneurs' working in the project. What can be seen in the cases when analyzing their investment opportunities is that top management does not have patience or incentives to invest in radical innovation projects. One reason behind this is the low understanding and the long payback times of those types of innovations (Nagji and Tuff, 2012). Other reasons are the risks involved and the frameworks to evaluate the different opportunities. Ordinary risk management and risk matrices will increase uncertainty and challenge the patience of managers toward breakthrough innovation (Shane, 1994). The other type of patience is the entrepreneurial, it is important for the entrepreneurial spirit within the collaboration team. This can be seen in case 18, where the entrepreneurs' patience finally ended and the team stopped using entrepreneurial working methods, which slowed down the working, pace as a result. The entrepreneurial spirit rises from an effectual logic, which require freedom to operate, and agile hypothesis confirmation (Read et al., 2010). Without these, entrepreneurs will lack patience and lower their efforts for and commitment to the collaboration project.

5.1.4. Factor D, Initial risk

It could be found in several cases, especially in those within firms less inclined towards radical innovations, that low initial investments increased the chances of success as they kept the initial risk low. This argument goes in line with the theory of uncertainty, saying that lower uncertainty makes managers more comfortable in uncertain environments and increase their focus on breakthrough innovations (Shane, 1994). This argument can be further supported by the bias of managers' risk perception, in which they have a risk-averse behavior making them want to keep the risks low (Kahneman, 2011). An example of this is shown in case number 4, where the firm's risk appetite towards radical innovation was low. They looked for ideas already fitting their existing business and were not interested in adjusting or adapting their business model to fit a new radical idea. However, the collaboration project succeeded in spite of this and this since they kept initial investments and risk low. Later as the team showed progress, they felt more confident in allocating more resources and money. Eventually the innovation was ready to be commercialized and the total amount of investment increased. The firm spent the money over a long period of time, which created a lock-in effect and a more positive attitude towards the radical project. Another, explanation on how to create a positive attitude is to collaborate with another party, this since collaboration per se is a risk sharing activity. (Selsky, 1991). To further establish a positive attitude, one could influence the mindset of the people involved. This by making them adopt an effectual logic, which suggests that when working in an uncertain environment the people involved should calculate the risk they can afford or accept (Sarasvathy, 2001). This could potentially reduce the fear or risk taking caused by the subjective perception of the risk.

5.1.5. Factor E, Short-term wins

Like most of the projects within firms, progress or short-term wins are essential for the projects to continue (Kotter, 1995). For an incremental project this is not hard to see since one can recognize the path and thereby understand the short-term wins of the project (McDermott and O'Connor, 2002). However, for breakthrough innovation where the path is unknown it is harder to see progress. It is therefore important to possess the capability to translate or associate the iterative work made in a breakthrough collaboration project to short-term wins: (Norman and Verganti, 2014). Please note that short-term wins do not need to be financial but can also be soft values such as learning achieved and knowledge creation. Case number 15 is illustrating how the short-term wins kept the project alive. What the team did was to show the increased customer satisfaction, technology progress and results from the pilot tests. Due to the low payback times connected to the breakthrough collaboration project, they did never have payback time as a measurement of progress. In contrast to case 15, one can see in case 2 how the absence of short-term wins contributed to the decision not to continue with the collaboration. The knowledge of how to translate an entrepreneurial working process to short-term wins is therefore important for a breakthrough innovation collaboration.

5.1.6. Factor F, Willingness to change

This factor was a determining element for the acceptance of radical innovations within the firm's top management. It could be found in for example case 12, how the firm was urgent to change what they were doing and hence open to make both risky and expensive projects to change their current path. At most of the firms interviewed, the willingness to change was an external factor e.g. increasing competition. Nevertheless, at one interviewed firm, the willingness to continuously change was as natural as coffee in the morning. This mindset enabled breakthrough innovation projects to play a central role for the firm's competitive advantage and they were prioritized in innovation budgets. The firm have due to the breakthrough collaboration projects established a market leading position in a highly competitive market. Within theories of change management, breakthrough innovations and open innovation, it could be found that willingness to change will contribute in favor for breakthrough innovation collaboration as the risk willingness increases (Kotter, 1995; Chesbrough, 2003; Koen et al., 2010).

5.1.7. Factor G, Internal resistance

It could be seen in for example case 19 is that no middle manager had the authority to make decisions over the breakthrough collaboration project. That was important because the KPIs of middle management were not in line with those of the breakthrough innovation projects (McDermott and O'Connor, 2002). Therefor there is an underlying incentive to be resistant to these types of projects. If the decision to continue with a radically new idea is made by a middle manager of a specific business unit and the idea is not in line with the manager's current incentives, it will be shut down (O'Reilly and Tushman, 2004). This can be seen in case 2 where the idea would lower the performance of the business unit initially but over time increase it. Despite the long-term improvements, the managers decided not to continue to pursue the innovation. Due to this type of situations, it is important to keep the middle managers away from the breakthrough innovation

collaboration. The most effective organizational structure to accomplish this is by an ambidextrous organization (O'Reilly and Tushman, 2004). Furthermore, it is shown that the innovativeness of such organizations will increase, confirming the empirical findings in e.g. case 11.

5.1.8. Factor H, Usage of resources and capabilities

One incentive to collaborate when doing breakthrough innovation is to take advantage of complimentary effects of each other's resources and capabilities (Chesbrough, 2003). However, as in the literature of creating breakthrough innovation, it is important not to borrow too much from the existing business units (Govindarajan and Trimble, 2005). This will increase the amount of radicalness, as the existing business will strive to create incremental innovations or streamline the existing operations (Pfeffer, 2003). What can be seen from the cases is that projects placed within existing business units either face increased resistance or lose their touch of radicalness, e.g. case 1 and 10. It could also be shown how the commercialized innovations borrowed as little as possible and built most of the business model canvas by themselves e.g. as in case 8 and 11. This finding goes in line with theory of entrepreneurship and the creation of innovations (Blank and Dorf, 2012). Furthermore, with the theory of breakthrough innovation, arguing that the innovation team should work agile and iterative, which is hard when borrowing too much of existing resources and capabilities (Sarasvathy, 2001).

5.1.9. Factor I, Right mix of people in team

Having the “right” people in the project was found to be of great importance. The profile of the people involved in a collaboration team is essential for the innovation to become developed and commercialized (Koen et al., 2010). What has been found in the interviews is that the people from the firm played a central role for the collaboration to succeed. They should have an entrepreneurial mentality, like to work in uncertain environment and possess key knowledge about the idea. This is in line with the theory of effectuation in which people ideally should have a similar mindset when working in an exploratory way (Sarasvathy, 2001). In several cases it has also been highlighted that in order to efficiently get access to the firm's resources and capabilities, an informal network is vital. The formal way is often slow and requires high level of authority. These findings are in line with the theory, saying that breakthrough innovation collaboration teams should have at least one team member with many informal contacts, thereby making it easier to access resources and knowledge (Klijn and Tomic, 2010; Leifer et al., 2001). Besides having the correct competences and access to the informal network, the personal missions of the ones involved have to go in line or shaped to match the vision of the collaboration project (Klijn and Tomic, 2010; Leifer et al., 2001). It is shown in case 17 how the entrepreneurs’ mission did not go in line with the rest of the collaboration team. As written in the theory of organizational autonomy, personal missions are stronger than the common vision and must therefore go in line with the collaboration’s vision (Tschirhart et al., 2005).

Keeping the core people from both parties of the collaboration team the same during time was argued to be of great importance in case 18, where the core people of the team were replaced several times, making them have a hard time to sustain important relationships with the other in the team. Good relationships serve trust and with this people dare to try new things (Klijn and Tomic, 2010;

Leifer et al., 2001). However, a bit contradicting to our findings the theory of innovation team argue that members should be replaced to avoid group thinking and keep the flow of new ideas steady (Klijn and Tomic, 2010; Leifer et al., 2001). From this one could argue that it is important to possess the ability to build new strong relationships when old ones are disrupted and the capability to transfer knowledge from one person to another when relationships are rebuilt. Further that the core people of the team needs to stay the same and that the rest can be changed during time.

5.1.10. Factor J, Culture acceptance

In theory and also found in the cases, culture plays a central role for breakthrough collaboration to succeed (Leifer et al., 2001). However, it takes time for a shared culture to emerge, if the initial strategically differences are big (Cabrera and Bonache, 1999). When influencing the establishment of a culture, it is important to have high degree of trust and a continuity among the team members (Calton, 1998). It is on the other hand shown that in some of the cases where the innovation was commercialized, that a shared culture was not established, e.g. case 3 and 19. The participants did not strive to unify their cultures but accepted each other's differences. These findings point in the direction that the acceptance of each other's difference is more important than the establishment of a shared culture in order to commercialize a radical innovation. Moreover, in the theory of breakthrough innovation the five elements of the innovation team, confirms this finding where the elements shift of members, establishment of trust and a heterogeneous team will generate breakthrough innovation (Klijn and Tomic, 2010; Leifer et al., 2001). The theory does not emphasize the establishment of a shared culture. Nevertheless, a shared culture will increase capacity and effectiveness when it is aligned with the strategy (Cabrera and Bonache, 1999). Thus, it could be argued that an acceptance of culture will be enough to create radical innovation but a shared culture could increase the efficiency of the innovation process.

5.1.11. Factor K, Communication

In case 1, it is shown how poor communication hindered the participants within the collaboration to fully understand each other. The participants did not speak the same language in terms of technical feasibilities and market opportunities. Moreover, overcoming the communication gap is fundamental for a collaboration to be successful. In case 5, the participants had continuous communication and managed to overcome the communication gap. This enabled the participants to understand the other's need and commonly point to the direction of the collaboration. Likewise, high performing teams have communicated a clear working task, which are fulfilling the participants' need (Wheelan, 2005; Tuckman and Jensen, 2010). However, communication channels at firms are filtering information to match the existing direction (Henderson and Clark 1990). Such communication channels will hinder radical and favor incremental innovations. Due to these factors, one can understand the importance of both the team's internal communication and which external channels that are used. Case 19 is a good example of good communication where the team leader communicated the internal visions and used a direct external communication to top management.

5.1.12. Factor L, Trust

Utilizing resources and capabilities from the market to the firm always includes transaction costs (Coase, 1937). In a cost efficient industry, a firm should choose the option including the lowest costs. It is shown how trust could decrease the transaction cost for external collaboration making them more attractive to choose (Cummings and Bromiley, 1996). Furthermore, trust within teams creates an atmosphere of creativity (Klijn and Tomic, 2010). Creativity is fundamental for radical innovations where thinking outside the box is necessary. Due to these characteristics one can understand that trust will play an important role in breakthrough innovation collaborations.

It could be found that in cases where the parties were interdependent a calculative trust was established in the initial stages. That is trust established when the parties perceive that the choice of collaboration with one another is more beneficial than with alternative ones (Rousseau et al., 1998). The calculative trust was later transformed to relational trust as the team started to get to know each other. A similar development of trust is common in regular collaborations (Rousseau et al., 1998). In cases where trust was established the team could perform at a high level. This goes in line with the theory of group dynamics, saying that a well performing team have good relationships with a high degree of trust that enables communication and shared vision (Tuckman and Jensen, 2010). Conversely in cases where trust could not be established the parties could not communicate clearly which made it hard to establish a clear vision of the project. This happened for example in case 18, where mistrust destroyed the collaboration.

5.1.13. Factor M, Timing

Innovations or ideas, separated from the environment in which they are used, are useless (Adner, 2006). Due to this, timing is important when making innovations. The environment in which it should be used must fit the innovation to utilize its gains (Adner, 2006). What can be seen in the empirical findings is that timing is not only about the innovation ecosystem but also a question of business need. The firm must see or face the need of adjusting their current business to accept the radical innovation (Nagji and Tuff, 2012). Cases like, 14, 15 and 19, all show how both types of timings were in place and empowered the innovation to be commercialized. With these in place, the door to breakthrough innovation collaboration was open. However, with an open innovation strategy firms can more effectively source the innovation ecosystem (Chesbrough, 2003). With such strategy the firm could influence and co-create the innovation ecosystem, making the issue of timing easier. With the right timing it will become more easily to identify the short-term wins as the utility increase (Adner, 2006).

5.1.14. Factor N, Mutual dependence

Initially as the collaboration take place, some form of complementarity between the parties should exist (Alter and Hage, 1993). At this point it is usually enough, but as difficulties or opportunities rise the participants need to be mutually dependent on the collaboration (Thomson and Perry, 2006). Otherwise it is hard to establish any form of collaboration, since the parties cannot satisfy the other's need without losing its own (Wood and Gray, 1991). In case 17 it could be seen how the parties not were mutually dependent which created a mismatch in their power balances. The entrepreneur became less interested of the collaboration project and was not willing to provide the needed effort to commercialize the innovation. On the other hand, the firm was willing to face the risk involved and to put in a large amount of resources. This unbalanced situation made it impossible for the collaboration to continue since the entrepreneur's' commitment decreased to almost zero. With decreased commitment, it is hard for collaboration to succeed (Mora-Valentin et al., 2004). Furthermore, the outcome is dependent of both parties' specific resources and will not become commercialized if one party's commitment disappears.

5.1.15. Factor O, Entrepreneurial way of working

In order to accomplish radical innovations, effectual logic is more suitable (Sarasvathy, 2001). Depending on how far the idea is developed the amount of iteration and exploration differs (Blank and Dorf, 2012). However, the cases are showing that successful collaborations are not working within the firm's established stage gates, but in an explorative way, e.g. case 4 and 11. Their methods have differed but the common factor is the effectual reasoning. As the logic reflects the organizational structures, KPIs and methods, it is understandable why the collaborations are placed beside the ordinary organization (O'Reilly and Tushman, 2004). As can be seen in case 7, the firm's structures and innovation methods lowered the radical edge of the innovation, which further argues for the importance of an entrepreneurial working method. Furthermore, innovation teams that are integrated within firm's innovation processes will lose their entrepreneurial way of working since the influences from the other innovation processes are too high (McDermott and O'Connor, 2002; O'Reilly and Tushman, 2004). Summarizing the factor of entrepreneurial way of working, it is essential for the radical edge of the innovation to stay and it will disappear if the innovation team is integrated within a innovation process.

5.1.16. Factor P, Vision sharing

In collaboration theory, the establishment of a shared vision makes the participants committed to their work task (Klijn and Tomic, 2010). Furthermore, committed team members will increase their performance and create a problem-solving atmosphere (Thomson and Perry, 2006). In the cases where a shared vision was established, they managed to keep their focus, even though iterations were made to find the product-market-fit. Furthermore, an agreement of a shared vision made it easier to unify the individual members' missions with the project's vision. This clarified the work task and hindered individual resistance. However, the individual's missions and mindsets are hard to change and should therefore be selected to fit into the project's vision, and not the other way around (Tschirhart et al., 2005). In case 11 the firm understood the importance of individual vs. collective visions and matched the two Doing so, the team kept the correct focus during the

collaboration and performed at a high level. Moreover, teams with shared and clear visions will perform at a high level (Wheelan, 2005). In contrast, the participants in case 7 did not manage to establish a shared vision, which made it hard for them to unify their resources. Furthermore, the expectations of entrepreneurial part did not match the firm´s and vice versa. The outcome did not match the other parts. The expectations regarding anticipated market sizes and technical difficulties were not shared and became a problem during the collaboration. They did not manage to bridge this gap and decided to go separate ways.

5.1.17. Factor Q, Future potential evaluation

Breakthrough innovations in the early phase cannot be evaluated by their current performance (Nagji and Tuff, 2012). They should instead be evaluated by their future potential of increased returns and market leading position. However, it is hard for firms, for different of reasons, to adjust their existing business model to a radical innovation (Henderson and Clark 1990; Pfeffer, 2003). Firms are instead looking for innovations that can be evaluated by their current fit within the existing business, as seen in e.g. case 1 and 7. However, it was found that some firms *first* are evaluating breakthrough innovations by their future potential and *then* how they fit into the organization. Another two distinguishing points were found, concerning the acceptance of uncertainty and the willingness to alter the business model. These points can be exemplified as the following examples; a firm is only willing to collaborate if the collaborators completely complement them by filling in all the parts of the new idea's business model canvas. Making them together possess a completely new business model canvas. The second point is that at least two parts of the canvas has to be filled by the collaborators and the rest are emerging or developed during the collaboration. This means that the parties initially at least posses one complementing part of the business model canvas that is beneficial in the innovation collaboration project. The parts of the business model canvas can arguably be whichever as long as they provide advantage to the innovation collaboration project. In the later way of thinking, one accepts higher degree of uncertainty and will be more open to radical ideas. Within breakthrough collaboration projects, several evaluations of the projects are made. If these evaluations are made by the idea's future potential, more radical innovations will be commercialized (Nagji and Tuff, 2012). Due to this, the evaluating mindset of the collaborators' is vital for a breakthrough innovation collaboration to take place.

5.1.18. Summary of analyzed factors

In this section the factors analyzed above are summarized to get a better grasp over them as a whole. They are summarized in table 9 below and will guide the reader further in the analysis as the factor's term is used.

Table 9. Summary of factors with terms.

Term	Factor
A	Synergies
B	Top management support
C	Patience
D	Initial risk
E	Short-term wins
F	Willingness to change
G	Internal resistance
H	Usage of resources and capabilities
I	Right mix of people in team
J	Culture acceptance
K	Communication
L	Trust
M	Timing
N	Mutual dependence
O	Entrepreneurial way of working
P	Shared vision
Q	Future potential evaluation

5.2. Analyzing the factors interdependencies

In order to understand the interdependencies between the factors and how they are contributing to un/commercialized breakthrough innovation four types of analysis will here be conducted. The first are looking at patterns within commercialized ideas, where as the second are analyzing the reasons behind un-commercialized ideas. After this an analysis of the study's purpose, theory and identified factors are conducted, followed by a cluster analysis.

5.2.1. Factors contributing to get breakthrough innovations commercialized

Within the analysis of the result, 17 success factors have been identified where the mean value of identified factors are 13 factors per case. All contributing, in one-way or another, to the commercialization of a breakthrough innovation collaboration. However, one can see in table 10 that some of the factors contributing to the commercialization of breakthrough innovations are more frequent, thereby contributing more to the explanation of a successful outcome. Furthermore,

one can argue that the most frequent factors would be most important towards a commercialization. This since their presence indicates a better collaboration between the parties. Factors present in nine or more of the eleven commercialized breakthrough innovation collaborations will be considered as the more important factors. Analyzing the theoretical impact of each factor together with their frequency will further guide the discussion of the factors' relation to the commercialize breakthrough innovation collaborations.

Table 10.Summary of factors present in cases resulting in commercialization.

Factor	Case 3	Case 4	Case 5	Case 6	Case 8	Case 11	Case 12	Case 14	Case 15	Case 16	Case 19
A	X		X	X	X	X	X	X	X	X	X
B	X	X	X	X	X	X	X	X	X	X	X
C		X	X	X		X	X	X	X	X	X
D		X		X	X			X		X	
E		X		X	X	X		X	X		X
F			X	X		X	X		X	X	X
G					X	X	X	X		X	X
H	X	X	X	X	X	X	X			X	
I	X	X	X	X	X	X	X	X	X	X	X
J			X	X	X		X			X	X
K			X	X	X	X	X	X	X		X
L		X	X	X		X	X	X	X	X	X
M				X	X	X	X	X	X	X	X
N	X		X	X	X	X	X	X	X	X	X
O		X	X	X	X	X	X	X	X	X	X
P	X	X	X	X	X	X	X	X	X	X	X
Q		X	X	X		X	X	X		X	
	6	10	13	16	13	15	15	14	12	15	14

Three of the factors were contributing to the successfulness of all the commercialized innovation projects investigated. These are factor B*, Top management support*, factor, I *Correct people* and factor P, *Shared vision in the team*. This finding points in the direction that collaboration projects really accomplishing commercialized breakthrough innovation should have top management support, work towards the same vision and have the right mix people in the team. A shared vision enables the participants within the project to allocate all their resources into the same direction and make it sustain is strengthened by theory (Thomson and Perry, 2006). Furthermore, it contributed to the problem-solving atmosphere necessary for the iteration towards the product-market-fit realizing radical innovations. The collaboration team members are also of biggest concern since people create innovations. The five foundations of an innovation team, shift members, create friendship atmosphere, heterogeneous backgrounds, leadership and informal network, were repeatedly found in the studied cases and are building the foundation of the creation of radical innovations (Klijn and Tomic, 2010; Leifer et al., 2001). Due to the characteristics of a radical innovation, internal resistance is natural and can be seen in all the studied cases (McDermott and

O'Connor, 2002). With top management support the threats from internal resistance was drastically decreased. Moreover, with top management support the required resources and freedom of operation was secured. Without this, no projects were possible.

The next group of factors is those contributing to ten out of the eleven successful cases. These factors are; A, *Synergies in the business model canva*s, N, *Mutual dependence* and O, *an entrepreneurial way of working.* The innovation team in case 3 did not have an entrepreneurial way of working. If the factor O would be considered as a key success factor the innovation would fail with it absent, which not was the case. However, in case 3 the radical innovation was well developed when it was presented to the firm. Therefor it was not needed to adapt an entrepreneurial way of working, but they could succeed with the commercialization by a causal reasoning (Sarasvathy, 2001). Case 4, is missing both the creation of synergies in the business model canvas and the mutual dependence between the collaborators. The participants saw the potential of the innovation and had a shared vision. However, the parties were not mutually and strategically dependent because the startup's core focus was to develop another type of software. Thus, the firm was more dependent on the outcome and there were no incentives for the startup to complete the collaboration. Therefor it could continue and the innovation becomes commercialized (Wood and Gray, 1991). When it comes to the absence of synergies in the business model canvas, it is more of a prerequisite factor. During the collaboration it is not as important but one can question the decision of commitment to a collaboration if the potential of synergies is absent (Chesbrough, 2003).

With the fact that case 3 not was in need of an entrepreneurial way of working, one could with the acceptance of case 4 see how the six most frequent factors contributed to the commercialization of all breakthrough innovation collaborations studied. Due to this one could argue that these six factors to a higher degree contribute to the success of a breakthrough innovation collaboration project.

5.2.2. Factors absent in projects with un-commercialized ideas

In some of the projects the innovations were not commercialized. In table 11 one can see that these projects had an absence of in total ten different factors thereby directly contributing to that they were stopped before the innovations could be commercialized. In the findings it was found that in average 3,25 factors were directly contributing to not commercialized ideas. When a factor directly contributing to a not commercialized projects an M, missing factor, are marked in table 11. Out of these ten factors, four were more frequently non-appearing. These factors were B. *Top management support*, P. *Shared vision*, I. *Right mix of people in the team* and N. Mutual dependence. To get a deeper understanding of the importance of the absence of these factors, they will be further discussed and reflected upon. Doing this we will look more in depth into the specific events of the non-commercialized cases.

Table 11. Summary of main factors absent in cases with non-commercialized ideas.

Factor	Case 1	Case 2	Case 7	Case 9	Case 10	Case 13	Case 17	Case 18
A								
B	M	M		M	M	M		M
C						M		
D								
E	M					M		
F								
G					M			
H								
I		M					M	M
J								
K								
L			M					
M				M	M			
N	M			M			M	
O			M					M
P	M	M	M				M	M
Q								
	4	3	3	3	3	3	3	4

5.2.2.1. B, Top management support

The absence of top management support is likely to be a direct explanation of why six of the eight stopped cases did not manage to commercialize their innovation. This trend further strengthens top management support as a key factor towards success. Open innovation projects cannot be done without top management support and their prioritization of long-term wins (Kiron et al. 2015). Within case 18 it could be found that the collaboration in the beginning got top management support and could secure funding and had freedom of operation. However, when the support from top management suddenly stopped due to reorganization, the collaboration did not survive. The internal resistance and the frustration within the team became too high.

5.2.2.2. P, Shared vision

Within five of the cases where the innovation did not become commercialized the absence of shared vision was one reason to the outcome. As well as top management support, shared vision seems to be critical for successful breakthrough innovation collaborations. Without unified vision the team cannot collaborate or perform at the necessary level to create radical innovation (Mora-Valentin et al., 2004). In case 1 it was found that the parties did not manage to established a shared vision, which lead to a shut down of the project. The parties clearly had different expectations of the outcome, leading to an environment that was negative for the outcome.

5.2.2.3. I, Right mix of people in team

The explanation behind three of the nine non-commercialized innovation projects was that the people in the innovation team were not the right ones. The interviewees saw a direct negative influence of a badly assembled innovation team. A badly assembled innovation team could create a hostile environment where the creativity may decrease (Klijn and Tomic, 2010; Leifer et al., 2001). In case 18 the participants from the firm shifted several times, which created a hostile and distrustful environment, making it impossible to continue. Another outcome of an incorrectly assembled team is a misaligned personal mission that would make it hard to reach the collaboration vision (Tschirhart et al., 2005). This could be seen in case 17 where the entrepreneurs' individual missions did not go in line with the overall mission of the collaboration. The individuals' missions did not change, forcing the collaboration to end.

5.2.2.4. N, Mutual dependence

The theoretical importance of mutual dependence is well defined by the following citation:

Collaboration can't be rushed. [It is] very energy intensive. You have to be willing to invest inordinate amounts of time at low productivity to establish relationships and trust building. Organizations don't initially start with a cost – benefit analysis. They start with a kind of idealism. Then, as they start to accomplish things, they realize that they're going to have to pay a cost. When organizations are willing to make the costs that is when you have moved to collaboration. (Thomson, 2001, 93)

If the participants not are mutually dependent of the collaboration, it will be impossible for them to find incentives to pay these costs of collaboration. If only one part sees a potential in the collaboration, the organizations cannot collaborate (Powell, 1990). It was found in case 9 that the parties were not mutually dependent of the outcome. The firm was not willing to pay the cost of a collaboration to the same degree as the entrepreneur did. This created a frustration between the participants, which led to the decision to end the collaboration.

5.2.3. Analysis of the study's purpose, theory and identified factors

The scope of this study was to investigate and find patterns for success within breakthrough innovation collaboration projects. Theories have been written within the different elements creating the foundation of such project. With some few words, one can state that what characterizes the successful collaboration was…:

The authority and knowhow to collaborate in order to create breakthrough innovations

Furthermore, this statement could be divided in four parts in which previous studies have concluded reasons to success: *The authority...* → **Top management support** (Chesbrough, 2003; McDermott and O'Connor, 2002; Meer and Han, 2007)
and knowhow... → **Right mix of people in team** (Klijn and Tomic, 2010; Leifer et al., 2001)
to collaborate... → **Shared vision** and **Mutual dependence** (Klijn and Tomic, 2010; Thomson and Perry, 2006; Wheelan, 2005).
in order to create breakthrough innovations → **Entrepreneurial way of working** (Blank and Dorf, 2012; Sarasvathy, 2001)

With this separation made, it is clear how these five factors ("BOPIN") create the foundation of a breakthrough innovation collaboration. Without one of these factors the statement would not be completed which makes it hard to succeed with the case.

5.2.4. Cluster analysis

As discussed in the previous section, five out of 17 factors are considered to be more important for a breakthrough innovation collaboration project to be successful. When arguing for this we are not saying the other factors are unimportant, rather they have interdependence with the more front standing ones. To get an understanding of their interdependence a cluster analysis was conducted, as can be seen in figure 14. When interpreting this analysis one should look outside- in at the model, for example top management support is providing a willingness of change and future potential evaluation. Moreover, the grey lines are dividing the model into five separate areas, where one can see if the factor are related to one or more of the main factors.

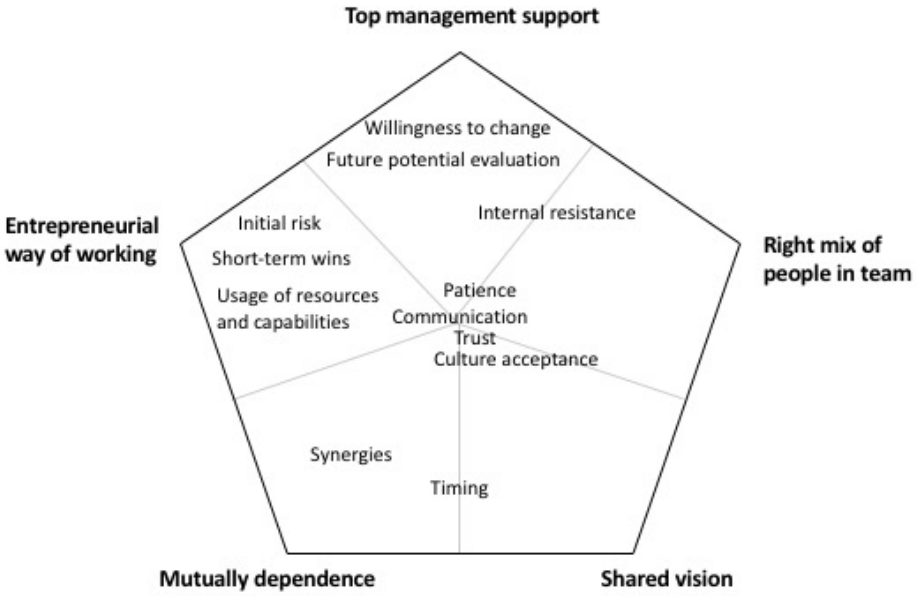

Figure 14. Cluster analysis of factors

When arguing about the factors within the cluster analysis, we have as earlier said that the main factors are generating the sub factors in various ways. The argumentation for the position of the

factors can be seen in table 12. For example, with top management support it is easier to established the factors of willingness to change and future potential evaluation.

Table 12. Argumentation for the cluster analysis.

Main Factor	**Sub Factor**
Factor B Top management support	Willingness to change of the firm is choice dependent upon top management and its ability to communicate and push the group forward (Wheelan, 2005; Tuckman and Jensen, 2010; Klijn and Tomic, 2010; Leifer et al., 2001). With this they have the authority to stand up against internal resistance and make the choice of future direction (McDermott and O'Connor, 2002). Moreover, they are being patient giving the breakthrough innovation the time and resources needed (Nagji and Tuff, 2012).
Factor I Right mix of people in team	One could prohibit the emergence of internal resistance by choosing people with a mission in line with the project's vision (Tschirhart et al., 2005). Further, similar missions of people will create understanding and build trust within the team who in turn undermine patience (Tuckman and Jensen, 2010). Moreover, make communication smoother, which enable one to share or accept cultural differences between firms.
Factor P Shared vision	Two firms possessing the same vision is a matter of timing since the vision of firms might change during time. Sharing each other's vision creates a degree of interdependence making one establish calculative trust (Rousseau et al., 1998). Communication and some degree of trust will help in generating a common culture or accept each other's culture (Calton, 1998)
Factor N Mutual dependence	Being mutually dependent is important both initially and over time. Initially this includes synergies and calculative trust. Timing could be affected by the synergies the team possesses, since synergies might change in degree over time. Moreover, as earlier said communication and trust will help in generate or accept each other's cultures (Calton, 1998).

Factor O. Entrepreneurial way of working	Keeping the initial risk on an affordable level is a fundamental way of reasoning in the entrepreneurial way of working (Sarasvathy, 2001). Moreover, one should as entrepreneur test hypotheses fast and iterate in order to find a product market fit, which enables one to show progress/short-term wins (Blank and Dorf, 2012). Furthermore, not to bound the entrepreneurial spirit, a breakthrough innovation team should only borrow resources and capabilities giving competitive advantage (Govindarajan and Trimble, 2005).

5.2.5. Summing up the four angles of analysis

The findings together with the factor analysis have further been analyzed from four different angles:

Angle 1, Factors contributing to get breakthrough innovations commercialized.
Angle 2, Factors absent in projects with un-commercialized ideas.
Angle 3, Analysis of the study's purpose, theory and identified factors
Angle 4, Cluster Analysis

Independent of angle, four of the factors identified, is repeatedly found as explanations behind each angle. Moreover, these factors are not only the most common explanations for success, their absence are also the most contributors to collaborations not leading to collaboration and hence they are the most critical from a theoretical perspective. High importance in one of this angles of analysis could be a coincidence, but four of the factors are of high importance in all three. These factors are; *top management support, right mix of people in team, mutual dependence* and *shared vision*. This points in the direction that these four factors are more critical for the success of any breakthrough innovation project. However, an *entrepreneurial way of working* is distinct in its contribution to commercialization and is adding radicalness to innovation collaboration (Chesbrough, 2003; Sarasvathy, 2001). The projects were in a wide range adapting the entrepreneurial way of working and was therefore not contributing to failed collaborations to the same extent as the previously four mentioned. Due to this, an *entrepreneurial way of working* is considered to be of high importance for the success of a breakthrough innovation collaboration. Thus, five of the 17 factors identified are considered to have higher importance for commercialization of breakthrough innovation when firms and startups collaborate.

6. Result and analysis discussion

The aim of this paper is to identify success factors for breakthrough innovation collaboration projects. This chapter will discuss the validity and the generalizability of the study's findings. The factors with a high degree of impact will mainly be discussed because they are considered to be more important.

6.1. Result validity

Research within industrial theory concludes that the new paradigm open innovation makes the boundaries between firms fuzzier, which imply increased collaboration (Chesbrough, 2006). Furthermore, the radicalness of innovations will increase due to an increased scope of knowledge and effectiveness from collaboration projects (Alter and Hage, 1993; Dodgson and Rothwell, 1994). However, as the radicalness of innovations increase, the risk of failure will follow (Leifer et al., 2001). Adding the fact that collaboration can be hard per se makes the situation even more complex (Huxham and MacDonald, 1992). The aim of this master thesis was to identify success factors in breakthrough innovation collaboration. 19 cases, involving 30 firms and startups, contributed to the findings of this study.

The results from this study could maybe be more valid if more cases would be investigated. However, due to the new area investigated and its theoretical contribution it is more valid with fewer more in depth cases than the other way around (Easterby-Smith et al., 2012). Therefor it would have been better to increase the depth of each case rather than increase the quantity. Nevertheless, interviews were held with both parties of the collaborations validating the data (Bryman and Bell, 2011). An alternative way of answering the research questions would be to do an action research, participate within breakthrough innovation collaboration projects to see and experience the success factors. This was not possible due to the limitations in time and resources as these projects usually spans over several years. However, the characteristics of the research questions allowed for in depth interviews. These were performed with participants from the cases and were considered to validate the findings (Easterby-Smith et al., 2012).

The existing theory within the scope of the study was limited. Therefor have theories from subareas within breakthrough innovation collaboration been applied to validate the findings. Due to this, the validity of this study relies on the generalizability of the existing theory used (Easterby-Smith et al., 2012). Hence, theory considered to have a high degree of generalizability is used, which increases the validity of the findings.

The scope of this study, collaboration between startups and firms when pursuing breakthrough innovations, is by its definitions hard to keep solid. The evaluation of whether the smaller firm within the collaboration is a startup or just a small firm has sometimes been hard to define. Furthermore, the evaluation of the innovation's degree of radicalness has also been hard to determine. The same comes to the definition of collaboration and the distinction to corporations and market transactions. As a result, from these uncertain facts the validity of the study decreases. However, the evaluations have been made from the definitions used it the theory section. By

keeping every evaluation within these definitions decreased the uncertainty and increased the validity.

The factors identified in the study are interdependent of each other. Due to this, it is hard to determine the root cause of each statement made by the interviewee. The empirical findings have due to this become influenced by the researchers' bias when the reflections of each interview were made. However, the researchers made the reflections separate from each other and made them separately from the note taking. Doing so, the understandings could be discussed and compared to increase the validation, before stating anything in the report.

6.2. Generalization

No previous research within the scope of this master thesis was found, making the findings of this study useful for firms as they entering collaborations to accomplish breakthrough innovations. However, no collaboration studied where unique and had different characteristics. The different characteristics, together with the fact that the studied cases were from various industries, one can argue that the findings from this study is generalizable to a high degree within the scope. Nevertheless, no cases were studied outside Sweden, which could have complications due to cultural differences. Though, the cultural differences were high within and across the cases without having high implications of the findings, which pointing in the direction of high generalizability.

Furthermore, it could be seen that the cases studied were heterogeneous. They differed in type of industry, firm size, development of innovation, type of products etc. The heterogeneity further strengthens the generalizability within the scope of the study. It was not important for the collaborations to fit within certain criteria to apply the findings.

To increase the generalizability of the results more and deeper studies could be made of each success factor. This because the generalizability of this study not consider the individual factor. Doing this would also increase the knowledge about the dynamics of each individual factor.

7. Conclusion

The first aim of this master thesis was to identify factors characterizing collaborations between firms and startups when pursuing breakthrough innovations. The second aim was to discuss the interdependencies of these factors to see whether some of them are of more or less importance. Below a brief description of how we conducted the study are made, later we present our conclusions in table 13 and figure 15, hence answering the first and second research question. Later theoretical and managerial implications of the result will be discussed.

To address the research questions, information has been collected through theory and interviews. Theory has been collected in the areas of open innovation, breakthrough innovation, collaboration, startups and firms. Interviews have been performed deeply with people in relevant positions, where 19 cases have been collected and reflected upon. Later these have been analyzed and discussed together with theory in order to get clarity and understanding of the topics.

7.1. Factors characterizing collaboration between firms and startups when doing breakthrough innovation

This part answers the first research question; *what factors characterize the success of breakthrough innovation collaboration projects between firms and startups?* The research has shown that 17 factors characterize breakthrough innovation collaboration between firms and startups, which are found in table 13.

Table 13. The 17 factors characterizing success of breakthrough innovation collaboration.

Factor	**Description**
Synergies	Complementing effects of resources and capabilities between the parties. A practical way of seeing this factor is through a business model canvas, in which at least one part should complement the other party's as this gives the participants incentives to work together.
Top management support	To keep the project alive, top management support is crucial. This could for example be when the project is facing opposition or need a push in the right direction.
Patience	This refers to both the patience of the top management and the entrepreneur, for example the former need to have understanding about long-payback times and the later need to have autonomy to keep the entrepreneurial spirit alive.
Initial risk	Keeping the initial risk low increased the likelihood of the participants to engage and invest in the collaboration project. This could for example be achieved by doing investments gradually in the project as it proceeds.
Short-term wins	Showing short-term wins of the project is crucial to get further support for

	long payback times. Thus having the capability of translating progress to visible result is of importance.
Willingness to change	This refers to the willingness to change and be open to take both risky and expensive actions. This could be triggered in two ways either by actively choosing to be ahead of competition or by being forced to stay alive as a company.
Internal resistance	Keeping the internal resistance low towards the breakthrough innovation project makes it smoother to manage. Getting management support or maybe more effectively by using an ambidextrous organization could for example keep this away.
Usage of resources and capabilities	Not borrowing too much of existing resources and capabilities of the firms are important not to loose the radical edge of the project. Since those are streamlined to match the existing activities of the firms.
Right mix of people in team	Having the "right" people in the team is crucial in three ways; *first* they should be aligned with the vision of the project by having similar personal missions. *Secondly*, they should possess accurate competencies necessary for the specific project. *Lastly*, the core of the team should stay the same through the project helping to not losing the path and important relationships in the group. However, the periphery of the team could change and might be preferred since this will keep the inflow of new ideas into the project.
Culture acceptance	To establish or having the same culture will help in communicating and build trust in the project, however, findings shows that at least an understanding of each others culture is enough.
Communication	To avoid biased and bad communication the team leader should clearly communicate visions internally and externally directly to the top management.
Trust	Establishing or having a high degree of trust is important to keep the transactions costs low and make the people in the team dare to be open.
Timing	Having the right timing is important in two ways, *first* two parties must have the business need to be willing to start the collaboration and *secondly* the project needs to have an idea that fits into the current external ecosystem.

Mutual dependence	Not only having synergies initially is of importance, during time new difficulties and opportunities usually emerge. When this happen the parties have to be dependent on each other and the project, otherwise incentives will change and the parties usually feel less inclined to continue.
Entrepreneurial way of working	The logic of working when doing breakthrough innovation is different to the logic used in existing firms. When doing breakthrough innovation an effectual logic should be used in which one explore the market for opportunities.
Shared vision	Sharing the vision will help the participants to stay focused and work against the same target. Keeping this can be challenging when pivoting the product and market fit, but must be shared and agreed.
Future potential evaluation	Firms might find it hard to use criteria's others than those in line with their existing business when evaluating ideas. For breakthrough innovation to happen the idea should ideally be evaluated of its future potential.

7.2. The interdependencies of the factors

This part answers the second research question; *how are the identified factors´ interdependence related to the commercialization of breakthrough innovations when firms and startups are collaborating?* To sort out the interdependence behind the 17 factors, the empirical findings have been analyzed from four different angels. From the analysis five factors were more front standing in each angle; these were top management support, shared vision, mutual dependence, right people in team, entrepreneurial way of working. First one could see that these five factors were present in cases with commercialized ideas, secondly that four of these were the main reason of failure in the cases with un-commercialized ideas. Thirdly, that the same five factors were supported by the analysis of the study's purpose, theory and identified factors. Lastly, from the cluster analysis, it was found that the rest of the twelve factors could be generated from the five main factors. Together these views conclude that ***Shared vision, Top management support, Mutual dependence, Entrepreneurial way of working*** and ***Right mix of people in team*** are the most front standing factors contributing successful breakthrough innovation collaboration. When concluding this, it is important to note that the twelve other factors are not unimportant. However, when doing breakthrough innovation collaboration projects between firm and startups, the people involved should first and foremost focus on the five main factors, illustrated in figure 15.

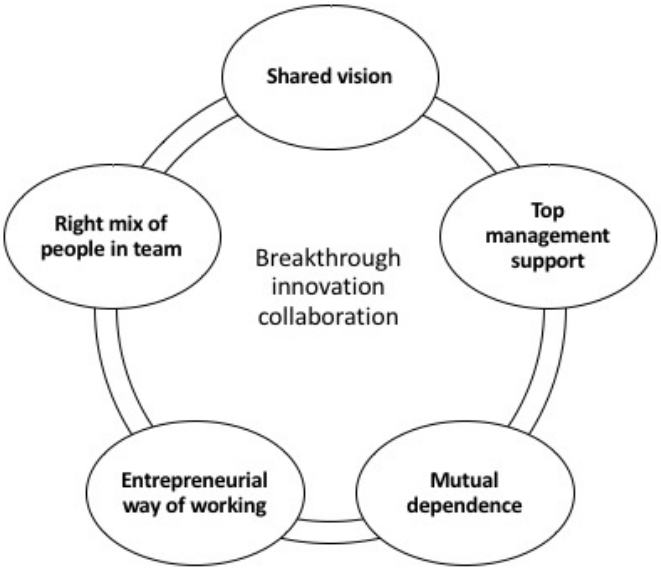

Figure 15. Main factors of breakthrough innovation collaboration

7.3. Theoretical contribution

Within its scope this study fills a part of the identified theoretical gap by contributing with new theory. In comparison to previous research, this study adds to this gap by translating existing generalizable theory mixed with new empirical findings. Furthermore, one can argue that this study has identified and prioritized factors contributing to the commercialization of breakthrough innovation, rising from collaboration between firms. Thus, it is mainly within this field of knowledge the study is contributing with theory.

The factors by themselves are not new since they can be found in previous research. However, the way they contribute to breakthrough innovation collaboration is new. The empirical findings lay the foundation of how the factors influence the collaborations and the existing theory guides the analysis. In table 13 the factors are identified. Their usage in the breakthrough innovation collaboration context is contributing to theory both within collaboration and breakthrough innovation, as well as in the study's scope.

Furthermore, the identification of the main factors contributes to theory, where few publications could be found related to factors interdependencies and their influence to commercialization of innovations. Due to this, one can consider that also these findings contribute to theory.

7.4. Practical implication

The factors identified in this study, will increase the knowledge of how to manage breakthrough innovation collaborations. Even though the generalizability within the study's scope is considered to be high, the usage of the findings can further be discussed. Creating knowledge of each success factor will increase the understanding of the dynamics of collaboration to create breakthrough innovation. However, the study is not providing information on how the factors are created and within which part of the collaboration each factor has the highest implication.

When it comes to the five main factors, all parties of a collaboration should take them in serious consideration. These are contributing to the collaboration outcome in a higher degree. Therefore, should participants initiating a breakthrough innovation collaboration focus their resources and strategies to the five main factors. Doing so, the right foundation of a breakthrough innovation collaboration will be build. With that done one could further add success factors and increase the chance of a commercialized breakthrough innovation.

8. Further research

The study has identified 17 factors within breakthrough innovation collaboration. These factors have been identified through interviews with participants in the cases and are later compared to generalizable theory. However, more research is needed to further validate the factors and to understand the dynamics within breakthrough innovation collaboration. Four areas have been identified in which it is possible to research and validate the findings further.

The first area of further research is to validate the success factors with a quantitative research methodology. One can see the identified factors as hypotheses within a quantitative research approach. The validation from such a study would find correlation between the presence of a factor and the different outcomes. With the findings from this study together with theory the causality behind successful breakthrough collaboration could be found.

Another way to continue the research from this study would be to identify how the factors are created. If one understands the importance of the five main factors and do not know how to establish them, the findings become useless. For the findings to become more practically useful studies like the explained one are important.

The third way of future research would be to investigate the generalizability of the findings within this study. Such study would include the investigation across continents and within other countries than Sweden. Depending of the outcome the generalizability would increase or stay within the scope of this study.

The fourth and final area of further research would be to verify in which situation the various factors play its role. The collaborations go through different stages and factors will play different roles in different stages. Results from studies like this would better guide the management of breakthrough innovation collaborations.

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Appendix

Questions

1. Who took the initial contact?
2. How did you find the other part?
3. How did you choose your partner?
    a. Evaluation matrix?
    b. Earlier experiences?
4. For what reason did you start to collaborate?
5. What recourses or capabilities did your partner possess that the collaboration was in need of?
6. Have you collaborated earlier?
7. Whit who did you have contact with during the collaboration?
8. What expectations did you (the organization) have of the collaboration? Did the other part share these expectations?
9. How did the collaboration contract look like?
10. How did your (the organization's) industry look at the time when the collaborated started?
    a. Profits?
    b. Market shares?
    c. Competition?
    d. Growth?
11. How did you collaborate?
12. Who within your organization was responsible for the collaboration?
13. What people from both the firm and the startup were participating in the collaboration? What roles did each have?
14. Explain the daily work of the collaboration?
    a. Work methods?
    b. Communication?
    c. Meetings?
15. How did you assure that the work made progress?
16. What authorities did the team possess?
17. How did the collaboration allocate money?
18. Were in the organizational "tree" did the collaboration take place?
19. Was the top management's vision in line with the collaboration's vision?
20. Did the collaboration face resistance?
    a. From who?
    b. What was the outcome?
    c. Could it be avoided?
21. Could you explain the culture within the collaboration?
22. Outcome:
    a. Did the innovation sell?
    b. What was new (product/market)?
    c. Were the expectations fulfilled?
23. Did both parties stand behind the outcome?