

# **Managing Discontinuous Innovation**

- exploring internal processes and value networks

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## **Abstract**

This thesis explores the challenges that discontinuous innovations create for incumbent firms. It looks both at internal and external impediments and also addresses how some of those issues can be handled.

It is well documented today that established firms get into difficulties in the face of discontinuous innovation. These challenges can be classified as either internal and related to existing resources or as external and associated with the firm's value network. While previous literature on discontinuous innovation has argued that alternative processes and structures are needed in order to develop discontinuous innovations, more knowledge is needed regarding how they can be designed. Moreover, value networks have been increasingly used as an explanation of incumbent failure. Though this perspective has increased the understanding of incumbent failure, it has so far maintained a somewhat simplistic view of the customer.

Based upon qualitative in-depth case studies from the camera industry and the personal care business, this thesis argues that internal structures and processes can have a dual structure in order to enable the development of both discontinuous and steady-state innovation. The thesis reports upon evidence of an idea management which evaluates and develops ideas in different ways depending upon their nature. Such systems can allow a higher degree of uncertainty than some of the commonly used processes. However, the presented findings remain inconclusive regarding the actual performance of these dual systems.

Additionally, the thesis also claims that the value network of an incumbent firm imposes a great indirect control of the success or failure of discontinuous innovation initiatives and that those forces are also at work inside the customer's organization. Based upon an in-depth case study of the launch of an incontinence diaper, it is argued that discontinuities inside the customer's organization create particular challenges regarding value appropriation. This aspect has not been sufficiently captured by previous literature and it is argued in this thesis that a more nuanced view of the customer needs to be maintained in order to identify and manage challenges related to discontinuous innovation. The results also indicate that those obstacles can be handled by changing the business model and by aligning incentive structures throughout the supply chain.

Based upon these findings a couple of anomalies in existing literature were identified. One such issue is how and why discontinuous innovations may prosper in high-end applications. Previous literature on discontinuous innovation and value networks has stated that those initiatives tend to be nurtured either in new markets or in low end segments. The performed case study on Hasselblad and the shift to digital imaging provides an example of the opposite. This finding calls for future research into discontinuous innovations and value networks.

## Appended papers

Sandström, C., Magnusson, M., Jörnmark, J. (2009), Exploring factors influencing incumbent's response to disruptive innovation, *Creativity and Innovation Management*, vol 18(1), pp. 8-15.

Sandström, C., Björk, J. (2009), Idea Management Systems for a Changing Innovation Landscape, accepted for publication in *Journal of International Product Development*.

Sandström, C., Osborne, R. (2008), Changing the business model to overcome innovation adoption barriers – the case of new value distribution in the customer's organization, presented at the 9<sup>th</sup> CINet conference in Valencia, 1-4 September, 2008. To be submitted to a scientific journal.

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# 1. Introduction

Few people today dispute that innovation lies in the heart of economic development. Ever since Schumpeter wrote his book *The theory of Economic Development* (1912, 1934), scholars have emphasized the importance of innovation as a driver of structural change and economic growth. Schumpeter (1942) argued that economic growth in a capitalist regime happens through *creative destruction*, a process where the old is continuously being destroyed and thereby freeing resources for the new.

It is well documented that this process of creative destruction has often created insurmountable problems for established firms (Gilfillan, 1935; Foster, 1986). This phenomenon is almost as old as capitalism itself and there are many historical examples of how established firms encounter problems under conditions of discontinuous change. None of the typewriter manufacturers survived the shift to personal computers, the shift from sailing ships to steam engines put incumbent firms in great trouble and all companies operating in the ice industry went out of business with the rise of fridges (Utterback, 1994). The shift from vacuum tube radios to transistor radios implied great difficulties for established firms like RCA and created an innovative opportunity for entrants like Sony (Henderson and Clark, 1990). When minimill technology for steel production emerged in Northern Italy in the 1960s the large integrated steel mill manufacturers in France, Germany and Belgium encountered severe difficulties (Jörnmark, 1993).

While this phenomenon is hardly new, the collapse of large, successful companies due to discontinuous innovation has often caused great surprise, both in the press and among investors. More recent examples of this include the shift from mechanical to electronic calculators in the late 1960s and early 1970s. In Sweden, Facit went from record profits to facing bankruptcy within only a few years (Pettersson, 2003). However, Facit was not alone to face these problems. Former competitors such as Olivetti, Olympia, Friden, Adler, Marchant, Monroe and Remington all collapsed in this shift. In the camera industry many film manufacturers such as Agfa, Ilford, Konica and Polaroid have declared insolvency. Other firms such as Contax, Hasselblad, Mamiya and Bronica have either gone out of business or been through difficult times.

Needless to say, there are many more examples of this pattern. Though technological discontinuities have had a great impact on changes in industrial leadership, discontinuities in general seem to cause problems for incumbents. Changes in the regulatory environment or the emergence of new business models have also toppled former industry leaders (Chesbrough 2003; Markides 2006).

Many scholars have addressed what is sometimes referred to as the incumbent's curse (e.g. Cooper and Schendel, 1976; Utterback, 1994). Tushman and Anderson (1986) argued that discontinuities which render existing competences obsolete tend to overthrow established firms. Henderson and Clark (1990) pointed at organizational impediments in order to explain changes in industrial leadership.

Over time, the literature on discontinuous innovation has shifted from primarily looking inside the firm towards exploring the influence of its surrounding environment. Christensen (1997) drew upon the concept of value networks in order to explain why established firms encounter problems under conditions of discontinuous change. He argued that those innovations which do not fit into an incumbent's value network will be developed by someone else. Thus, established firms are "held captive" by their most profitable customers, belatedly enter the emerging technology and therefore lose market shares to entrant firms who have prospered in a new business context. The concept of value networks shed some new light on why established firms have such difficulties to develop discontinuous innovations.

Existing literature on incumbent failure can on an overall level be classified as dealing with either internal or external factors and there has been a trend over time towards looking outside the boundaries of the firm. While plenty of research has been conducted regarding incumbent failure, our knowledge about how and why established encounter such difficulties under conditions of discontinuous change is still incomplete. Furthermore, additional knowledge is needed regarding how established can create and lead those shifts proactively. The purpose of this thesis is to increase our understanding of the challenges related to discontinuous innovation, by looking at internal and external aspects of this dilemma. In doing so, the investigation also aims to create new knowledge that is useful for practitioners.

### ***1.1 Purpose***

This investigation aims to explore both internal and external impediments to discontinuous innovation, as well as to look at how some of those impediments can be overcome.

### ***1.2 Delimitations***

The purpose as stated above is relatively broad, but there are several aspects of discontinuous innovation that are not addressed within the scope of this thesis. Concerning internal factors related to incumbent failure, the present investigation does not address such issues as organizational design. Moreover, the thesis only looks at impediments in the value network that are related to the interaction between the innovating firm and its customers.

### ***1.3 Structure of the thesis***

The rest of this document is organized as follows. Section two contains a theoretical exposition and the research questions are derived in the following chapter. After the methodology section and the presentation of the business context, brief summaries of the appended papers are given. Then follows a discussion of the conclusions thus far, as well

as some potential ideas for future studies and how the work carried out so far can be continued up to a PhD level.

## **1.4 Definitions of used terms**

The issue of technological discontinuities has received an increased interest in recent years and this has to some extent resulted in a confusion regarding the terminology. Frequently, such terms as discontinuous, disruptive and radical are used interchangeably. For the sake of clarity, definitions of different terms that are important throughout this thesis are outlined briefly below.

A *discontinuous innovation* is here defined as an innovation which creates a discrete and momentaneous shift for the incumbent firm or its value network. Such a shift can be imposed by new technologies or business models. A technological discontinuity is regarded as “a major technological change resulting in the creation of a substitute technology for a particular industry’s products or processes” (Hamilton and Singh, 1992). *Steady-state innovations* will throughout this thesis be thought of as the opposite to discontinuous innovations. The emergence and eventual domination of digital imaging as opposed to analogue photography can serve as an illustrative example of a discontinuous innovation since it changed the competence base in the industry and also resulted in major changes in the value network. The introduction of color film in the mid 20<sup>th</sup> century can be regarded as a steady-state innovation. While it brought a significantly enhanced performance to the market, it did so without causing any major shift in the competence base or in the value network.

A *disruptive innovation* is regarded as a technology or business model which initially underperforms along performance dimensions that mainstream customers have historically valued, while at the same time bringing new performance attributes to the market. It is usually cheaper and simpler than existing alternatives. Hence, disruptive innovations will be considered as an important subset of discontinuous innovation throughout this thesis. *Sustaining innovations* will thus be considered as the opposite (Christensen and Raynor, 2003). While the work on disruptive innovation has contributed largely to our understanding of discontinuous innovation and incumbent failure, this terminology will not be used throughout this thesis. The main reason for this is that these notions are a bit too vague. Towards the end of this thesis a more detailed critical discussion of this terminology will be provided.

A *radical innovation* is defined as an innovation which creates a significantly enhanced performance. Such an innovation does not necessarily have to be discontinuous or disruptive, it might create a much greater performance without implying any discontinuities. *Incremental innovation* is regarded as the opposite of radical innovation.

The *business model* is regarded as a construct which describes 1) the value proposition, 2) who the customer is, 3) the value created for the customer and 4) how this value is appropriated. Hence, a *business model innovation* can be thought of as a change along any of those dimensions without necessarily launching a new product (Markides, 2006).

The *value network* is defined as the environment within which a firm responds to customers' needs, solves problems and operates its daily business (Christensen, 1997).

A *supply chain* is defined as the system of organizations, people, technology, activities, information and resources involved in moving a product or service from a supplier to a customer.

## **2. Theoretical exposition**

It is well established today that established firms may encounter difficulties in the face of discontinuous innovation (Tushman and Anderson, 1986, Cooper and Schendel, 1974; Utterback, 1994). Incumbent companies are usually good at innovation under steady, stable circumstances. But when technologies shift or new business models are introduced they can all of a sudden become vulnerable (Chesbrough, 2003). Frequently, incumbent firms do not manage these changes; they lose market shares and the successful firms are found among the entrants (Utterback and Kim, 1986; Christensen and Rosenbloom, 1994).

There are many examples of how incumbent firms run into problems in the face of a technological discontinuity. In the early automotive industry, the closed body made of steel substituted the open wooden bodies and this led to a substantial change in the nature of competition in the industry. Ford lost market shares to Chevrolet and the position of small firms was significantly weakened (Abernathy and Clark, 1985). In the camera industry, incumbent firms like Kodak (Macher and Richman, 2004) and Polaroid (Tripsas and Gavetti, 2000) have struggled to manage the transition from analogue to digital technology. Facit, a manufacturer of mechanical calculators, typewriters and office furnishings suddenly encountered major difficulties when electronic calculators changed the competitive landscape of the industry.

Many scholars have sought to understand what is sometimes referred to as "the incumbent's curse" (Foster, 1986). These explanations and their respective managerial solutions can be classified as either related to the interior of the company or its external environment. The two subsections below will review existing literature in those respective areas.

### **2.1 Internal explanations of incumbent failure**

Abernathy (1978) suggested that gains in productivity hampered a firm's flexibility and its ability to innovate. He argued that in order to remain competitive over time a firm needs to be efficient and innovative simultaneously (Abernathy, 1978: 173; Hayes & Abernathy, 1980). Foster (1986) claimed that one key challenge is to jump from one S-curve to another one and that timing thus becomes a key determinant of success. Answers to this puzzle have often been sought by looking inside the firm (e.g. Cooper and

Schendel 1976). For instance, Tushman and Anderson (1986) wrote about competence-enhancing and competence-destroying innovations. They argued that innovations which require the destruction of a firm's existing competencies are very difficult to manage, because established firms are bound by traditions, sunk costs and internal political constraints. Henderson and Clark (1990) nuanced those arguments by introducing the concept of architectural and component level innovation. Through their study of the photolithographic industry, it was found that incumbents were good at handling innovation on a component level, but often failed to recognize and respond to architectural innovations, i.e. changes in the linkages between different components in a given product. The authors pointed out inertia on the organizational level as the main reason for this.

Leonard-Barton (1992) and Dougherty (1995) provided similar arguments, suggesting that a firm in fact has a set of core competencies which may prevent it from developing certain innovations. Therefore managers face a paradox when developing new products and processes: they need to take advantage of some core capabilities without being hampered by the core rigidities. One reason for this dilemma is that capabilities are associated with certain values, which are difficult to change. Prahalad and Bettis (1986) argue that as managers work together they tend to develop a common set of beliefs, a 'dominant logic' based upon their history. In line with this, Adams et al. (1998) used the term inertia when they described how people within an organization tend to proceed as they always have. Hedberg (1981) claimed that an organization must unlearn before it can learn new routines.

### **2.1.1 The increased formalization of innovation work**

While explanations of incumbent failure have pointed at several rigidities inside the incumbent firm related to established competencies, processes and routines, an increased formalization of innovation work has also taken place over the past decades.

The introduction of such ideas as concurrent engineering, simultaneous engineering and design for manufacturability emerged in order to speed up the process of successfully bringing new products to the market (Gerwin, 1993). This approach to New Product Development (NPD) had a significant positive impact on both the speed of development and the quality of the new products. One such structure that is partly based upon the idea of concurrent engineering is the stage gate system (Cooper, 1990). The main purpose with such a model is to divide the innovation process into a predetermined set of stages which contain a group of structured and often parallel activities. The gates work as checkpoints where a project has to meet certain criteria before it can move into the next stage. Though stage gate systems vary in terms of number of gates, the overall function is to bring structure and efficiency into a process which is highly uncertain (Veryzer, 1998). Involving both manufacturing and suppliers early in the process implied that products could be brought to the market faster. Moreover, a stage gate system normally allocates attention and resources to activities that are often deficient in the innovation process. Stage gate models are usually market oriented and keen to obtain marketing input. They have also proven to reduce uncertainty a lot as well as making sure that projects are killed

at the right time. According to Cooper (1994), many leading firms have developed a systematic stage-gate process aiming at improving the effectiveness and efficiency of the product development cycle.

### **2.1.2 Potential drawbacks of the increased formalization**

Though the abovementioned structures and processes have contributed to an increased efficiency and a lower failure rate in new product development, several researchers have pointed out the shortcomings of those systems, particularly for discontinuous innovation. Aitsahlia et al (1995) apply a rudimentary math model to show that under conditions of high uncertainty concurrent engineering may be worse than serial engineering. They conclude that the parallel approach to new product development may not be appropriate for generating discontinuous innovations. These findings are in line with the ones presented by McDermott and Handfield (1996). In a study of eight successful discontinuous innovations, Veryzer (1998) concluded that the processes that were used here differed significantly from the normal stage gate system. Conventional analytical methods for understanding customer needs may in fact be inaccurate for more significant innovations (Lynn et al, 1996; Song and Montoya-Weiss 1998). For discontinuous innovations it is often not clear who the customers are and what they actually need. Furthermore, it is not obvious that it is good to involve customers early in the development of discontinuous innovations (Macdonald, 1995; Christensen, 1997). In line with this, Handfield (1994) stated that an early involvement of marketing and manufacturing often makes the final product more similar to what has been previously produced. Involving users that are not able to look beyond today's products and services may therefore in fact hamper discontinuous innovation.

Hence, the paradox related to core capabilities and core rigidities as described by Leonard Barton (1992) can be seen in the current discourse on structures and processes for innovation. While the increased formalization of innovation work seems to have reduced the failure rate and increased the efficiency, it may at the same time have hampered firm's abilities to generate discontinuous innovations.

Some researchers have explored how structures and processes can be designed in order to overcome the problems that are associated with having a highly structured approach to innovation. For instance, Veryzer (1998) states that these criteria need to allow for a more exploratory approach, should be less customer driven and more experimental rather than analytical. Moreover, he concludes that prototypes have been developed at an earlier point than in steady-state projects and that this task preceded many things such as market research, financial analysis and opportunity development. In line with this, Slater and Mohr (2006) state that potential customers should be looked for rather than just the current ones.

Employing standard criteria may lead to what Chesbrough (2004) calls false negatives. i.e. ideas or initiatives that are not killed because they are undesirable, but for other reasons. Discontinuous innovations are often difficult to develop because they may be inconsistent with a firm's current resources and capabilities. Additionally, an innovation initiative may be rejected because it is incompatible with what a firm's current customer

base is demanding. Thus, there is an apparent risk that the processes and structures for discontinuous innovation fail to avoid the trap of false negatives even though they are designed to support the evaluation of breakthrough or “radical” initiatives. This calls for evaluation criteria for discontinuous innovation which are different from those employed in the models described above.

Rice et al (1998) investigate what evaluation criteria incumbent firms employ when selecting discontinuous innovation projects. They found that very few companies in fact have a deliberate process or strategy for evaluating these projects differently. Either the evaluation is conducted according to normal procedures or it is done on an ad hoc basis. In those cases when the evaluation was different they note that the criteria employed were much more open, focusing on the potential of the new business rather than trying to give detailed estimates. In their field study it was found that 86% of the R&D managers which were interviewed thought that the evaluation process should be different from the one employed for steady-state innovation. Yet at the same time, the study indicated that very few companies actually have a deliberate process for evaluating discontinuous initiatives differently. Screening is either undertaken as part of the normal project evaluation process or is treated in an ad hoc fashion. As the project moves downstream the evaluation models become increasingly conventional. The fact that most R&D managers think that a different process should be employed yet don't have one suggests that research into what such processes can look like would generate knowledge which is of both theoretical and practical value.

Summing this section up, while previous literature has argued that incumbent failure can be largely attributed to internal rigidities related to competences and organizational structures, the internal processes for innovation have become increasingly formalized over time. Much scholarly work has pointed at this problem and claimed that discontinuous innovations need to be handled in a fundamentally different way, but more needs to be known regarding what such processes and structures should actually look like.

## ***2.2 Discontinuous innovation and the external environment***

Christensen (1997) rejected previous explanations of incumbent failure which had primarily been looking inside the firm. Instead, he drew upon resource dependence theory (Pfeffer and Salancik, 1978) the concept of value networks (Christensen and Rosenbloom, 1995) in order to explain incumbent failure. This theory suggests that a firm's freedom of action is in fact controlled by actors outside the boundaries of the company, e.g. customers and investors. Since the customers and owners are the key stakeholders that provide the firm with resources, they also impose a great indirect control on what decisions are taken and how resources are allocated.

Consequently, a key determinant of the probability of success for an innovation is the extent that it addresses the needs of actors in an incumbent firm's current value network. From this theoretical base, Christensen explains the pattern of incumbent failure by making a distinction between sustaining and disrupting technologies. Sustaining technologies have in common that they improve the performance of established products

along the dimensions that existing customers value. Disruptive technologies on the other hand, initially underperform along these dimensions. Typically, they are simpler and cheaper than the sustaining technology. The lower traditional performance and the higher ancillary performance create a large market uncertainty around the disruptive innovation. At the same time the established firm finds it irrational to abandon its current, profitable customers in order to aim for a new market and a new technology. As the performance of the disruptive innovation increases it begins to attract customers from the sustaining technology and eventually displaces the former technology.

Through his studies of the disk drive industry among others, Christensen showed that incumbents usually win sustaining battles whereas entrants succeed in disruptive battles. Hence, incumbent firms are “held captive” by their investors and their most important customers and therefore resources are not allocated to initiatives that are initially less profitable. Christensen referred to this pattern as the innovator’s dilemma, arguing that disruptive innovations present a particular challenge for incumbents since they require managerial skills that are different from the ones needed to succeed in sustaining battles.

Christensen and Raynor (2003) further developed the theory about disruptive innovation by drawing upon value networks. One important enhancement of this framework is the distinction between low-end and new market disruptions. Low-end disruptive innovations evolve in the lower segments of the market, typically by having a business model which enables the firm to offer cheaper products with a performance that is initially inferior. Steel minimills and discount retailing are both examples of this. New-market disruptive innovations prosper by approaching customers that have not been addressed previously. The personal computer and the first portable transistor radios can serve as illustrative examples of new market disruptive innovations.

While the concept of value networks and the work by Christensen has contributed to an increased understanding of the challenges related to discontinuities, there are still many questions that remain unanswered. Some of the recent work on disruptive innovation has focused increasingly on the role of the market and the customer. Danneels (2004) underlined the importance of developing a “customer competence” in order to succeed with disruptive innovation. Adner (2002) pointed out that the structure of demand needs to be addressed in order to clarify the nature and effect of disruptive innovations. Moreover, Adner used the notion of thresholds, defined as critical performance levels that must be met. The functional threshold of a product is the minimum performance that the customer can accept whereas the net utility threshold also takes price into consideration. Slater and Mohr (2006) identified parallels between the work by Christensen (1997) and Moore’s book *Crossing the chasm* (2002) and underlined the importance of finding a nursing market for disruptive innovation. Several other scholars have developed Christensen’s theories further by looking into various aspects of the market and the customer, for instance how the diffusion of disruptive innovation can be forecasted (Linton, 2002), differentiating market strategies (Kassiech et al, 2002) and issues related to commercialization (Walsh et al, 2002).

## 2.2.1 An over-simplified view of the customer

Though the above mentioned literature has improved our understanding of the challenges related to discontinuous innovation it has with few exceptions maintained a somewhat simplified view of the customer. Previous research has primarily regarded customers as distinct entities in the value network, with one specific interest, rather than as organizations which comprise several actors with different utility functions.

Afuah and Bahram (1995) argued that a firm must assess whether the innovation is discontinuous for any of the actors throughout the supply chain or not. They introduce a model for this which is called the hypercube of innovation and argue that many innovation studies tend to neglect the effects on the customer's capabilities and assets. In line with this, other researchers have also claimed that an innovation needs to be understood in terms of newness for every actor in the supply chain that is affected by it (Assink, 2006; Doolin, 2007). Hence, one way forward could possibly be to look at the effects a discontinuous innovation has *inside* the customer's organization. Such an approach would differ from previous ways of addressing this issue. Given that this stream of literature has shifted over time from primarily looking inside the firm towards addressing the value network it can be regarded as a natural step to now look inside the customer's organization in order to understand what happens in those shifts.

This approach to innovation adoption is different from those models which regard the process as a linear set of events (e.g. Mintzberg et al, 1976; Simon, 1977). The model developed by Rogers (1995) assumes that customer preferences follow a normal distribution and that adoption happens in an epidemic way based upon the properties of the innovation. While the diffusion process has been understood in a better way by applying this perspective (e.g. Moore, 1991), it is too simplistic to explain the specific pattern of adoption. In line with this, Seligman (2006) argues that the adopter is often treated as a black box and that it needs to be understood in a better way. An over-simplistic view of the customer may conceal some important challenges, particularly in business to business settings. Under these circumstances, adoption often involves several actors and interests inside both organizations. A large firm can be considered a political economy where units differ in terms of power and interest (Benson, 1971). In such organizations, discontinuous innovations may create value on various levels. Hence, the adoption process is often much more complex and several challenges related to this need to be addressed. This exposition of existing literature suggests that looking at value networks has significantly improved the understanding of incumbent failure, but that this literature has maintained a somewhat simplistic view of the customer and this calls for further research into the role of value networks.

## 3. Research questions

This licentiate level document addresses some of the challenges related to managing discontinuous innovation. The purpose of this thesis is to explore internal and external impediments to discontinuous innovation. Additionally, the thesis seeks to understand

how established firms can handle those issues. Thus, the research questions can be formulated as follows:

1. What internal and external impediments to discontinuous innovation can be identified in established firms? (RQ1)
2. What measures can incumbent firms take in order to overcome different types of barriers to discontinuous innovations? (RQ2)

These questions are primarily answered in the attached articles and conclusive remarks are provided in section 7.

## **4. Methodology**

This chapter provides a description of the research design and methods that have been used in order to answer the aforementioned questions.

### ***4.1 Choice of method***

The thesis is based upon several qualitative in-depth case studies. This method is usually preferable when addressing a phenomenon that is insufficiently understood and when the research aims to give detailed illustrations of certain events.

As the research performed here is of an exploratory character, seeking to understand specific internal and external challenges related to discontinuous innovation, this method is chosen since it enables the kind of nuanced documentations that are required in order to address the abovementioned research questions.

It is often argued that case studies impose constraints upon the generalisability of the findings (Yin, 1994). This potential drawback should not be regarded as a major shortcoming of the conducted research since this thesis does not attempt to provide an exhaustive set of answers. The purpose is rather to create a more nuanced understanding of the discontinuous innovation challenge and this would not be possible in the same way with a quantitative method that drew upon a very large set of data. Moreover, forthcoming studies will draw upon a broader set of cases in order to give further illustration of these issues and thereby increase the generalisability to some extent.

## 4.2 Data collection and analysis

The research questions explicated above have been addressed by conducting three empirical studies (see table 1). In this section, those studies will be described and justified.

Study	Unit of study	Methods for data collecton	Corresponding paper
Surviving Discontinuous Innovation	Firm level	Interviews, access to internal documents, discussions	Paper 1
Structures and processes for discontinuous innovation	Idea management system	Interviews, discussions, data from the system	Paper 2
Inhibitors and triggers of discontinuous innovation	Discontinuous product innovations.	Interviews, discussions	Paper 3

*Table 1 gives an overview of how the studies in this thesis have been conducted.*

### 4.2.1 Study 1 - Surviving Discontinuous Innovation

The first study that was performed within the scope of this PhD research concerned the problems incumbent firms face under conditions of discontinuous technological change. The main purpose with this study was to gain practical and detailed insight into the challenges which are related to this kind of shifts.

In order to explore this further a camera manufacturer named Hasselblad was targeted. The firm was approached since it had gone through a technological shift just recently and encountered significant difficulties when doing so. The change from analogue to digital imaging implied that the company went from stable profits to collapsing revenues within only a couple of years. While many articles had been written in the popular press about how Hasselblad had ‘overslept’ the digital revolution, no one had really performed a detailed investigation of what actually happened to the company. It turned out that the firm had explored digital imaging in various applications since the late 1970s. Hence, in order to fully understand the problems that were encountered, a historical study of the company was deemed to be the right method. By doing so, insights into the challenges that technological discontinuities imply could be obtained.

Though no formal relationship with Hasselblad has been maintained, extensive amounts of information have been accessed. After having performed a couple of open ended interviews with people who have been in top management positions at Hasselblad over the years, plenty of internal documents such as reports, strategy documents and mail conversations were reviewed. In addition to this, all minutes from the board meetings

during the period 1989–94 were accessed. This helped to ensure the accuracy of the information obtained from the conducted interviews. Managers of R&D have also been accessed in order to understand the specific challenges they faced when shifting from analogue to digital imaging. In total, more than 50 hours of interviews were performed and recorded with 11 people. Follow-up interviews and discussions also took place in order to confirm that the gathered information had been interpreted correctly. These discussions and follow-up interviews totaled to about 50 hours. All field research interviews began with general open-ended questions, asking managers how they perceived the challenges posed by the disruptive technology and how they tried to deal with them. The same questions were asked to at least two senior managers from one era and compared to the internal documents that had been accessed. Paper 1 and the case description provided in this article emerged once similarities had been observed between the different sources of data.

#### **4.2.2 Study 2 - Structures and process for discontinuous innovation**

This study has been performed within a research project called the Discontinuous Innovation Project (DIP). Within the scope of this work, empirical data has been gathered from approximately 10 Swedish incumbent firms. Initially, the study was quite broad and exploratory in order to look for interesting empirical observations that could be further investigated. The main purpose has been to explore how established firms are working with challenges related to discontinuous innovation. After having performed open-ended, semi structured interviews at many of those firms, a couple of key issues and challenges were identified and those were further researched. Those challenges were related to how firms can overcome internal obstacles to discontinuous innovation by re-designing existing processes and structures.

The studied firm was targeted since it had a long experience of working with these issues and had decided to re-structure some elements of its innovation process in order to handle both steady-state and discontinuous innovation initiatives. Hence, the firm and its idea management system offered an interesting opportunity to investigate how incumbent firms work with discontinuous innovation in a proactive way and develop processes for doing so.

The close relationship with the studied company enabled the kind of detailed information that was needed in order to fully comprehend how the system works. Both R&D managers and contributors to the idea management system were accessible for interviews. Follow-up interviews and discussions were also performed in order to ensure an accurate interpretation of the gathered information and discussions regarding those findings have taken place continuously. In total, about 30 hours of interviews were performed and 20 hours of discussions took place.

These data have been supplemented with statistics from the idea database. Here, all ideas within the company are stored and key information such as idea descriptions and assessments of the ideas can be found. The case description emerged by combining these different sources of data and by asking key employees at the company to proofread and

validate this text. Hence, the case emerged after having ‘triangulated’ (Eisenhardt, 1989) the results from these different sources.

### **4.2.3 Study 3 – Inhibitors and triggers of discontinuous innovation**

The third study was initiated after an innovation audit had been performed at the case company. One major outcome of this audit was that the company needed to better understand how discontinuous innovations can be nurtured and encouraged. In order to do so, a 5 month research project was initiated which aimed to understand how discontinuous innovations had been both rejected and developed in the past. As the research questions formulated above concern those issues, the project suited the overall purpose of this thesis and the author therefore decided to join. Moreover, having studied both a company that had undergone a technological discontinuity and systems and processes for discontinuous innovation, there was a need to look at these challenges on a more detailed level.

This project was performed together with a master thesis student. In total, the evolution and fate of 8 discontinuous innovation projects were documented through semi structured interviews with both current and former employees at the company. All interviews were recorded, transcribed and listened to afterwards. This work has been documented in Osborne (2008) and should be regarded as important background information about innovation work at the studied company.

This case concerned the introduction of a product innovation that despite its superiority along several performance dimensions initially failed in the marketplace. It was identified as particularly interesting in relation to the other ones since value networks seemed to play an important role in determining the success or failure of this product. In addition to this, the case provided an interesting opportunity to understand how challenges related to the value network can be managed since the studied product started off as a commercial failure but eventually became a success after a couple of measures had been taken.

When this case was identified as interesting, more interviews were performed with people who had been involved in various aspects of the development. As the challenges of particular interest were related to the commercialization aspects, people in charge of those issues were specifically targeted. The case description that emerged from this research was later on read and validated by the person who had been in charge of the main business model changes that this product had implied. After the termination of the project, a final presentation was given to the company where the main findings and conclusions were communicated. During this session, the general interpretation of the collected data could be validated one more time.

Hence, an inductive approach has been employed in this research project. It started as a general exploration of inhibitors and triggers of discontinuous innovation, several different cases were identified and one seemed to be of particular interest since it had discontinuous effects in the value network.

### **4.3 Research context**

As was stated above, no formal relationship has been maintained with Hasselblad. However, the second and third studies have been conducted at a company that the division the author belongs to has an institutionalized collaboration with. This context therefore merits some further description.

In 2007, an innovation audit was performed by the Center for Business Innovation at this firm. Within the scope of this audit, more than 30 interviews were performed by the author and by close colleagues. During the audit, interviews were conducted with top and middle management. The interviews were semi-structured, asking the respondents about such issues as the company's current processes, its organization, its idea management system and innovation strategy. This information along with the continuous relationship with the company should be regarded as vital contextual knowledge that later on contributed to identifying areas where further research could be performed. The third study was initiated after the audit had been performed since the company needed to obtain more knowledge in this particular area.

The relationship has enabled extensive access to information that it would have been difficult to access otherwise. Throughout those two studies, both databases and key employees have been available. Moreover, working together with a company over a longer period of time creates an important contextual understanding of present challenges and ways of working.

### **4.4 Validity and reliability**

When assessing the employed methodologies, reliability and validity can be regarded as two important issues. Reliability can be defined as the possibility to replicate the study. Given that all three case studies that have been performed are based upon historical events which have been described through both accessing key interviewees and internal documents, it should be possible to replicate these studies. Furthermore, since all interviews have been recorded and transcribed and in many cases been performed by more than one person, this source can be considered as reliable. In addition to this, the vast source of internal documents that have been accessed further increased the reliability of the study.

The collaborative approach often makes it difficult to replicate a study since the researchers are actively interfering with the reality they are studying. However, this should not be regarded as a major concern for the studies above. The main reason for this is that while some of the research has created recommendations that have in some cases been enacted by the company, this was not the case for the parts of the studies that the papers below and their conclusions were based upon. These papers are based upon cases that the author has not been influencing during the course of these studies.

Validity can be thought of as either internal or external. Internal validity refers to how well the collected data matches the reality that it seeks to represent whereas external

validity concerns to what extent those results can be generalized. In the abovementioned studies, the internal validity is enhanced by using several different sources of data such as interviews and access to a vast amount of internal documents. Since the case studies emerged from similarities in those different sources and were later confirmed by conducting follow-up interviews, the internal validity should not be regarded as a major drawback in this work.

The external validity defined as the possibility to draw general conclusions about the surrounding reality is often quite weak when conducting single case studies. However, as the work presented here is of an exploratory character, describing and seeking to understand internal and external challenges to discontinuous innovation, this method is still deemed to be the most suitable one.

## **5. Business context**

The work carried out thus far within the scope of this PhD research has been performed within two different business settings. The first study is based upon the discontinuous shift from film-based photography to digital imaging and how Hasselblad, an incumbent firm in the high-end segment, handled this change. The other two studies have been performed at a company that manufactures incontinence products, diapers and feminine pads. A brief background to these different contexts is given below. These descriptions have primarily emerged from the data that has been collected within the scope of the abovementioned studies.

### ***5.1 The camera industry***

The camera industry remained mature and stable over most of the 20<sup>th</sup> century. The most significant change would be that some of the German companies such as Leica and Rollei encountered major problems with the rise of the Japanese camera industry. In addition to this, Kodak's hegemony in the film business was seriously threatened from the 1970s and on, most notably by Fuji but also by Konica. However, the industry remained technologically mature up until the rise of digital imaging. The first camera which captured images on a Charged Coupled Device (CCD) was invented by a Kodak engineer in 1975 and had a resolution of 0,01 megapixels. Various attempts at filmless photography such as the Sony Mavica in 1981 and the Canon RC-250 Xapshot from 1988 were launched in the 1980s, without any commercial success due to the poor image quality and the high price.

During the early 1990s, digital imaging started to prosper in the high-end segment of the industry where companies like Hasselblad were operating. Firms such as Leaf Systems, Phase One, Jenoptik and Imacon were founded in order to develop digital backs which could be attached to medium format cameras. Those digital backs were expensive and still offered a lower image quality than film. In the lower segments, the dominant design for digital cameras emerged in 1995 when Casio launched the QV-10, the first camera to contain an LCD screen. This concept turned out to be appealing since images could be

viewed instantly after the photo had been taken. From this point and on, digital cameras were subject to rapid incremental improvements and then started to take market shares from the analogue cameras.

Later on, the solution with a digital back attached to a medium format camera lost market shares to the high end Digital Single Lens Reflex (DSLR) cameras. While those products had a lower image quality in terms of pixels, the performance was still 'good enough' along this dimension. Since DSLR cameras were lighter and cheaper they offered a better total solution which implied that medium format companies like Hasselblad, Mamiya, Contax and Bronica lost ground in such segments as portrait and wedding photography, mainly to Canon and Nikon which attacked 'from below' with advanced DSLR cameras.

With the rise of digital imaging, the camera industry has been restructured and many incumbent firms have lost market shares or gone out of business. Film manufacturers such as Kodak, Polaroid, Agfa, Ilford and Fujifilm have encountered major difficulties. In addition to this, the industry has become increasingly competitive as consumer electronics firms such as Casio, Samsung, HP and Sony have entered the industry. In recent years, sales of simpler DSLR cameras have grown while compact cameras have decreased, partly due to the rise of mobile cameras.

## **5.2 Personal Care**

The company which has been researched within the scope of the other two studies can be regarded as a conglomerate, which has one division operating in the personal care business. Personal care is here defined as the industry which comprises incontinence products, diapers and feminine pads. These products have in common that they are mainly based upon absorption technology. The industry can be regarded as technologically mature and well consolidated. There are a couple of large companies such as Kimberley-Clark and Proctor & Gamble which dominate the industry on a global level. The studied company encountered major problems in the diaper business when P&G introduced super absorbents in their products back in the 1980s. Ever since, a follower strategy has been enacted for feminine pads and diapers.

While the industry can be considered mature, it is still quite R&D intensive and patents are considered a vital source of competitive advantage. This is one of the main reasons why the studied company created an idea management system back in 1995. The patent department was becoming increasingly underfunded since the scanning of all ideas was very time consuming. The idea management system was created in order to take care of this increased inflow of applications. After having been in place for some years, the system started to function as a storage place for different innovation ideas. However, the main purpose was still to generate ideas which could lead to patents and therefore business ideas and discontinuous innovation ideas were not welcomed. As the company became increasingly interested in these areas they decided to re-design the system in order to stimulate, evaluate and develop these forms of ideas as well. The second paper appended paper describes how this idea management system was designed.

Ever since the company pioneered incontinence diapers back in the 1970s it has maintained a strong position on this market. The studied firm is today the global leader and has undergone considerable expansion over the last decades. New products have been launched at a high pace, for instance in the area of light incontinence. However, as the performance of these products has increased over time in terms of absorption capacity, the company has increasingly sought to focus on other performance attributes. This was one of the main reasons why the incontinence diaper described in paper 3 was developed and launched. As can be seen in this study, several problems were encountered in the commercialization phase, despite the fact that this product innovation created an increased value for the customer.

## **6. Summary of the appended papers**

This thesis is based upon three studies, which have resulted in three corresponding papers. The first paper concerns the camera industry and how the discontinuous rise of digital imaging created problems for an incumbent firm and the following two are based upon studies conducted at a Swedish company that manufactures diapers, feminine pads and incontinence products. This section contains summaries of the appended articles, the full versions of each paper can be found in section 9.

### **6.1 Paper 1**

#### ***Exploring factors influencing an incumbent's response to disruptive innovation***

This was the first paper written within the scope of this PhD work and to some extent it has functioned as an introduction and an exploratory piece. The paper is based upon an in-depth case study of how a manufacturer of professional cameras handled the disruptive shift to digital imaging.

While plenty of research has been performed into the area of incumbent failure under conditions of discontinuous technological change, established firms have often been treated as one homogeneous group vis-à-vis entrants. The paper discusses different factors that influence an incumbent's response to the discontinuous threat and concludes that Hasselblad's limited resources combined with its high-end profile affected how the firm managed the transition from analogue to digital photography. In addition to this, it illustrates how digital imaging emerged in Hasselblad's high-end segment in the early 1990s, despite its inferior image quality at this point.

Being a small high-end niche player made it difficult to allow experimentation with digital imaging in the main business since the available resources were severely limited and this initially inferior technology could harm the brand image. Instead, Hasselblad pursued collaborations and eventually launched a hybrid camera, which was compatible both with film and digital backs but did not result in the expected success. Being close to

bankruptcy, the needed digital resources were acquired and the company eventually survived the shift. In conclusion, this paper argues that the managerial challenges and solutions to surviving discontinuous innovation depend upon the particular characteristics of incumbents and that this heterogeneity has not been sufficiently captured by previous literature. It also suggests that medium sized, top segment firms can survive disruptive innovation through collaborations and mergers.

## **6.2 Paper 2**

### ***Idea management systems for a changing innovation landscape***

Historically, idea management systems have been primarily related to Continuous Improvements (CI). With the rise of information technology, those systems became increasingly sophisticated and have in many cases started to function as a structured approach to the Fuzzy Front End of the innovation process. However, the literature review above suggests that firms are increasingly looking for ways to handle both steady-state and discontinuous innovations at the same time. This is not something that has been mirrored thus far in literature concerning idea management systems.

This article explores what an idea management system that handles different forms of innovation ideas may look like. It does so through an in-depth case study of an idea management system which was re-designed in order to take care of both steady-state and discontinuous innovation ideas.

The studied idea management system differs from previous descriptions in the sense that it is dual, i.e. aiming to generate, evaluate and select both steady-state and discontinuous innovation ideas and employing different processes and criteria for this within the same system. Since these properties of idea management systems have not been covered by past literature, this paper calls for an extension of existing typologies into including what is here referred to as dual idea management systems. In conclusion, this paper provides an illustration of how existing innovation processes can be re-designed in order to cope with both steady-state and discontinuous innovations.

## **6.3 Paper 3**

### ***Overcoming innovation adoption barriers***

This paper aims to understand what barriers to discontinuous innovation adoption that may occur in the value network, as well as trying to address how these obstacles can be handled. While previous literature on discontinuous innovation and value networks has contributed to an increased understanding of incumbent failure, it has maintained a somewhat simplistic view of the customer. This article seeks to explore the role of the value network from a more nuanced point of view. It is based upon an in-depth case study of a product innovation that was partly based upon new technology, brought new performance dimensions to the market and created an increased value for the customer.

Nevertheless, the product was still initially a commercial failure. The main reason for this was that the new economic value was distributed over many different actors within the customer's organization. The individual purchaser was not assigned to take the total cost of incontinence care into consideration. Since the product reduced the total cost significantly but was more expensive, a discrepancy occurred between where the value was created and how it was appropriated.

Eventually this innovation adoption barrier could be overcome through undertaking a couple of measures. The firm extended its value proposition and focused on the total cost for the customer's organization rather than the product costs. One major step in this direction was the launch of a service organization which took a systemic approach to the customer's needs, while at the same time actively educating the market. Moreover, the incentive structure of the sales organization was changed in order to encourage the sales of the new product.

The case study illustrates the importance of exploring discontinuities inside the customer's organization. Thus, unlike previous research on discontinuous innovation, this paper addressed shifts that may happen inside the customer's organization when a discontinuous innovation is launched. The main conclusion in this paper is that the heterogeneity of interests within a customer's organization has not been sufficiently captured by previous literature. Rather than viewing customers as distinct actors with one specific utility function, customers may be regarded as a collection of actors who sometimes have diverging interests. By doing so, some potential barriers to successful commercialization of innovations which are sold to organizations can be revealed and consequently also addressed. These conclusions imply that it may in some cases be an over-simplification to view customers as distinct entities with one utility function. In reality, the adoption process is much more complex, particularly in business to business settings.

## **7. Discussion and Managerial Implications**

This section discusses the findings from the studies summarized above. Each RQ is answered below under different subheadings.

### ***7.1 RQ1 - Internal and external impediments to discontinuous innovation***

The first research question concerned what internal and external impediments to discontinuous innovations that established firms may encounter. As was stated in the literature review, those impediments can be classified as either internal or related to the external environment.

### **7.1.1 Internal impediments**

Previous literature has pointed out that discontinuous innovations which render existing competences obsolete tend to create particular difficulties for established firms (Tushman and Anderson, 1986). However, it has so far largely failed to address how different characteristics of incumbents influence their response to discontinuous innovation. This thesis concludes that such factors as firm size affect the challenges that are likely to occur and consequently also the managerial prescriptions related to surviving discontinuous innovation. It can be seen in paper one how Hasselblad's limited resources in many ways augmented these difficulties. These findings suggest that an incumbent's response to such shifts depend upon the particular characteristics of the firm and that this aspect has not been sufficiently captured by previous literature. Additionally, this thesis concludes that a firm with limited resources like Hasselblad can look for collaborative partners instead of only performing internal development work.

The thesis has also underlined the importance of having dual structures in order to cope with discontinuous innovations. Paper two illustrates how discontinuous ideas were rejected in the established process. Though the presented findings remain inconclusive regarding the actual performance of dual structures, it seems at least to be better than simply rejecting all those initiatives from the beginning. While dual processes may be preferable, it is not obvious that the design described in the second paper is preferable. After all, this is yet another process and it may in fact imply an even greater formalization of innovation work. Another possible way forward would be to have a dual organizational structure where a certain unit is specifically committed to developing discontinuous innovation initiatives.

### **7.1.2 External impediments**

The first paper also pointed out another property of an incumbent firm which affects its response to discontinuous innovation, namely the market position. This article illustrates how Hasselblad's niche market position affected how the threat was dealt with. Being present in a value network where customers were very demanding on such performance dimensions as image quality augmented the problems related to entering this initially inferior technology. Early attempts at a digital camera system were considered risky as they could potentially harm the brand image of the company. These findings suggest that a more nuanced view of incumbent firms is necessary in order to understand and address the challenges related to discontinuous innovation.

The case also triggered a couple of questions related to value networks that are interesting to explore in future research. One of those is the issue of how and why discontinuous innovations may prosper in high-end segments, despite its lower performance. Digital imaging actually prospered in the Hasselblad's segment for professional photographers in the early 1990s, long before it entered the mass markets. Back then, digital backs could be attached to medium format cameras, thereby creating a hybrid which was compatible with both film and digital imaging. However, at this point, traditional performance in terms of image quality was considerably lower than for film-based photography. Given that previous literature on discontinuous innovation and value networks has stated that

those technologies may prosper either in the lower ends of the market or in completely new markets (Christensen and Raynor, 2003), this seems to be an anomaly, particularly bearing in mind the lower image quality that was associated with digital imaging back in the early 1990s. Hence, these results are in many ways inconsistent with existing literature on discontinuous innovation and value networks and they call for further investigation in coming studies.

The findings from the first study did also shed some new light on the definition of disruptive innovations (Christensen, 1997). Disruptive innovations have been defined as having a worse performance along dimensions that customers have historically valued, while at the same time bringing new attributes to the market. Existing literature has also suggested that they are typically cheaper and easier to use. While the early versions of digital cameras fulfilled the two first criteria, they certainly did not fulfill the other two. The first products were actually quite the opposite – bigger, bulkier and far more expensive than the dominant analogue technology back in the early 1990s. This observation triggered an interest in the process of digitalization and after having read about other shifts from mechanics to electronics in several industries such as transistor radios and watches (Jörnmark and Ramberg, 2005), electronic calculators (Pettersson, 2003) and performed a case study at a company driving the shift from analogue to digital technology in the video surveillance industry, it was concluded that similar patterns can be seen in other industries. Thus, it seems to be clear that those products are not typically cheaper or simpler in the beginning and that they tend to be nurtured in high-end applications despite the inferior performance. It seems that the current definition of disruptive innovation fails to cope with a wide range technological discontinuities related to microelectronics. Value networks may still play an important role as an explanation to incumbent failure in those shifts, but current theory cannot explain this adequately. This observation calls for further investigations of what role the value network plays in shifts from mechanic and analogue technology to electronics.

Other barriers to innovation adoption in the value network were identified within the scope of the third study. In this study and its corresponding paper, it was found that barriers may occur inside the customer's organization. The appropriation of economic value is distinct from the creation of it (Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002) and in this case study, the product innovation created a new distribution of economic value inside the customer's organization. This change created a barrier to innovation adoption since the individual purchaser was not assigned to take the value that was created elsewhere into account. This observation suggests that it may sometimes be misleading to view customers as single entities with only one aggregated utility function, rather than as a collection of individual actors with distinct and sometimes conflicting interests. Value can be created on many different levels and in many different ways inside the customer's organization and this thesis shows that a customer can indeed contain many diverging utility functions, and that this needs to be taken into account as a particular adoption barrier when introducing discontinuous innovations. Much of the recent literature on discontinuous innovation and value networks (e.g. Christensen, 1997) has overlooked this fact and this thesis shows that if customers are viewed as one homogeneous entity, some of the specific challenges and

barriers to adoption may be concealed. This is an aspect of value networks and innovation that has been largely overlooked by previous literature and this issue will be further explored in future work.

## **7.2 RQ2 - Overcoming impediments to discontinuous innovation**

The second research question concerned how incumbent firms can overcome different obstacles to discontinuous innovation. The conclusions will be presented below in the two sub-sections below.

### **7.2.1 Structures and processes for discontinuous innovation**

As was stated in the literature review, innovation work has become increasingly formalized over the last decades and several researchers have pointed out that this may hamper a firm's ability to come up with discontinuous innovations (O'Connor, 2006; Veryzer; 1998a). It has been argued that a different process is needed for discontinuous innovation and that more knowledge is needed regarding how those processes can actually work in practice. The thesis has filled some of this research gap by providing an illustration of how one innovation process, namely idea management systems, can be designed in order to generate, evaluate both steady-state and discontinuous innovation ideas.

As was noted in the former section, the studied system is dual in the sense that it deals with both steady-state and discontinuous innovation, and does so by making a distinction between them and then treating the ideas differently by employing different processes and evaluation criteria. Having a dual approach is in line with much of the recent literature on discontinuous innovation which underlines the importance of treating discontinuous and steady-state ideas differently. The findings suggest that previous literature on idea management systems has not covered this aspect and that past typologies ought to be extended into also incorporating what is here referred to as dual idea management systems. Hence this thesis has contributed to existing literature by providing an illustration of how certain processes and structures can be designed in order to deal with both steady-state and discontinuous innovations.

While a dual approach is consistent with many of the managerial prescriptions related to discontinuous innovation (e.g. Rice et al., 1998; Magnusson and Martini, 2008; Tushman and O'Reilly, 2006), it is not obvious that such systems will increase a firm's innovativeness. The evidence that is presented in this thesis does not allow for any conclusions regarding the performance of dual idea management system. They may become too complex and lead to excessive bureaucracy which could be potentially harmful for discontinuous innovation. After a couple of other studies related to discontinuous innovation had been performed at the same company within study 3, the benefits of those systems became questioned. The reason why discontinuous innovations had been rejected or not in the past did not seem to be primarily related to idea management systems or the evaluation criteria that are employed in the early phases.

Rather, such issues as corporate strategy, available resources and the presence of champions seemed to be more important determinants of whether the company decided to look for and move forward with discontinuous innovations. While this insight has not been validated scientifically, it still made a strong impression that there may be other topics that are more important to understand, both for practitioners and academics. The observations around idea management in combination with the literature review and the fact that it seemed to be scientifically difficult to identify, develop or validate different evaluation processes and criteria implied that this stream of research will not be further researched within the scope of this PhD thesis.

### **7.2.2 Overcoming impediments related to the value network**

Some conclusions regarding barriers to adopting discontinuous innovation were provided above. It was argued that discontinuities may occur inside the customer's organization and that these challenges have not been sufficiently addressed by previous literature. This thesis also provides some conclusions regarding how those issues can be managed. It argues that firms need to innovate their business models in order to overcome barriers to innovation adoption that may occur inside the customer's organization. More specifically, this thesis suggests that this can be done by extending the value proposition, changing the sales channel and aligning incentives throughout the value network.

In order to understand and address those obstacles, it may be beneficial to extend the concept of value networks towards a supply chain perspective. Though this literature looks at the flow of goods, it seems to be useful also when studying the adoption of innovations, mainly since it takes a systemic approach by looking at value chains and assumes that a firm can only impose direct control over itself in this highly interconnected system. In such a complex setting, it is enough that one out of many actors reject an innovation for it to fail. Hence, firms need to collaborate more with their supply chain and seek to align incentives throughout the system in order to succeed with discontinuous innovations.

In the same way as firms must acknowledge that incentive misalignments exist in supply chains and that this may create a barrier to change (Narayanan and Raman, 2004), they also need to recognize that such misalignments may result in a blockage to successful adoption of innovations. Given that this has turned out to be hard to for existing products, the challenges are likely to become even greater when innovations are introduced in a supply chain. Innovations are by definition novel, and hence, the degree of uncertainty is much higher. Moreover, many innovations create new value by removing certain functions in a supply chain, e.g. the shift to digital imaging destroyed the market for film and consequently also an integral part of the supply chain. In such settings, it becomes important to find other actors to collaborate with.

The findings in this thesis suggest that business model innovation is crucial in order to overcome such barriers to adoption. The value proposition must be aligned with the way value is created and the returns need to be appropriated in a way that is aligned with the

different incentives inside the customer's organization. It is by no means a trivial task to understand the incentive structures, the empirical data presented in this thesis suggest that firms can develop closer relationships with their customers in order to do so.

### ***7.3 Managerial implications***

There are several managerial implications that have emerged so far from this research. One of the most important implications is that firms that operate in a business to business setting need to maintain a more nuanced view of the customer's organization and innovate their business models in order to appropriate the returns from discontinuous product innovations. Established firms must to an increasing extent map and seek to understand the different incentives that govern the adoption of a discontinuous innovation. This could be done in a three step process where all stakeholders inside the customer's organization that are affected need to be identified in the first phase. Then an analysis of the different incentives that govern these actors should be undertaken. The third step deals with aligning these incentives and this can be done by changing the business model, for instance by extending the value proposition and changing the sales channel.

In addition to this, the thesis has pointed out that a dual approach to ideation may be one way forward for firms that want to enhance their discontinuous innovation capabilities. While the evidence of the benefits of this approach remain inconclusive for idea management, this thesis has given further illustration of the notion that discontinuous innovation initiatives may need to be handled differently.

## **8 Future Direction**

This section will be based upon the findings and conclusions above to try to outline what future research can be conducted within the scope of this doctoral research. The work performed thus far has identified several areas for future research, but also some topics that should not be continued, at least not within the scope of this PhD thesis.

The first and third studies that have been carried out addressed the issue of value networks and the control that actors outside the firm's boundaries impose on an incumbent firm. The second study differed from those two in that it explored processes and structures inside the firm that could be employed in order to develop discontinuous innovations. Though this study provided interesting illustrations of how such processes and structures can be designed, it is deemed to be more interesting to look at value networks in coming studies. There are both theoretical and practical reasons for doing so.

The most interesting managerial implications that have emerged from this doctoral research so far have primarily been related to looking at the value network rather than inside the company. By doing so, new barriers to adopting discontinuous innovations could be identified but maybe more importantly, solutions that help companies to overcome these obstacles were found. Such findings may have an impact on the outcome

of innovation work at incumbent firms. While the study concerning internal processes and structures provided an interesting illustration of how those can be re-designed, it was not really clear that this would make companies better at succeeding with discontinuous innovations. Given that this thesis partly aims to provide useful managerial implications, the conclusions so far suggest that it is more relevant to look further into value networks, rather than at structures and processes inside companies.

The value network approach also seems to be more attractive from a theoretical point of view. As was noted in the theoretical review in section 2 of this thesis, the literature regarding discontinuous innovation has historically looked primarily inside the firm when trying to explain incumbent failure. Hence, many of those aspects as well as how internal structures and processes can be designed have been covered to quite an extent by previous literature. While the design of dual idea management systems had not been addressed before and much remains to be done in this field, the overall impression from the literature review is that this area is more researched than the role of the firm's value network with regard to discontinuous innovations. The fact that Clayton Christensen's work has become so widely cited can be regarded as one indication of this. Christensen was one of the first scholars who explained incumbent failure by drawing upon value networks and resource dependency theory (Pfeffer and Salancik, 1978). It was also in the two studies above that drew upon value networks that anomalies and drawbacks in existing literature were identified. For instance, the fact that digital imaging initially prospered in a high-end application despite its lower performance cannot be explained by existing literature on discontinuous innovation and value networks. Moreover, this study also resulted in a criticism of how disruptive innovations are defined. The early versions of digital imaging were bulkier and more expensive than the dominant analogue technology, not 'typically cheaper and simpler' as suggested by Christensen (1997). These findings triggered a particular interest in digital technology and how it has substituted mechanic solutions in many different industries. The third study indicates that new insights can be gained maintaining a more nuanced view of the customer's interest and this approach will therefore be used in future studies of discontinuous innovations.

Summing up, given that considerable improvements have been made over the last decade in the field of discontinuous innovation by looking at value networks and that the work carried out in this thesis has identified several potential improvements of this approach, it seems to be the preferred way to move forward with this doctoral research.

## **9. Further research**

A suggested outline of future studies to be performed is provided below. The main purpose with each study is given, as well as a brief discussion of how it fits into the overall PhD work. Additionally, the state of each study will be described briefly. While some of this work has already been initiated, these thoughts should still be regarded as work in progress rather than a definitive roadmap for the coming years.

## **9.1 Study 4**

### ***Incumbent Failure, Value Networks and Competence Destruction***

#### ***– evidence from Facit***

Facit, the Swedish manufacturer of typewriters, mechanical calculators and office machines, balanced at the brink of bankruptcy in 1971-72 after almost 50 years of successful expansion and continued profitability. The shift from mechanical to electronic calculators was the main reason why Facit encountered those problems. While some work has been done about Facit and the shift to electronics (e.g. Pettersson, 2003; Starbuck and Hedberg, 1977; Starbuck et al, 1978) this case has not yet been addressed from a resource dependency perspective. Other scholars have focused on such aspects as leadership and organizational impediments, but the value network approach has not yet been applied in order to understand this incumbent failure, which is of particular historic interest in Sweden. Moreover, since the initial diffusion of digital technology does not seem to fit into the existing definition of disruptive innovation, this study will hopefully shed some additional light on this issue.

This study aims to explore the role of value networks in the case of a technological shift from mechanics to electronics. Since the purpose is to obtain a more nuanced view of how value networks affect a firm's response to discontinuous innovation, an in-depth case study method seems to be suitable. An extensive amount of data has been gathered thus far, interviews have been conducted by former directors of the company and historical documents such as minutes from board meetings and top management meetings have been reviewed. In addition to this, internal documents regarding the shift from mechanics to electronics have been accessed.

Hence, the study is well under way already and it indicates that not only the technological competence was rendered obsolete, but that the entire sales model lost its value with the rise of electronics. In addition to this, the study aims to give further illustrations of how and why discontinuous innovations may initially prosper in high end applications in order to move down into lower segments over time. The anomaly in existing literature on discontinuous innovation and value networks (Christensen, 1997) will therefore be addressed to some extent by this study. Moreover, the findings can also be compared to those that have emerged from previous studies.

## **9.2 Study 5**

### ***High-end discontinuous innovations with lower performance***

The anomaly identified in study 1 above can be regarded as the starting point of this study. Why did a technology with lower traditional performance like the early applications of digital imaging initially prosper in the high-end segment of the market?

Christensen and Raynor (2002) argued that there are two forms of disruptive innovations, namely new market and low end disruptive innovations. The first category prospers in a totally new market by targeting needs that have not been met previously. One such example would be the transistor radio. It initially emerged primarily among teenagers who could not afford a large radio and appreciated the portability that was enabled by this smaller and simpler technology. An example of a low end disruptive innovation would be the 5.25 inch disk drive in relation to the 8 inch disk drive. It substituted the low end applications of the former product and then improved in terms of storage capacity.

There has been a discussion in the academic community regarding the issue of high end disruptive innovation. Other scholars have argued that disruptive innovations might as well emerge in high end segments of the market (e.g. Govindarajan and Kopalle, 2006). However, it is not entirely clear how and why an innovation with lower traditional performance would emerge in a high end application and what kind of problems this would create for established firms.

This study will address the issue of high end discontinuous innovation through a couple of case studies on how and why this has happened. Since the study aims to understand the nature of the adoption process, a case study approach will hopefully enable the kind of nuanced description that it is needed in order address the existing anomaly. It will primarily use data that has already been collected within the scope of study 1 and 3 above. This data is rich in detail and can hopefully illustrate how and why a technology with lower performance can prosper in a high end segment. Moreover, work from other scholars can be used in order to provide further illustrations. From the research carried out so far, the supply chain perspective of the customer's organization as employed in paper 3 seems to be a suitable way of exploring this topic. There are two reasons for this. The empirical data collected so far has in common that it has concerned a business to business context. Secondly, this approach turned out to be very useful in order to understand the challenges and managerial solutions that were described in paper 3.

### **9.3 Study 6**

#### ***Microelectronics and the failure of established firms***

Many of the studies described above have in common that they've looked at shifts from analogue to digital technology. The calculators, camera and video surveillance industries all have in common that a shift to microelectronics has occurred or is currently happening. In many of those industries which have undergone a transition to digital technology, incumbent firms have encountered major difficulties. One reason for this appears to be the way that digital technology is improved over time. Gordon Moore (1965) identified that the amount of transistors that could be crammed onto an integrated circuit doubled every second year. This observation has later on been referred to as Moore's law. Similar patterns were later identified by Noyce (1977). It has implied a continuous and rapid increase in performance and lower prices for more than 40 years now and it is clear that

this development has resulted in technological shifts in many industries (Jörnmark and Ramberg, 2005).

This study aims to explain incumbent failure in those shifts and provide a conceptual discussion of the discontinuous nature of digital technology and the role of value networks in those shifts. It does so by discussing Moore's law and its implications in relation to Christensen (1997) and by drawing upon data from several different cases of digitalization such as radios, cameras, calculators, video surveillance and disk drives. Hence, the study will not gather more data, rather it will try to use the information collected so far and combine it with existing empirical cases.

The findings so far suggest that the 'attack from below' as illustrated by Christensen's disk drive example (1997) can be regarded as a direct consequence of Moore's law and the fact that microelectronics tends to become smaller and cheaper over time. Similar patterns can be recognized for calculators, cameras and radios. However, this should primarily be regarded as a sequence of events that follows after the actual shift from analogue to digital technology. As has been argued previously, digital technology does not seem to prosper initially in the low end segments but rather in highly advanced applications due to the high price in the beginning along with its ancillary performance attributes and the simplification that the new technology enables.

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## 11. Appended papers

### *Paper 1*

#### **EXPLORING FACTORS INFLUENCING INCUMBENTS'**

#### **RESPONSE TO DISRUPTIVE INNOVATION**

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## *Abstract*

*This paper explores how certain incumbent characteristics influence established firm's response to disruptive innovation. More specifically, it looks at the challenges a middle size, top segment company faced and how this affected its reaction to the disruptive threat. This is done by conducting an in-depth case study of Hasselblad, a manufacturer of professional cameras. It can be seen in this case study that Hasselblad's limited resources and its niche strategy affected how it managed the transition from analogue to digital camera technology. These characteristics made it difficult to allow experimentation with digital imaging in the main business since the available resources were severely limited and this initially inferior technology could harm the brand image. Instead, Hasselblad pursued collaborations and eventually launched a hybrid camera, which was compatible both with film and digital backs but did not become the expected success. Being close to bankruptcy, the digital resources needed were acquired and the company eventually survived the disruption. In conclusion, this paper argues that the managerial challenges and solutions to the innovator's dilemma depend upon the particular characteristics of incumbents and that this heterogeneity has not been sufficiently captured in previous literature. It also suggests that medium size, top segment firms can handle disruptive innovation through collaboration and acquisitions.*

*Keywords: Disruptive innovation, digital camera, incumbent, acquisition, collaboration, strategy, firm size.*

## **Introduction**

The concept of disruptive innovation (Christensen, 1997) has received much attention from both academics and practitioners. Nevertheless, there are several areas that so far have been insufficiently explored. One such aspect is the heterogeneity of incumbents. While the literature on disruptive innovation has proved that incumbents frequently fail in the transition from a sustaining to a disruptive technology, it has so far shown limited interest in the differences between established firms. In the discourse regarding disruptive innovation, incumbents are often treated as one population vis-à-vis entrants rather than as many populations with different resources, market positions and strategies. Contrary to this, it appears reasonable that the capacity to respond to disruptive innovations depends largely on the characteristics of the incumbent and consequently that the managerial solutions proposed need to take these differences into consideration.

This paper investigates how certain incumbent characteristics influence the response to disruptive innovation. More in particular, it explores the challenges and managerial solutions for a medium size established firm in the high end segment of its industry. This is done by conducting an in-depth case study of Hasselblad, a manufacturer of professional cameras. Based on the observations made, it is argued that the managerial challenges and solutions to the innovator's dilemma depend upon the particular characteristics of an incumbent and that this term needs to be nuanced further. Moreover, the article suggests that a medium size company in a high market segment can survive disruptive innovation through collaboration and acquisitions.

This paper is organised as follows. The next section reviews literature on disruptive innovation and entrant-incumbent dynamics. The subsequent section contains a description of the methods used in this paper. Then the case study about Hasselblad is presented in order to illustrate how a particular incumbent firm encountered severe problems, but eventually survived the disruption. The firm provides a particularly compelling example in that despite early investments and recognition of the disruptiveness of digital imaging, it encountered problems in the transition to the new technology. The final section contains an analysis of the case study and a discussion about its theoretical and managerial implications.

## Theoretical Exposition

It is well documented today that many established firms find it hard to adapt to changes in the technologies they employ. Frequently, incumbent firms do not manage the shift to the new technology, they lose market shares and the successful firms are found among the new entrants (Tushman and Anderson, 1986; Cooper and Schendel, 1978; Utterback, 1994). Christensen (1997) brought a new perspective upon this issue by drawing upon resource dependency theory (Pfeffer and Salancik, 1978). This theory suggests that a firm's freedom of action is in fact controlled by actors outside the boundaries of the company, e.g. customers and investors. Hence, resource dependency theory posits that a firm's freedom of action is in fact limited to satisfying the demands of those actors that provide the resources it needs in order to survive.

By making a distinction between sustaining and disruptive technologies, Christensen explained the recurrent pattern of incumbent failure in technological shifts. Sustaining technologies have in common that they improve the performance of established products along the dimensions that mainstream customers demand. Disruptive technologies on the other hand, initially underperform along these dimensions. The lower traditional performance and the ancillary performance attributes create a large market uncertainty around the disruptive innovation. At the same time established firms find it irrational to abandon their current, profitable customers in order to aim for a new, initially small market and an inferior technology. As the performance of the disruptive innovation increases it begins to attract customers from the sustaining technology and eventually displaces the old technology. Through his studies of the disk drive industry, Christensen showed that incumbents usually win sustaining battles whereas entrants succeed in disruptive battles. Hence, a key determinant of the probability of success for an innovation is the extent that it addresses the needs of actors in an incumbent's current value network.

Christensen also derives a number of managerial solutions which have been further developed (Christensen and Raynor, 2003). It is argued that managers in incumbent firms basically have three options, they can *change the processes and values of the current organization, create an independent organization, or acquire a different organization.*

Firms that try to *change the current organization* in order to adapt to the disruptive innovation have a weak track record (Christensen, 1997). The main reasons for this are related to the resource dependence that the innovator's dilemma originates from.

An *independent organization* can be regarded as a structure in which an organization develops new resources that are different and separate from the rest of the firm. It has objectives that are largely independent from and outside the current operations of the firm. As the new technology evolves within the organization, the required processes and values are also developed (Macher and Richman, 2004). This is one of Christensen's most influential recommendations for how to manage disruptive innovations.

When firms are not able to develop disruptive innovations, they can adapt by *acquiring* companies that possess the resources that are needed for developing the new technology. By doing so, the competencies needed for developing disruptive innovations can be incorporated into the organization rather than developed.

Though the problems and solutions described above are well elaborated, they suffer from some drawbacks mainly due to a lack of clarity in the terminology used. In the discourse regarding disruptive innovation, incumbents are treated as one population vis-à-vis entrants, rather than as many populations with different resources, market positions and strategies. However, the forces of resource dependency should arguably vary depending upon the specific characteristics of an incumbent firm. For instance, firms operating in a high end segment are likely to face other challenges than a company in the low end of the market. This implies that there could also be a substantial amount of heterogeneity among the solutions to the innovator's dilemma or that the most suitable means of action actually depend upon the characteristics of the incumbent. Consequently, the managerial solutions can potentially be improved further by exploring how the properties of an incumbent affect its response to a disruptive threat.

Moreover, given that disruption is a process and not a discrete event (Christensen and Raynor, 2003) it should strike at different points for different firms depending on the segment in which the firm is operating. Adner (2002) pointed out that the structure of demand needs to be addressed in order to clarify the nature and effect of disruptive innovations. Moreover, Adner used the notion of thresholds, defined as critical performance levels that must be met. The functional threshold of a product is the minimum performance that the customer can accept whereas the net utility threshold also takes price into consideration. The point in time when the net utility threshold is met by the disruptive technology should arguably depend upon which customer segment the incumbent operates in.

Furthermore, Danneels (2004) suggested that future research should investigate alternative routes for incumbents to access disruptive technologies, looking into the possibilities for using alliances, acquisitions, and internal development more in detail. This paper will address some of these issues by exploring how certain incumbent characteristics influence its response to disruptive innovation. More specifically, it will look at the particular challenges that a medium size established firm operating in the high end of the camera market encountered.

## Methods used

The case study below illustrates how Hasselblad failed to develop capabilities in digital imaging on its own and then survived through collaborations and an acquisition. This firm was targeted since it does not possess the characteristics of most incumbents that are studied in the field of disruptive innovation. The firm is operating in the high-end segment of the camera market, targeting professional photographers with a high demand on performance. An additional reason for studying Hasselblad is that interviews with current and former high-level managers of the company were feasible.

Though the authors have no past experience of working with Hasselblad extensive amounts of information have been accessed. Since this paper focuses on corporate strategy and the implementation challenges that confront managers, high-level managers who played a substantial role in forming the strategy were primarily interviewed. Managers of R&D have also been accessed in order to understand the specific challenges they confronted when shifting from analogue to digital imaging. In total, more than 50 hours of interviews were performed and recorded with eleven people. Follow-up interviews were also conducted in order to ensure an accurate interpretation of the information. All field research interviews began with general open-ended questions, asking managers how they perceived the challenges posed by the disruptive technology and how they tried to deal with them. The same questions were asked to at least two senior managers from one era. In order to ensure the accuracy of this information, it was compared with a large amount of secondary data such as annual reports, media articles, old mail conversations between managers and book chapters written by former managers. In addition to this, all minutes from the board meetings during the period 1989-1994 were accessed.

The description of this case emerged when all these sources of data had been analyzed. In those cases when the written material that was accessed diverged from the interview data, follow-up interviews were performed. The gathered data has thus been triangulated by looking at several independent sources and making sure that these sources were mutually consistent. Moreover, the most important material has been read, accessed or discussed by several researchers in order to ensure an accurate interpretation.

## Case description

Hasselblad is a small niche player in the camera industry. The firm had for a long time about 500 employees in total and annual revenues of around 600MSEK. It has for decades been one of the leading camera manufacturers and has sometimes been referred to as the “Rolls Royce” of the camera industry. The company received global recognition in 1969 when the first photos of Neil Armstrong on the moon were taken with a Hasselblad camera. During the following decades, a series of high-performing cameras for professional photographers were developed. This case study will focus on the late 1980’s to 2005, which is the era when Hasselblad’s analogue cameras were disrupted by digital imaging.

In 1981, the camera industry was shaken when Sony introduced the first camera that was not using film, the Sony Mavica. Given the poor picture quality of the Mavica, the CEO of Hasselblad at that time, Jerry Öster concluded that the firm should wait and instead learn more about digital imaging by developing other applications. Öster thought that Hasselblad was too small to make the investments in R&D required in order to overcome the weaknesses of the new technology and that it would take time before the technology would disrupt Hasselblad.

### ***Attempts to develop a new camera system***

During the late 1980's, Hasselblad became increasingly aware of the drawbacks of its analogue camera system. Cameras are not only about electronics or precise mechanics. There are many features which are related to optics and Hasselblad lagged behind in those areas. Therefore some R&D managers thought that the company needed to develop a completely new camera system with modern functions such as autofocus. Some proposals were made to the board but the project which was called Nova was never launched on a full scale. The main reason for this was that management thought Hasselblad was too small to afford such a project.

### ***The Development of a digital studio camera***

The firm instead moved further into digital imaging in the early 1990's. A new CEO was recruited who had who had a background in electrical engineering and believed in the potential of digital imaging. In 1994, the company started the development of a digital camera. During this time digital and analogue photography were competing for the same resources. One member of the product board recalls that *"we had one budget in the product board and money had to go to either the digital camera system or the mechanical camera system"*. It was eventually decided to move further into digital imaging.

When the development of a digital camera had started, it soon became apparent that this technology had some properties that made it fundamentally different from an analogue camera. The photo quality was lower at this point than with an analogue Hasselblad camera. Along other performance dimensions, digital photography had many attributes that made it attractive. Photos could be replicated, manipulated and sent at a much lower cost and much more conveniently than with analogue imaging. Thus, the business utility of digital technology was in fact very large at this point, yet different from what Hasselblad had offered previously.

With these properties in mind, the manager in charge of digital development, Lennart Stålfors, thought that the best thing to do was to develop a camera for studio photography. This customer segment would hopefully be willing to trade off some photo quality for the opportunity to take many photos, make copies and sending the photos in an easier way.

The development of the digital camera took place both in-house and in various collaborations. One of the largest projects was undertaken together with Philips. Among other things, this resulted in a sensor for digital cameras. *"Many large companies were willing to cooperate with us despite the fact that we were so small, our strong brand helped us a lot"*, Lennart Stålfors recalls.

## ***A change in strategy***

Partly as a consequence of having focused on digital imaging, Hasselblad lagged behind with its mainstream products. This was one of the reasons why the new owner in 1996 decided to cut off digital development. An additional reason was that some managers, primarily in the market organization thought that the inferior quality of digital imaging would damage Hasselblad's brand. Others argued that the firm was too small to develop a digital camera on its own. Stefan Arvidsson, member of the board, says: *"In the long run we would not have been able to keep up with the others. Compare us to what the huge Japanese companies spend on development. I still think stopping the project was the right thing to do."* However, many people thought that this decision was a disaster. For instance, the CFO by that time, Bengt Ahlgren said: *"Hasselblad did not have to develop everything on its own. Throughout the years our reputation had made us an attractive partner for collaborations."*

Instead of continuing with digital imaging, the new owner decided to develop a completely new camera system. As was mentioned before, this project had been considered in the late 1980's but had never been realized since it would have been very expensive for a small firm like Hasselblad. The new strategy was to pursue some collaboration and thereby follow the digital development, while focusing Hasselblad's own resources on analogue technology.

The development of Hasselblad's new camera system, the H1, was initiated in 1998. The camera was developed in collaboration with Fuji, who actually funded almost 50 percent of the camera. The idea was to create a camera which was analogue but also compatible with digital backs, thereby facilitating the transition from analogue to digital imaging.

However, this project was heavily delayed and the product was not launched until late 2002, many years after what was originally planned. Moreover, it had cost 150 MSEK too much and did not have all the features that were originally intended. This delay turned out to be critical since the technological shift started to affect the company during those years. One member of the development team notes that: *"if the H1 would have been launched in 1998, we would have had four good years of revenue from it. When the H1 was finally launched it was a fantastic product, but that did not matter since most cameras were completely digital then."*

The H1 system was a hybrid, which could use both digital backs and conventional film. The digital backs were initially delivered by Kodak and PhaseOne. Since Hasselblad did not manufacture their own digital backs this meant that they could not deliver a complete digital camera themselves. At the same time, the performance of digital cameras had increased to the extent that Hasselblad's position was threatened by actors that had not even been their competitors before. One of Hasselblad's most profitable segments, wedding photography, had for decades been a market that was protected from competition. But within a few years, Hasselblad lost this market to Canon due to the shift from analogue to digital technology. Digital backs are very expensive and thus, a fully digital Hasselblad camera cost 100 000 SEK more than Canon's similar

products. The firm now experienced a severe drop in revenues. As the market for digital cameras expanded rapidly, Hasselblad encountered further problems being caught with a technology that was essentially analogue.

In early 2003, the company was bought by the Shriro Group, a Chinese firm which had been Hasselblad's distributor for more than 40 years. The new owner sold off all subsidiaries of Hasselblad, downsized the firm and had to bring more money into the company many times in order to avoid bankruptcy. Hasselblad now had to develop a complete digital camera system, which included digital backs. Given that the firm was close to bankruptcy, had suffered severe layoffs and had cut off all digital capabilities in the mid 1990's the situation was desperate.

Shriro thought that it would be impossible under these conditions to develop a digital back and therefore started to look for potential acquisitions. Given that the new Hasselblad camera was compatible with digital backs the synergies from buying a manufacturer of those backs seemed obvious. In order to avoid bankruptcy, Shriro had to invest extensively in the acquisition of Imacon, a Danish firm manufacturing digital backs. Imacon and Hasselblad were merged together and Hasselblad could now sell a complete digital camera system.

After having been close to bankruptcy in 2003-2004, the company recovered financially and since then it has been profitable in manufacturing digital cameras for professional photographers. However, Hasselblad is still paying back a lot of debt to the owner for whom the acquisition of Hasselblad turned out to be far more expensive than anticipated. A long and dramatic journey for Hasselblad had been made, or as the CEO Lars Papilla expressed it in May 2004 - "*the shift to digital technology was much more dramatic than we had expected.*"

## **Analysis and discussion**

The case study of Hasselblad can indeed be regarded as an illustrative example of the innovator's dilemma. It clearly shows that the digital cameras were disruptive. While initially having a lower performance along traditional measures such as photo quality it had other attributes such as the possibility to store, replicate, send and manipulate photos more easily and at a lower cost.

Despite recognizing the future importance of digital technology at an early point, Hasselblad encountered great difficulties in this technological shift. Resource dependency theory seems to provide one explanation for why this happened, as suggested by Christensen (1997). The continuous demand from investors to focus on profitability and therefore downsizing disruptive initiatives can be regarded as one example of this. Moreover, the particular characteristics of Hasselblad affected how the firm handled the disruptive threat from digital imaging. The company was relatively small and had a limited and demanding customer base. These properties imposed constraints on how Hasselblad could handle the innovator's dilemma.

### ***Focus on the high-end segment – an obstacle for experimentation?***

It can be seen in the case study above that Hasselblad's niche strategy affected how the firm managed the transition to digital imaging. Digital cameras could not initially provide the superior performance that was demanded in the high-end segment where Hasselblad had established a unique position. The net utility threshold (Adner, 2002) was much higher for a firm like Hasselblad than for a company operating in the amateur segment. In addition to this, Hasselblad's customers associated the brand with quality and superior performance and this image could have been damaged when experimenting with an initially inferior technology. The strong brand was one of Hasselblad's greatest assets and this seems to have created a large hostility against digital technology, particularly in the market organization. The protected market position and the brand were probably two of the main reasons why the new owner decided in 1996 to cut off digital development and focus more on analogue imaging.

In this respect, companies in the lower segments had better possibilities for early experimentation and learning since they could sell digital cameras to amateurs with low demands on photo quality. The values associated with the Hasselblad brand implied that a transition to a lower performing technology was deemed to be very risky and thus, the forces of resource dependency seem to have worked strongly in favour of the sustaining technology. Based upon a history of landmark events such as the photos taken on the moon, a dominant logic (Prahalad and Bettis, 1986) emphasising extreme performance had emerged within the firm and this further implied that moving into digital technology was difficult. Clearly, the firm's core capabilities in the mechanical technology in this sense turned into core rigidities when facing the disruptive technology (Leonard-Barton, 1992).

### ***Firm size limiting the possibilities to keep options open***

The case study also illustrates how being a medium size company affected Hasselblad's response to the disruptive technology. When management decided not to develop a new camera system in the late 1980's it was largely a consequence of the limited resources of the firm. Moreover, the fact that much of the digital development in the early 1990's occurred in various collaborations such as the one with Philips illustrates how firm size affected the way Hasselblad handled the disruptive threat.

During the mid 1990's the firm continuously moved away from digital imaging and instead embraced the sustaining technology that had proven to be successful for so many decades. When the new owner decided to focus solely upon conventional camera technology and pursue only minor collaborations in the digital technology area, another step in this direction was taken. It appears as this decision was also affected by the firm's size and its available resources. It can be argued that the limited size of Hasselblad accentuated the difficulties involved in meeting the disruptive innovation as the company ended up in an either-or situation, due to its financial constraints.

Hence, the forces of resource dependency were very strong for a firm like Hasselblad. It would have been expensive for the company to pursue development in both the new and the established technology fields simultaneously. Hasselblad tried to keep the option of developing a digital camera open through collaborations and instead focus on a hybrid camera, but lost valuable time and resources in doing so. The fact that the new camera system launched in 2002 was to a large extent financed by Fuji also illustrates how the size of the firm affected its way of managing the technological shift. During this long and costly project, Hasselblad never had the resources or strategic focus needed to develop digital backs. When Shriro acquired Hasselblad and the firm was close to bankruptcy, it could eventually survive through an acquisition of Imacon and thereby providing a fully digital camera system.

Whether the outcome of this strategy should be regarded as a success or not is a subject that is open for discussion. If the new owner hadn't brought additional funding to the company it would most likely not have survived and it is still paying off debts to Shriro. On the other hand, empirical evidence from both other industries and the camera industry (e.g. Christensen, 1997; Tripsas and Gavetti, 2000) suggest that few companies survive disruptive innovation and therefore survival may be regarded as some form of modest success.

Summarising the above, it is seen that Hasselblad's size and strategy affected its response to the disruptive technology. For a firm like Hasselblad, the relative cost of pursuing digital technology was higher than for a larger incumbent, and hence, the inertia seems to be very strong in this setting. It can be seen in the case study how this forced Hasselblad to handle the disruptive innovation through various collaborations and through an acquisition of digital capabilities.

Moreover, digital cameras could initially not satisfy the demands that Hasselblad's high-end segment required. In contrast to this, larger camera manufacturers like Canon and Nikon could develop capabilities in digital photography while they were still producing conventional cameras. These firms had the sizeable resources that were needed in order to undertake this kind of ventures. Furthermore, they were operating in the amateur segment for cameras, which could tolerate the lower performance that the disruptive technology initially provided.

However, it should be underlined here that there are several examples of large incumbents in the low-end segment of the camera industry that encountered problems despite having larger R&D budgets. One such example is Polaroid (Tripsas and Gavetti, 2000) which initially sought to develop digital cameras and complementary assets but failed and after that focused on conventional cameras. Since this pattern is to some extent similar to what happened to Hasselblad, incumbent size and strategy can clearly not be the only factors affecting how established firms handle disruptive threats. This paper does not argue that these are the only, nor the most important determinants, rather, it claims that the particular characteristics of an incumbent affect the challenges in a disruptive shift and that they consequently also need to be considered when looking for managerial solutions to the innovator's dilemma.

## **Conclusions and managerial implications**

This paper has explored how certain incumbent characteristics influence the way an established firm responds to disruptive innovation. More in particular, it has looked at the challenges a medium size, top segment company faces, and possible ways of handling them. It can be seen in this case study that Hasselblad's limited size and its niche strategy made the firm highly vulnerable to the innovator's dilemma despite the fact that the disruptive effects of digital imaging were recognized and dealt with at an early point. Having a small and demanding customer base implied that Hasselblad became highly dependent on these customers and also lacked the resources to pursue extensive internal development projects.

Moreover, the case illustrates how the managerial solutions to the innovator's dilemma are affected by the particular characteristics of an incumbent. A relatively small niche player like Hasselblad could eventually survive the disruption through collaborations and an acquisition. This finding suggests that the heterogeneity of incumbents has been downplayed by previous literature and it calls for further investigations to allow for the development of a more nuanced view of established firms' possible ways of responding to disruptive innovations.

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## Paper 2

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# Idea management systems for a changing innovation landscape

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**Abstract:** Over the last decades, the nature of innovation has changed from being primarily related to incremental product innovation towards more business model innovation, discontinuous innovation and open innovation. These changes impose new demands upon the ideation phase of the innovation process and on idea management systems. This article explores what an idea management system that handles some of these different forms of innovation ideas may look like. The studied idea management system differs from previous typologies in the sense that it is dual, i.e. aiming to generate, evaluate and select both continuous and discontinuous innovation ideas and employing different processes and criteria for this within the same system.

**Keywords:** dual idea management system, discontinuous, continuous innovation

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## 1 Introduction

Over the last decades, several changes have taken place in the field of innovation management. There is a growing interest in both how companies can survive discontinuous innovation (e.g. Christensen, 1997) and how they can proactively generate these discontinuities (e.g. Veryzer 1998). Moreover, firms are increasingly looking outside their boundaries in order to become more innovative (Chesbrough, 2003). A growing body of literature has also explored the area of business model innovation in detail (e.g. Charitou,

2001; Gilbert and Bower, 2002). Business model innovation is becoming increasingly important, both in order to appropriate returns from technological innovation and to increase the profitability in mature industries.

These changes impose new demands upon how firms manage their ideation activities. However, when looking at the literature about ideation and idea management systems, it can be seen that the above-mentioned changes in innovation are scarcely mirrored in the design and scope of these systems. Most of the literature concerning idea management systems views them as a way of coming up with continuous improvements or incremental product innovations. The nature of innovation has changed but the use of idea management systems does not seem to have shifted to the same extent.

This article explores what new characteristics are required in an idea management system in order to meet the changing nature of innovation. This is done by conducting an in-depth case study of a firm that has an idea management system and re-designed it in order to match its broadened innovation scope. The findings in this article indicate that idea management systems perhaps need to become more complex in order to handle different forms of innovation. The studied system differs from previous typologies in the sense that it is dual, i.e. aiming to search, develop and assess ideas in different ways depending upon their nature.

## **2 Theoretical exposition**

Ideation can be regarded as the process of how individuals and companies generate creative ideas and develop them further (Graham and Bachmann, 2004). Idea management systems can be viewed as a structured support of the ideation phase. This theoretical exposition will first review how idea management systems have evolved over time and then some of the major changes in the innovation landscape will be outlined. Finally, those changes and their implications for the design and scope of idea management systems will be discussed.

### *2.1 The development of idea management systems*

Historically, suggestion boxes have been used as a way to coordinate and manage creativity (Ekvall, 1971). In the 1990s idea management systems became an important element of the Continuous Improvement (CI) stream of management literature. In line with this, Fairbank and Williams (2002) view idea management as a way to increase CI capabilities. Several scholars have claimed that these systems can be used in order to come up with continuous improvements, for cutting costs and as a way to initiate cultural change (Schuring and Luijten, 2001; Verespej, 1993). Studying 22 idea management systems in small and large manufacturing companies, Carrier (1998) reached similar conclusions. He points out that those systems rarely lead to sweeping innovations: “they were generally concerned with changes aimed at improving organizational efficiency and competitiveness, or with improving certain practices and procedures” (Carrier, 1998, p. 63).

Over time idea management systems have become increasingly sophisticated. This development has been enabled by the evolution of IT-tools which enable a systematic and efficient handling of ideas. As these systems have become more advanced the use of them has also been broadened. Idea management systems are today more useful not only for continuous improvements but also for coming up with new products (Cooper, 1993; Wheelwright and Clark, 1992; Day, Gold and Kuczmarski, 1994). According to Verespej (1992), suggestion systems can be a lucrative source of innovation in organizations. Flynn et al. (2003) report on one example of such an idea management system which is designed to operate at the front end of the innovation process, aimed at gathering and documenting opportunity identifications. The outputs from the system are ideas which then proceed into the product development process of the company.

Some researchers still argue that idea management systems primarily deal with minor improvements. For instance, Proctor et al. (2004) point out that these systems can be used as a way to improve bottom-up communication. They further note that most suggestions concern minor things and that they consequently

rarely have a major impact on the way the organization works. Though some researchers maintain this view, idea management systems are today often regarded as a management tool being used in order to give structure to the early phases of the innovation process (Boeddrich, 2004).

Gorski and Heinekamp (2002) developed a typology which summarizes much of the literature above about how suggestion boxes and idea management systems have been used (see Figure 1 below).

[Insert Figure 1 here]

They describe the suggestion box and the Kaizen Teian systems, and note that these were primarily concerned with continuous improvements. Gorski and Heinekamp (2002) also provide an illustrative example of how an idea management system can work as a part of the fuzzy front end of the innovation process. The described system primarily aims to promote collaborative exchange of new product ideas, to collect ideas in one single repository and to facilitate quick generation of new product ideas. By extensive use of web technology, the system is highly interactive, and different ideas can be exchanged, refined and reused. The system has also enabled an increased participation in the ideation process. Creativity has become more decentralized and people who have not historically worked in the early phases of innovation are now participating to a larger extent.

In conclusion, previous literature has primarily viewed idea management systems as a structured process for generating, absorbing and evaluating incremental innovation ideas. Some researchers argue that these systems can be used as a structured approach to the fuzzy front end whereas others state that they are primarily related to continuous improvements.

## 2.2 *The changing nature of innovation*

The field of innovation management has changed over the last decades. Researchers are increasingly trying to understand how established firms can respond to and generate discontinuous innovation. A discontinuous innovation can be defined as a major change, either technology- or business model-related (Veryzer, 1998). When technologies shift, new business models are introduced or new markets emerge, established firms can suddenly become vulnerable (Chesbrough, 2003). Over time, the field of discontinuous innovation has changed from primarily explaining incumbent failure (e.g. Tushman and Anderson, 1986) towards exploring how firms can proactively handle and generate it (e.g. Christensen and Raynor, 2002).

The area of business model innovation has also received more attention. The business model can be regarded as a construct which describes the value a firm offers to customers, the architecture of the firm, its network of partners, and its way of creating, marketing and delivering this value (Osterwalder and Pigneur, 2003). A growing body of literature has explored this area in detail (e.g. Charitou, 2001; Gilbert and Bower, 2002). Business model innovation is becoming increasingly important, both in order to appropriate returns from technological innovation and to increase the profitability in mature industries.

Another recent trend is that firms are increasingly drawing upon external resources in order to become more innovative (Chesbrough, 2003). Companies are re-thinking how they generate ideas and bring them to the market. Firms like Proctor & Gamble are bringing in more external ideas in order to leverage their internal R&D. One trend that is partly conflicting with the open innovation paradigm is the development towards intellectual capitalism (e.g. Granstrand, 2002). Productive assets and processes are becoming intellectual or non-material and this trend has to some extent called for an increased protection of those assets.

The broadened spectrum of innovation has implied that scholars are trying to understand how different forms of innovation can be managed within the same firm (e.g. Magnusson and Martini, 2008; Bessant, 2002; Tushman and O'Reilly, 2006). Interestingly, many scholars have underlined the importance of treating ideas differently depending upon the nature of the ideas (e.g. Bessant et al., 2005). For instance, former studies have concluded that discontinuous innovations need to be selected according to different

criteria than incremental innovation (Rice et al., 1998). Employing standard evaluation procedures might even be counterproductive since discontinuous innovations are fundamentally different from incremental ones. There is an apparent risk that ideas which are discontinuous or business model-related are filtered away, not because they are bad but because they do not fit into the current business model and evaluation process. Chesbrough (2004) refers to these ideas as 'false negatives'. Moreover, he concludes that companies need to alter their metrics of innovation in order to handle such initiatives. Summing up, the scope and perspectives on innovation have changed from primarily being concerned with incremental product innovation towards also looking at discontinuous innovation, business model innovation and open innovation. What new demands do these changes impose upon ideation activities and idea management systems?

### **3 Methods used**

Given the exploratory nature of this paper, an in-depth single case study seems to be a suitable method. This method enables the detailed, descriptive information which is needed in order to understand the nature of this kind of idea management systems. The case study below examines how the studied firm designed its idea management system in order to encourage both discontinuous and continuous innovation. Single case studies impose constraints upon the generalisability of the findings (Eisenhardt, 1989). However, as the work presented here is of an exploratory character, describing and seeking to understand the nature of this system and how it differs from previous descriptions of idea management systems, the method is deemed to be appropriate. Thus, the article does not attempt to provide an exhaustive definition of exactly what such a system may look like. Rather it aims to outline some of its key characteristics.

The firm was targeted since it has long experience of idea management and because it has changed its idea management system in order to handle different types of innovation. Hence, the chosen company offers an interesting opportunity for a detailed investigation of what an idea management system that handles different forms of innovation may look like.

The authors of this article maintain a formal research partnership with the studied firm and have been interacting with it continuously over the last years. This relationship enabled extensive access both to databases and to key employees. Both R&D managers and contributors to the idea management system were accessible for interviews. In addition to this, people who have been involved in the design and development of the system have been interviewed. In total, more than 30 interviews have been conducted, by the authors and by close colleagues. Some of this work was done within the scope of an innovation audit that was performed at the company. During the audit, interviews were conducted with top and middle management. The interviews were semi-structured, asking the respondents to describe how the idea management system works and how it differs from their previous system. All interviews were recorded, transcribed and listened to afterwards. Follow-up interviews were also performed in order to ensure an accurate interpretation of the gathered information. These data have been supplemented with statistics from the idea database. Here, all ideas within the company are stored and key information such as the assessment of the ideas can be found.

### **4 Results**

The studied firm develops and manufactures consumer products and has long experience of doing so. It is currently present in 90 countries and has three different business areas. Since 1995, the firm has managed some parts of its ideation process by using an idea management system. This system started as a way to handle the increased flow of ideas that came into the patent department.

[Insert Figure 2 here]

The purpose of the system was to capture, encourage, evaluate and select technological ideas for further investigation at the patent department (see Figure 2). It started within one business area and soon it

expanded into handling all of the firm's business areas. From the beginning, there has always been one person working fulltime managing the system. In addition to this, 10 persons from the different business units spend 10 percent of their time evaluating the submitted ideas. These people are highly experienced within R&D and product development. Many of them hold positions as senior researchers and are therefore regarded as competent when it comes to evaluating the technical feasibility of a new idea. This evaluation board is appointed by the R&D manager who also attends the evaluation meetings. When an idea is submitted, the most knowledgeable person is assigned to make an assessment. Each week, the evaluation team gathers, and those who have assessed ideas share their thoughts with the others. Then the group jointly decides what grade the idea should get on a scale from 1 to 5. The evaluation criterions are set after the value the idea can bring to the case company, foremost in terms of novelty and usefulness:

- 1 point - The idea is well known and/or hard to implement
- 2 points - The idea is known and/or has minor advantages
- 3 points – The idea is new and useful
- 4 points – The idea is new and has a clear inventive step
- 5 points – the idea is new and excellent

After the idea has been graded, it is either stopped, brought into idea refinement or handed over to the patent department. The idea initiator gets an email within about 2 weeks informing about the progress of the idea but all ideas are rewarded with gifts or money depending on the grading. The system makes extensive use of the company's intranet and everyone can submit ideas to it. It has grown steadily and today it also functions as an idea database. Thus, the system is also used in order to learn from earlier idea development, to reuse ideas in projects and also to inspire people in their daily work. When a new project starts, it is stated in the specifications that the idea database should be searched for ideas within the relevant area; R&D projects use the idea bank in the early phases of the project. In addition to this, employees can subscribe to new ideas within specific areas.

However, after a few years in operation, the people in charge of the system began to notice that although it successfully encouraged, stimulated and evaluated incremental technological ideas which led to patents, few discontinuous or business-related ideas were generated. Those which were submitted were rejected since they were not within the scope of the corporate strategy and the purpose of the idea management system. Having a background as a tool for handling patents, the system worked well for this purpose, but not for discontinuous technological or business ideas.

At the same time, a strategic shift in the company was taking place towards exploring new business areas. The firm started to move towards more business model innovation and discontinuous technological innovation. For instance, in 2002 the company launched a service organization in order to change the business model related to one of its major product innovations. Furthermore, it explored new technologies which are outside its core capabilities. Though the firm is still mainly focused on incremental product innovation, it has started to move into new areas. This strategic change had major implications for the ideation activities at the firm. Soon after this shift, the firm realized that its idea management system did not mirror the changed innovation scope. If a business idea was submitted it used to be rejected since the managers of the system did not have the competence or authority to evaluate business ideas. These ideas were then directed to the market organization, which was often too busy to develop such initiatives further. Moreover, the firm observed that the evaluation process tended to filter away discontinuous ideas. After the strategic shift, the company became increasingly aware of these problems and therefore decided to re-design the idea management system.

#### *4.1 The new idea management system*

The studied firm started to investigate how its system could be changed in order to handle different kinds of ideas. Previous experience suggested that different ideas needed to be evaluated and developed in different ways. Therefore the managers in charge of the system decided to make a distinction between "Inside the box" (ItB) and "Outside the box" (OtB) innovation ideas. "Inside the box" ideas were defined as incremental innovations with little market novelty and initiatives which are within the current competence

area of the firm. Those ideas which are completely new for the firm, in either the technological or business dimension, were defined as “Outside the Box” initiatives. However, all idea submissions are still made using the same template, which is briefly described in Figure 3.

[Insert Figure 3 here]

Hence, when an idea is submitted, it is first of all classified as either ItB or OtB and then it takes different paths depending upon its nature (see Figure 4). The classification is performed by the evaluation board and it is done by assessing the market and technology novelty of the idea in relation to the resources and capabilities of the company. For instance, if an established technology would be applied in order to develop products for a new customer segment, the idea would be classified as OtB. Conversely, a new process or product innovation which targets an established customer base would also be defined as OtB.

[Insert Figure 4 here]

The ideas which are classified as technological and inside the box go to the patent department for further investigation whereas continuous “inside the box” business ideas go to the market organization. These ideas are treated like other project initiatives within the firm. Since this part of the system has been in place for a long time it works without any major problems.

The ideas which according to the above mentioned criteria are regarded as OtB take a different path. They go to a recently started unit called New Business Development (NBD) which lies outside the rest of the organization and aims to evaluate, incubate and develop those ideas. The board of NBD is comprised of senior managers from many parts of the company such as the sales organization, NBD, R&D and sales development. Here, ideas which were previously regarded as undesirable can be developed further. For instance, one idea that concerned a potential collaboration with an actor in the packaging industry was judged to be OtB since the company had no past experience of doing this. In the evaluation of the idea, the board wrote “this is an interesting idea.... This will be handled further in the New Business Development Group.” With the old system, this kind of ideas would not have been absorbed by the company, nor would they have been developed further.

#### *4.1 The evaluation and development of outside the box ideas*

At NBD, the evaluation process differs in many respects from the assessment of incremental innovations. The process is less rigid here; rather than primarily evaluating ideas according to novelty and usefulness, the screening makes detailed assessments of the idea and in what ways it is OtB, what potential it has etc.

[Insert Figure 5 here]

Figure 5 gives an illustration of the different steps in the NBD evaluation and development. First, a coarse ItB/OtB assessment is performed by the person who is in charge of managing the system. Then a more detailed analysis of the idea’s nature is performed. If an idea is judged to be compatible with all existing capabilities it goes to the market organization (Cat). Those ideas which are deemed to be OtB are in the next step evaluated according to other criteria. There are three dimensions of the OtB evaluation: *Risk*, *Effort* and *Benefit*. *Risk* is comprised of market and technology risk, whereas the *Effort* dimension concerns difficulties related to the brand, the organization, customer insight and technological knowledge. The *Benefit* aspect deals with the potential market, possible learning and uniqueness. On all these different aspects, the idea is graded on a 1-5 scale. In the first step, the *Effort* assessment is made (the fine tuned assessment in the figure above) and in the next phase, the *Risk* and *Benefit* evaluations are made. These steps are performed by the board of the NBD group. By making the evaluation in two steps, the company believes that the risk of filtering out good ideas is reduced.

Moreover, the firm aims to be less strict here on profit calculations and growth prospects since past experience suggests that this may hamper OtB innovation. “*Big companies think big and therefore miss out on many initially small opportunities, therefore we try to avoid early calculations of profits and market*

*size*”, says the innovation manager at the company. If the business benefits are deemed to be larger than the risk and effort, the idea moves further into the Business Plan Development phase and later on to Concept Development. If the idea becomes an interesting concept it is in the next phase handed over to the market organization or launched as an independent venture. Though this process is more open-ended and iterative than the former one, the company has so far not managed to make it truly iterative, though they intend to do so. Since the NBD unit is still relatively small and has been started recently, it is hard to evaluate its performance at this point. So far, two major ideas have been developed further. The reason why these ideas have been nurtured in the NBD unit is that they were outside the current scope of the core business.

Several interviewees have underlined the importance of concept development and an extended fuzzy front end. The R&D manager says that the company should have a more experimental approach to innovation. The NBD initiative and the new evaluation process are regarded as major steps in this direction.

The new system was launched in May 2006. However, the firm started to receive business and OtB ideas already in December 2005 (see Figure 6). Figure 6 below contains data about the submissions of different forms of ideas from September 2005 until August 2007. It can be seen here that the percentage of OtB ideas (business ideas and technological ideas) has on average increased over time.

[Insert Figure 4 here]

The system has only been in operation for a few years and therefore it is too early to say now whether it will lead to any breakthrough innovations since this usually takes more time. The studied firm has encountered some problems in this shift. For instance, though improvements have been made since the launch of NBD, the company has still had difficulties finding time and resources in order to evaluate OtB ideas properly. Moreover, the firm did not initially have a landing ground for discontinuous ideas. Since the previous idea management system aimed to generate patents, there was always an obvious receiver of the ideas, namely the patent department. The NBD unit is intended to work as a landing ground for these ideas. The managers in charge of the system recall that it took a while before the first system that was launched in 1995 worked properly and thus they expect the new system to be improved over time. However, other interviewees are more skeptical and think that the company may in fact be too focused on the system and that so much structure may hamper its innovation capabilities. Others claim that this new approach gives OtB ideas a new chance and that the system is of much symbolic value since it encourages employees to submit ideas which used to be undesired. Thus, the new idea management system can help to nurture a new culture, where OtB ideas are welcomed. An additional benefit is that OtB ideas are stored in the company’s idea database and can be found and used later.

## **5 Analysis**

It can be seen in the case study above that the nature of innovation at the studied firm has changed significantly. The company went from having primarily focused on cost-cutting and incremental innovation towards more discontinuous and business model innovation. Though the firm is still very product- and patent-oriented in its innovation activities, the strategic shift still implied that the idea management system had to be re-designed in order to match the changing scope of innovation.

As can be seen from the description of how the firm’s idea management system used to work, it is clear that most of its features have been described by previous literature regarding idea management systems. The purpose of the system was to generate and encourage continuous improvements as well as new products or ideas for innovation (Boeddrich, 2004; Cooper, 1993; Wheelwright and Clark, 1992). The extensive use of IT enabled it to be highly interactive – ideas could be refined, exchanged and re-used in different projects. An additional advantage was that all ideas could be stored at one single repository within the firm. Hence, the previous system had many similarities with the one that Gorski and Heinekamp (2002) used as an illustrative example.

Having a background as a tool for handling patents, the idea management system worked well for this purpose, but not for ideas which were technologically discontinuous or business-related. The fact that ideas

which were not intended to result in patents used to be filtered out illustrates some of the shortcomings of the previous idea management system. In line with Chesbrough (2004) some of these ideas were probably “false negatives”, i.e. initiatives which for some reason were not developed further despite having a great potential.

In order to cope with the increased variety of ideas, the firm made several changes of its system. The new system does not fit into any of the descriptions in the typology by Gorski and Heinekamp (2002). First of all, it differs in the sense that innovation ideas follow different paths depending upon their nature and scope (see Figure 4). It can be seen in the case study above that a distinction is made between different forms of ideas.

Secondly, the evaluation and development process is different depending upon the nature of the idea. ItB technological ideas are primarily evaluated in terms of their degree of novelty and usefulness. The initial assessment of OtB ideas rather focuses on understanding their nature, and in what aspects they are discontinuous. Then the actual evaluation is done by using the *Risk*, *Benefit* and *Effort* dimensions. Interestingly, some aspects of those dimensions are not related to direct financial results. For instance, learning and uniqueness are factors which are hard to measure and evaluate from a profitability perspective but are still used as evaluation criteria. Moreover, the evaluation is made in steps, the *Risk* and *Benefit* aspects are dealt with after the *Effort* assessment has been made. By making a step-wise assessment, the company believes that the risk of ending up with “false negatives” is reduced.

Thirdly, the ideas are received by different units. Discontinuous technological ideas and business ideas go to the New Business Development group, which aims to develop and commercialize ideas that are adjacent to the core activities of the firm, whereas incremental technological ideas are handed over to the patent department.

These three observations indicate that the system in fact has a dual structure. Having a dual system is in line with many of the managerial prescriptions from the literature about discontinuous innovation, which underlines the importance of treating it in a different way than continuous innovation initiatives (e.g. Rice et al., 1998; Magnusson and Martini, 2008; Tushman and O’Reilly, 2006). Using a dual idea management system seemed in the case study above to be an attempt to overcome the dilemma of false negatives. The fact that these ideas used to be filtered away and that the firm started to receive business ideas even before the official launch of the new system can be regarded as a confirmation of this.

Summing up, the case study above has described an idea management system which does not seem to fit into previous typologies in the literature. Historically, idea management systems have been used as either a tool for continuous improvement and incremental innovation or as a structured approach to the early phases of new product development. The system described above differs from previous typologies in the sense that it has a dual structure, i.e. ideas are evaluated and developed in different ways depending upon their nature. Since these properties have not been covered by previous literature, this calls for an extension of existing typologies of idea management systems. We propose that this new category of idea management systems ought to be referred to as *Dual Idea Management Systems* since the submitted ideas are evaluated and take different paths depending upon their nature.

## 6 Discussion

As was noted above, having a dual idea management system is in many respects in line with the managerial practices related to discontinuous innovation. Moreover, the design of such a system is consistent with Ashby’s law of requisite variety (1969), which states that the larger the variety of actions available to a control system, the larger the variety of perturbations it will be able to compensate. A larger diversity of ideas seems to imply that the system which handles these ideas also needs to become more complex.

However, developing discontinuous innovations is an inherently uncertain and complex process and having a structured approach to this may therefore not be the right way forward. After all, many firms want to

employ strict financial criteria to the evaluation of innovation ideas. Having a highly structured, albeit dual, approach to ideation may result in the very opposite of what was originally intended.

Moreover, the literature on discontinuous innovation has underlined the importance of informal networks and having “champions” in a project (Veryzer, 1998) in order to succeed. Skunk work and other forms of loosely organized innovative activities have often turned out to be critical for the development of discontinuous innovations. Thus, the success factors related to discontinuous innovation may often be related to other things than having a highly structured idea management system and therefore firms should not expect that such a system will necessarily lead to a much greater innovation capability.

Summing up, this article does not argue that having a dual idea management system is necessarily the optimal way of handling the early phases of the innovation process. Rather, it has pointed out that the changing nature of innovation has imposed new demands upon ideation and that idea management systems need to be changed in order to meet this demand. The studied firm has realized that it needs to treat different forms of ideas in different ways and that all ideas cannot go through the same funnel. The idea management system which is described in this paper offers an illustrative example of how such a system can be designed in order to meet some of the new demands on ideation.

## 7 Conclusion

This article has explored the characteristics of idea management systems that aim to meet some of the new demands upon ideation that follow from the changing nature of innovation. The findings suggest that previous literature on idea management systems has not covered this aspect and that past typologies ought to be extended into also incorporating dual idea management systems. The studied system is dual in the sense that it deals with both continuous and discontinuous innovation, and does so by making a distinction between them and then treating the ideas differently by employing different processes and evaluation criteria. Having a dual approach is in line with much of the recent literature on discontinuous innovation which underlines the importance of treating discontinuous and continuous ideas differently.

However, it is still not obvious that such an approach to ideation is preferable; it may lead to excessive structure and bureaucratization. As was noted in the discussion part above, it is unclear how well such dual systems actually perform. Hence, more research needs to be undertaken concerning dual idea management systems and how well they work. Furthermore, there is an ongoing shift in idea management from workflow driven approaches towards community driven evaluation. Since the firm studied has not undergone such a shift, this aspect could not be assessed here. It would be interesting for future research to investigate how these different approaches affect what the degree of innovation ideas that is generated.

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## Figures

Type of idea management system	Main characteristics and scope
Suggestion Box	Can be anonymous, usually a broad scope
Kaizen-Teian systems	Incremental innovation and continuous improvements
Employee-driven idea systems	Quality and continuous improvement
Web-based idea collaboration programs	More interactive

Figure 1: A typology of idea management systems (Gorski and Heinekamp, 2002).

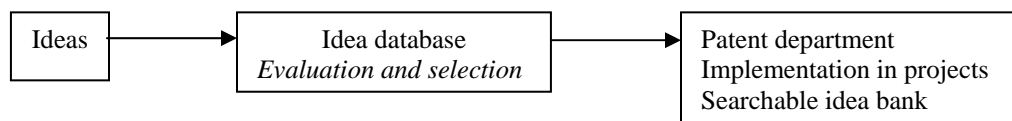


Figure 2: The studied firm's idea management system in 1995.

Dimensions of the idea submission template	A brief description of each dimension
Problem/Opportunity	What customer need the idea addresses.
Idea	Key elements from the ingredients, the manufacturing process, the packaging, the marketing, or the sales set-up.
Consumer benefits	A clear and single-minded description of the most important benefits for the consumer, in order of priority.
Company benefits	A description of benefits for the company if the idea was implemented. What would give us an advantage on the market?
Possible disadvantages	What are the main drawbacks of this idea?

Figure 3: The idea submission template used at the case company.

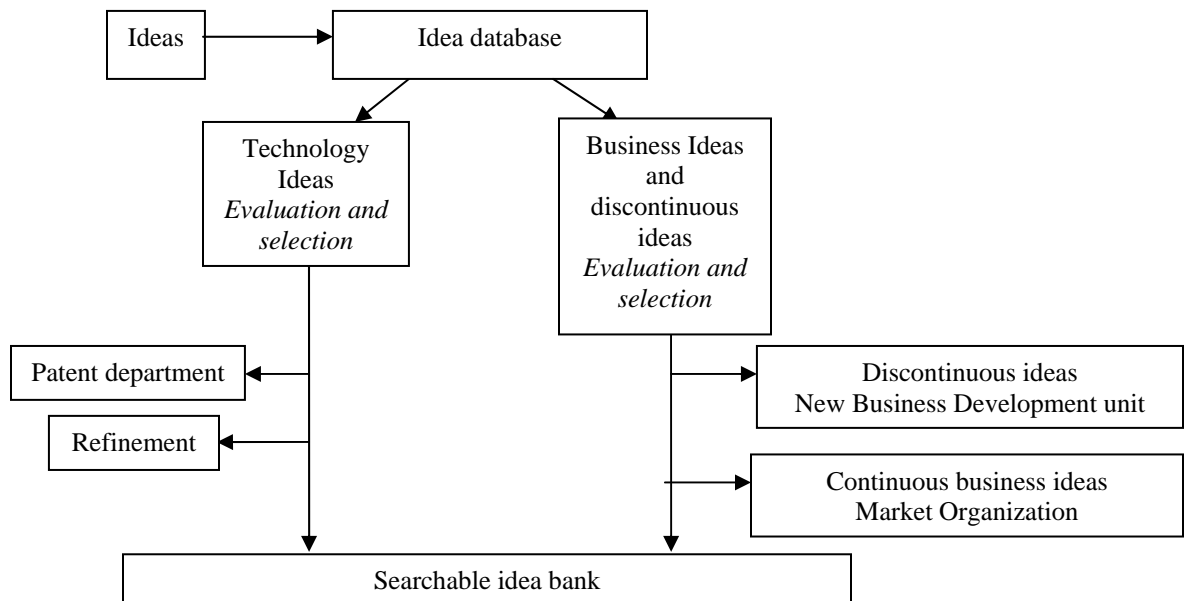


Figure 4: The new idea management system that the studied firm launched in 2006.

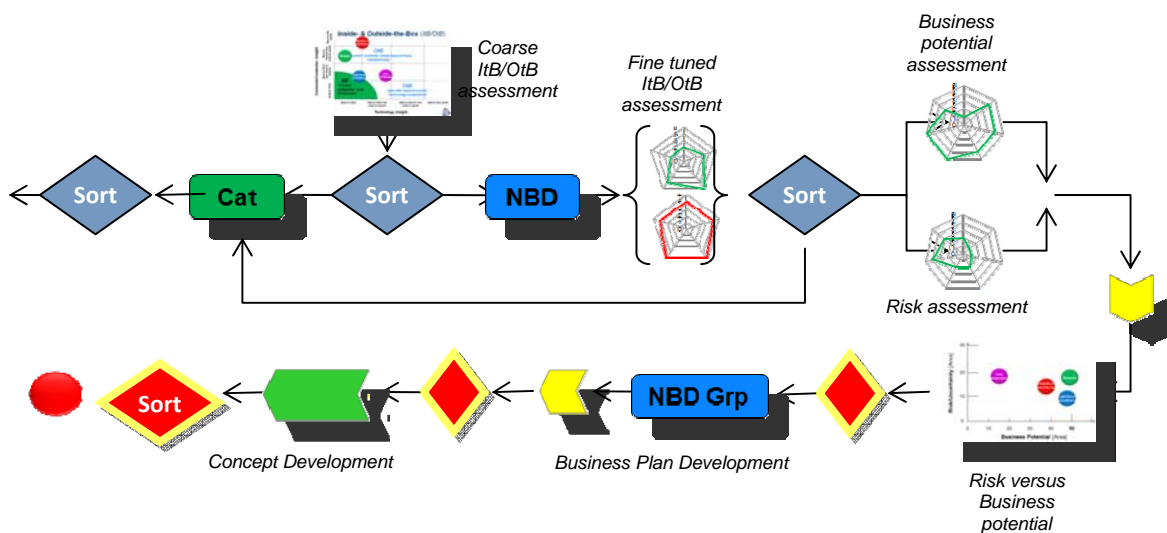
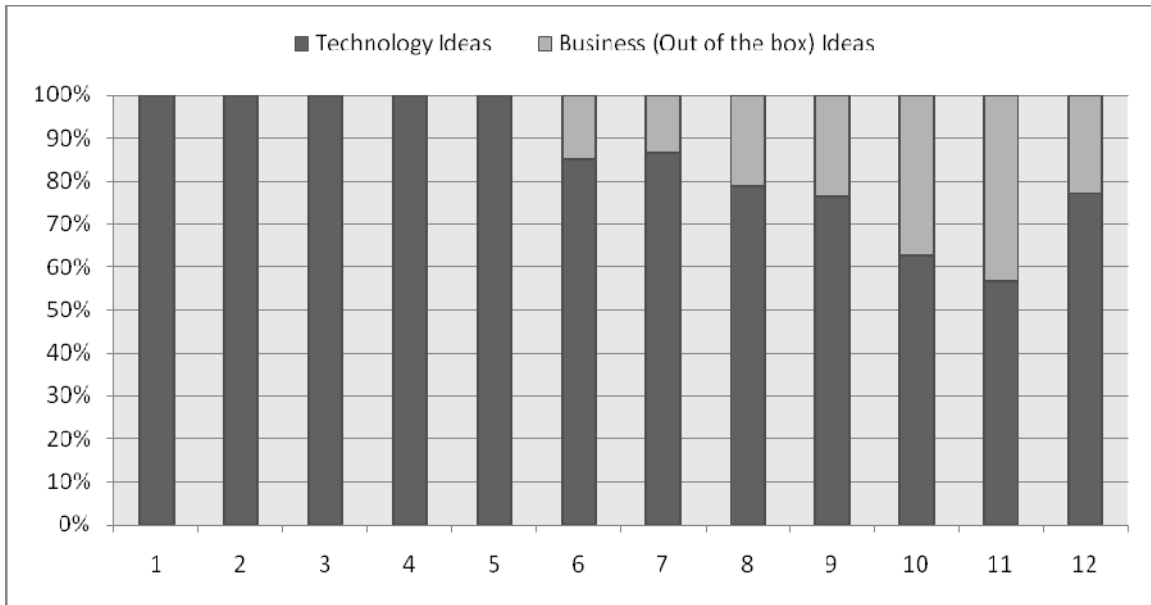


Figure 5: The development process for business ideas and discontinuous ideas. It starts with an ItB/OtB assessment and then takes different paths depending upon the nature of the idea.



*Figure 6: The percentage of ideas that are related to technology, business and Out of the box submitted to the idea management system each quarter from September 2004 until August 2007. The light gray color represents all OtB ideas, i.e. both technology and business related ideas.*

## **Paper 3**

# **Overcoming Innovation Adoption Barriers**

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### **Abstract**

**Purpose** – The purpose of this paper is to explore how a firm can overcome innovation adoption barriers that occur inside the customer’s organization.

**Design/methodology/approach** – An in-depth case study of a company that launched a product innovation which had discontinuous effects inside the customer’s organization has been performed. The case study is of particular interest since it provides a good illustration of these challenges as well as showing how they can be handled.

**Findings** – The product innovation created a discrepancy between where the value was created in the customer’s organization and how it used to be appropriated. This barrier to adoption was circumvented by extending the value proposition, creating a service organization and changing the incentive structures in the supply chain.

**Practical implications** – Firms must assess the discontinuities that an innovation may create inside the customer’s organization. The case study illustrates that this can be done by identifying those actors that are affected by the innovation, figuring out the incentives behind this and aligning them to the new distribution of value.

**Originality/value** – The article illustrates that a more nuanced view of the different interest groups in the customer’s organization must be applied in order to overcome challenges related to discontinuous innovations. In addition to this, it offers new explanations to why many firms are moving downstream in the value chain.

**Keywords** Discontinuous Innovation, Value Proposition, Adoption, Services

**Paper type** Research paper

### **1. Introduction**

It is well documented that established firms encounter difficulties when trying to develop discontinuous innovations. Incumbents are usually good at incremental innovation, but when technologies or business models change, new markets emerge or the regulatory frameworks of an industry are altered, they find it hard to adapt to these shifts.

There are many explanations of such incumbent failure. Historically, such failure has often been attributed to an inability to renew the firm’s resources, structures

and capabilities (e.g. Henderson and Clark, 1990; Tushman and Anderson, 1986). More recent literature has looked beyond the boundaries of the firm in order to understand why established firms encounter problems when facing discontinuous innovation (e.g. Christensen and Rosenbloom, 1995). Christensen (1997) argues that the customer imposes a great indirect control of the resource allocation process inside a company and that this is one main reason why established firms encounter problems under conditions of discontinuous change.

Hence, it can be concluded that there are many barriers to succeeding with discontinuous innovations, both inside a company and outside its boundaries. In line with this, Afuah and Bahram (1995) argued that an innovation may be incremental for the manufacturer while at the same time be discontinuous or radical for customers or suppliers. Based upon this argument, they develop a model called the hypercube of innovation, which essentially states that the different actors in the supply chain need to be considered when assessing the difficulties related to introducing discontinuous innovations.

The literature about discontinuous innovation has increasingly looked outside the boundaries of the firm, but it has rarely addressed events inside the customer's organization. While this is hardly a new approach in the supply chain management literature, the discontinuous innovation literature has often regarded the customer as one distinct actor, rather than as an organization which comprises several heterogeneous interests. Such a simplification may in some cases conceal the challenges which are related to successful commercialization, especially when an innovation is sold to industrial customers, where it may create new economic value on many levels in an organization. This article seeks to understand barriers to innovation adoption inside the customer's organization and how those can be handled. This is done by conducting an in-depth case study of the commercialization of a product innovation. The case is particularly interesting since it illustrates both the problems that may occur and how they can be managed.

The remainder of this paper is organized as follows. The next section reviews some literature on discontinuous innovation and value networks. The subsequent section contains a description of the methods used in this paper. Then the case study is presented in order to illustrate the particular challenges encountered and how they were handled, whereas the following part analyzes these results. The final section contains a conclusive remark.

## **2. Received theory**

A discontinuous innovation can be defined as a major change, related to either a technology or a business model (Veryzer, 1998). Discontinuities arise from shifts along technological, market, political and other frontiers and they demand new or at least significantly adapted approaches to their effective management (Phillips et al., 2004). The business model can be regarded as a construct which describes the value a firm offers to customers, the architecture of the firm, its network of partners, and its way of creating, marketing and delivering this value (Osterwalder and Pigneur, 2003). A growing body of literature has explored the area of business model innovation in detail (e.g. Markides, 1997, 1998; Charitou, 2001; Gilbert and Bower, 2002). A business model

innovation can be defined as a reformulation of what an existing product or service is and how it is provided to the customer (Markides, 2006).

Established firms are usually highly competent at the “steady state” or incremental innovation. But when technologies shift, new business models are introduced or new markets are created, they can suddenly encounter problems (Chesbrough, 2003). Frequently, incumbent firms do not manage these changes; they lose market shares and the successful firms are found among the entrants (Utterback and Kim, 1986; Christensen and Rosenbloom, 1994). Many scholars have tried to understand what is sometimes referred to as “the incumbent’s curse” (Foster, 1986). Answers to this puzzle have often been sought by looking inside the firm (e.g. Cooper and Schendel 1976; Henderson and Clark, 1990). For instance, Tushman and Anderson (1986) wrote about competence-enhancing and competence-destroying innovations. They argued that innovations which require the destruction of a firm’s existing competencies are very difficult to manage, because established firms are bound by traditions, sunk costs and internal political constraints.

Over time, this stream of literature has shifted from primarily looking inside the firm towards exploring its environment. Christensen (1997) drew upon the concept of value networks (Christensen and Rosenbloom, 1995) and resource dependency theory (Pfeffer and Salancik, 1978) in order to explain incumbent failure. This theory suggests that a firm’s freedom of action is in fact controlled by actors outside the boundaries of the company, e.g. customers and investors. Since the customers and owners are the key stakeholders that provide the firm with resources, they also impose a great indirect control on what decisions are taken and how resources are allocated. Consequently, a key determinant of the probability of success for an innovation is the extent that it addresses the needs of actors in an incumbent firm’s current value network.

Hence, the literature regarding discontinuous innovation has shifted over time, from looking primarily inside the firm towards addressing the value network of the firm. Afuah and Bahram (1995) argued that a firm must assess whether the innovation is discontinuous for any of the actors throughout the supply chain or not. They introduce a model for this which is called the hypercube of innovation and argue that many innovation studies tend to neglect the effects on the customer’s capabilities and assets. In line with this, other researchers have also argued that an innovation needs to be understood in terms of newness for every actor in the supply chain that is affected by it (Assink, 2006; Doolin, 2007).

This approach to innovation adoption is different from those models which regard the process as a linear set of events (e.g. Mintzberg et al, 1976; Simon, 1977). The model developed by Rogers (1995) assumes that customer preferences follow a normal distribution and that adoption follows an epidemic pattern based upon the properties of the innovation. While many scholars have increased our understanding of the adoption process by applying this perspective (e.g. Moore, 1991), it may be over-simplistic when addressing other adoption patterns. Seligman (2006) argues that the adopter is often treated as a black box and that it needs to be understood in a better way. An over-simplistic view of the customer may conceal some important challenges, particularly in business-to-business settings. Under these circumstances, adoption often involves several actors and interests inside both organizations. Hence, the adoption process is often much

more complex and several challenges related to this are likely to occur. By downplaying the heterogeneity of interests within the customer's organization, some of those difficulties and solutions related to succeeding with discontinuous innovation may be overlooked.

This article applies a more nuanced view of the customer and seeks to understand what barriers to adoption may occur inside the customer's organization. The case description is particularly interesting since it not only addresses some important challenges but also points out what mechanisms that can help a company to succeed with this.

### **3. Method and research setting**

This paper is based upon an exploratory single case study, which examines how the studied firm developed, launched and eventually succeeded with such an innovation.

The present authors maintain a formal research partnership with the studied firm and have been interacting with it continuously during the last year. This relationship enabled extensive access both to databases and to key employees. People who have been involved in both the technological and commercial development of the product were interviewed. The interviews were semi-structured, asking the respondents to describe the development of the product, in what respects it was discontinuous, what the main difficulties were, and why the product could eventually be turned into a commercial success. Follow-up interviews were also performed in order to ensure an accurate interpretation of the gathered information. All interviews were recorded, transcribed and listened to afterwards.

In order to obtain a contextual understanding of the company and its innovation activities, scorecards have also been sent out regarding the creative climate at the company and the innovative capabilities of the firm. In total, more than 150 people answered these scorecards, giving a total response rate of more than 70 percent. This was done within the scope of an innovation audit that was performed at the firm. During the audit, interviews were conducted with top and middle management. Moreover, detailed case studies of nine discontinuous innovation projects at the firm have been performed within the scope of the research which this paper is based upon. These data should be regarded as important background knowledge for the study described here.

Single case studies impose constraints upon the generalizability of the findings (Eisenhardt, 1989). However, as the work presented here is of an exploratory character, describing and seeking to understand what difficulties a firm encounters when launching an innovation with discontinuous effects inside the customer's organization and how these challenges were handled, this method is deemed to be the most suitable one. Thus, the article does not attempt to provide an exhaustive set of answers, but rather to outline some of key challenges and how they can be handled. Moreover, the case study approach enables the kind of detailed, nuanced description that is required in order to understand how the presented challenges can be managed.

### **4. Case description**

The studied product innovation is a diaper for adults, intended to take care of heavy incontinence among elderly people. It was first launched in 2001 and then re-launched in 2002. The technical development started ten years earlier within a concept development project. Initially, the scope was more open, with the purpose of generating new knowledge rather than aiming for a new product. This development eventually resulted in an ambition to launch a new incontinence product, which would be based upon a belt, instead of having a pant diaper or using tape when attaching it. There were several technological challenges in the project. A belt had to be developed, and by that time belts were rarely used in incontinence products. Moreover, both the absorption core and the shell of the diaper had to be improved.

The first attempt to commercialize the innovation took place in 1994. New machines were built and this was done at the same time as the product was developed due to strong pressure from management. Eventually this development turned out to be very expensive and it increased the complexity of the project significantly. Therefore the project was put on hold for some years, but since the firm's products for heavy incontinence became increasingly subject to price competition, the firm decided to re-start the development activities in the late 1990s and thereby replace the 'all-in-one' diaper the firm had been selling previously. *"There was a strong commitment from an early point; management really believed that new products had to be developed in order to survive in the long term"*, one project manager recalls. This time the technological ambitions were lowered. Instead of using a belt, it was decided that the product should be attached with tape, since this would be cheaper. When the product was launched in 2001 it turned out that this tape made the product too stiff and very uncomfortable to wear. Therefore it had to be withdrawn from the market and the brand was severely damaged.

However, management still believed in the product and therefore decided to improve the belt and re-launch it in 2002. Once the product had been put on the market again, the sales did not take off, for several reasons. The new design made the product appear inferior, though it was in fact much better, both in terms of absorption capacity and in terms of convenience for the users. More importantly, the price was higher, and thus it was difficult for the sales organization to justify to the purchasers at retirement homes why they should buy the product. Previously, the firm had mainly offered products which could last longer, thereby lowering the customer's expenses. Though the new product resulted in an improvement along this performance dimension, the main difference was that it enabled cost reductions by decreasing the total cost of incontinence care. The "consequence costs" in terms of unnecessary product consumption, extra work, laundry and skin treatments could be reduced significantly. Up to 10 percent of the total cost could be removed, and since the cost of incontinence products only summed to 1 percent of the total incontinence care cost, this reduction was indeed remarkable and would easily justify a higher price. The main reason for this reduced incontinence care cost was that problems with skin irritation and leakages could be decreased. This improvement was primarily related to the breathable back sheet which enabled air to circulate instead of having the fluid circulating. The back sheet thus helped to maintain a healthier skin while at the same time increasing the comfort.

Hence, the new product resulted in fewer pad changes, less leakage and skin breakdowns, and this led to a significant reduction of the total incontinence care cost.

But since the purchasers at retirement homes were not assigned to handle the total cost of incontinence care but only the costs of incontinence products, they had in fact low incentives to buy this innovation, despite its superior performance. Moreover, the sales organization preferred to sell the old products since they did not know how to justify the higher price. Thus, the incentives both to buy and to sell the product were initially very low. It also proved difficult for the caregivers to understand how the product should be used. The innovation was easier and more convenient to put on, but how to do so was not obvious, and therefore the product was not really appreciated by the caregivers either, despite being more ergonomic when used correctly.

To sum up, even though the innovation offered increased convenience both for users of the product and for the caregivers, while at the same time creating significant cost reductions for retirement homes, the product was about to become a failure. *“We underestimated the barriers to success and therefore the product was initially a commercial failure”*, one engineer recalls.

However, the firm still believed in the innovation since it clearly created an increased economic value for the customer. Therefore the company started to look for new ways of selling it, by focusing on different attributes and sales channels. One major step in this direction was the launch of a service organization which aimed to take a broader perspective on sales, focusing on total incontinence care rather than just selling products. This can be illustrated by the motto of the organization, which is *“better care at a lower total cost”*. The new unit sought to communicate these values by performing studies together with customers, which showed the superior performance of the innovation. In one study together with six Danish municipalities it was proven that the customer’s total cost for products could be reduced by 22 percent and that leakages could be reduced from 25 percent to 10.6 percent. In another study, they focused on the total cost of incontinence management, illustrating that it could be reduced by 13 percent. Moreover, by using simulations, the service organization showed the customers how the “hidden” costs of incontinence in terms of leakages, the required time for pad changes, and skin breakdowns could be reduced significantly.

Apart from focusing on new performance attributes, the firm started to work actively with educating caregivers regarding how to use the product. The innovation manager says that *“it was not really intuitive how the product should be put on, but once we showed the caregivers how it is done they found it to be much more convenient than to use the old products”*.

The service organization also performed a study together with Linköping University, where they could show that the innovation was in fact much more ergonomic for the caregivers. This was an entirely new performance attribute for an incontinence product that the firm was scarcely aware of when the product was first launched, even though this had been a focus area in the development ten years earlier. This implied that the costs related to employee absence due to illness could be reduced, thus lowering the total cost of incontinence care even further. Once these studies had been performed, the sales force felt more confident selling the product. Furthermore, the incentives of the sales organization were changed so that the employees received their annual bonus based upon how much they sold of the new product. The sales channel was also shifted towards the management of retirement homes, since they could focus on total incontinence care

costs rather than solely the costs for the products. By using advanced statistics and computer simulations, and extending the value proposition, it was proven that the innovation decreased the total cost of incontinence care significantly, and this argument turned out to be more appealing to the managers than to the purchasers.

After these measures, sales eventually started to take off and have been growing rapidly during recent years. The innovation manager summarized the story by saying that *“the product would not have become a commercial success if a service organization had not been initiated and the sales approach had not been changed.”* Moreover, top management had been firmly committed and was not reluctant about cannibalizing upon previous products, primarily because the profitability was much higher.

## **5. Analysis and discussion**

This section will analyze and discuss the findings that emerge from the case study above. It will focus on three different areas: the changed value proposition, how the product innovation created a demand for services and how incentives can be aligned throughout the supply chain.

### *5.1 Changing the value proposition and target new actors*

One important explanation for why the innovation did not take off initially seems to be that the appropriation of economic value is distinct from the creation of it (Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002). Hence, the case description above illustrates how important it is to investigate where and for whom an innovation has discontinuous effects (Afuah and Bahram, 1995). The product created economic value which was spread in a different way than previous products had done. The increased value was distributed over the end-users in terms of convenience and reduced skin irritation, the caregivers because the product was much more ergonomic, and the retirement homes by offering a significant cost reduction for total incontinence care. However, the individual purchaser was not assigned to take this value creation into consideration, and this in combination with the higher price per unit created an adoption barrier. This observation suggests that it may sometimes be misleading to view customers as single entities with only one aggregated utility function, rather than as a collection of individual actors with distinct and sometimes conflicting interests. The case study above shows that a customer can indeed contain many diverging utility functions, and that this needs to be taken into account as a particular adoption barrier when introducing some innovations. Thus, if customers are viewed as one homogeneous entity, some of the specific challenges and barriers to adoption may be concealed. As firms are to a larger extent drawing upon external sources in order to innovate and become more interconnected (Chesbrough, 2003), the difficulties described above have probably increased over time.

The studied innovation eventually became a success because several changes of the business model were made. According to Chesbrough and Rosenbloom (2002), firms should focus on the demands of users or customers and how to appropriate the value generated by satisfying those needs. Consequently, when new value is created and distributed in a different way, the way of appropriating this value has to be aligned with

this shift. Given that the product created value for the customer's organization on a systemic level, rather than on the level of the individual purchaser, the firm had to extend its value proposition in order to make it appealing for the retirement homes, as well as shifting the sales channel. This was done by initiating a service organization, which focused on the total cost of incontinence care, thus targeting the retirement homes on a systemic level rather than the individual purchaser. This is illustrated by the fact that the service organization's motto is "*better care at a lower total cost*". By gathering information and statistics which proved that the innovation indeed lowered the total cost of incontinence care, the performance dimensions were aligned towards the customer on a systemic level. By taking these measures and approaching the managers rather than the individual purchasers, the firm sought to develop a mutual understanding of the costs for incontinence care and thereby make the product more appealing.

This finding has further implications for models of diffusion and adoption of innovations. Such models often regard adopters as single entities with a homogeneous utility function. The diffusion model stipulated by Rogers (1995) is one of the more widely acknowledged ones. It focuses on relative advantage, complexity, compatibility, trialability and observability. The case study in this paper suggests that while models that address the properties of a product and customer preferences may highlight many of the important aspects of innovation diffusion, they may hamper the understanding of how and why some product innovations succeed if they do not address the heterogeneity of interests within a customer's organization. A particular issue in order to cross the chasm (Moore, 2002) and reach the early and late majorities of adopters with a new product seems to be related to aligning the business model with where the creation of value occurs within the customer's organization. This finding is partly in line with Leonard-Barton (1990) who emphasized that misalignments between an innovation and an adopting organization will require changes in the innovation or the organization in order to be diffused successfully.

### *5.2 Product innovation driving the shift to services*

The case study above is also offering an interesting explanation for why manufacturing firms are increasingly moving from providing products to offering integrated solutions (e.g. Davies, 2003). These authors argue that competitive advantage is not simply about providing services, but how services are combined with products to provide a better offer.

Many arguments for moving into services have been brought up by previous literature. For instance, Knecht et al (1993) underlined that significant revenues can be obtained from an installed customer base, Anderson et al (1997) argued that services in general have higher margins than products. Commoditization and East Asian competition in manufacturing, as well as stagnating product demand are other supply-side related explanations for why firms are increasingly moving into services (Slywotzky, 1996). In addition to this, there are many demand-side explanations. An increased pressure to focus on core competencies has created a demand for service-based activities (Lojo, 1997).

However, none of these explanations help us to understand why the case company eventually created a service organization. There was no strategic intention to move downstream when the firm developed or launched the new incontinence diaper. Moreover, the customer's did not demand this either since they were satisfied with the existing products. The main reason why the case company created a service organization

was that the economic value could not be appropriated without it. Developing a service organization turned out to be necessary in order to align the value proposition with the new distribution of value inside the customer's organization. Thus, it was not the customer, nor the supplier which initiated this shift, it was the product and its different properties that generated a need it. The case company changed from selling incontinence products towards providing incontinence care at a lower total cost. Launching a service organization was an integral part of this new value proposition. Furthermore, the customer had to be educated about how to use the product and a closer relationship was needed to communicate the value that was created. Hence, there seems to be an interdependency between product and service innovation that has not been sufficiently captured by previous literature. Though similar issues have been addressed by Björkdahl and Holmén (2009), this case is different in that the studied product created a new distribution of economic value inside the customer's organization and that a service organization was needed in order to communicate and appropriate it.

### *5.3 Aligning incentives throughout the supply chain*

The case study also illustrates the importance of aligning incentive structures, inside the company as well as inside the customer's organization. Some of the literature which may enhance the understanding of this issue can be found in the field of supply chain management. Supply chains extend across several functions in many firms, and thus aligning the incentives of these actors becomes crucial in order to succeed in the implementation of major changes (Narayanan and Raman, 2004; Lee, 2004). Though this literature looks at the flow of goods, it seems to be useful also when studying the diffusion of innovations, mainly since it takes a systemic approach by looking at value chains and assumes that a firm can only impose direct control over one entity in this system. The same assumption seems to be valid when firms are increasingly interconnected in their innovation processes. In the same way as firms must acknowledge that incentive misalignments exist in supply chains and that this may create a barrier to change (Narayanan and Raman, 2004), they also need to recognize that such misalignments may result in a blockage to successful diffusion of innovations. However, in the case of introducing innovations, the challenge becomes more related to issues such as uncertainty, complexity and communication.

In the case study above, the innovation created a new distribution of economic value and thus, the old incentive structure created a barrier to adoption. The purchaser was not assigned to take the total cost of incontinence care into consideration and therefore lacked incentives to buy the product, despite its superior performance. Moreover, since the caregivers did not know how to use the product, they could not grasp its value. In addition to this, the sales organization did not know how to motivate the higher price and were therefore more eager to sell the old products instead. Summing up, a product which created a superior economic value did not take off because it was not compatible with the established incentive structure.

The case provides a good illustration of how these incentive structures need to be altered in order to succeed. A new business model, an extended value proposition, changed bonus structures for the sales organization and a shift in the sales channel – all these actions contributed to aligning the incentives in favour of the new incontinence diaper. Given that a firm is to a large extent dependent upon actors outside its boundaries

and can only impose limited control over them, incentive alignment seems to particularly important when introducing innovations that have effects inside the customer's organization.

## **6. Concluding remarks and managerial implications**

This article has explored some of the challenges a firm may encounter when launching a discontinuous innovation by looking inside the customer's organization and has also sought to investigate how these issues can be managed. The case study provides a good illustration of those challenges but maybe more importantly, it has pointed out how firms can break out of existing resource dependencies (Christensen, 1997) and overcome these barriers to adoption.

While previous literature has often looked both inside incumbents in order to understand the challenges related to discontinuous innovation (e.g. Tushman and Anderson, 1986) and outside the boundaries of the firm (e.g. Christensen, 1997), this paper has taken a different approach and looked inside the customer's organization. In doing so, it has illustrated how this perspective can help to identify some important challenges related to succeeding with discontinuous innovation. This finding indicates that the literature on discontinuous innovation ought to take the heterogeneous interests in an industrial customer's organization into consideration when addressing the challenges related to the commercialization. By regarding the customer as a collection of actors with several, sometimes diverging utility functions rather than as one single actor, barriers to innovation adoption can be identified. The article therefore suggests that the concept of value networks ought to be extended into also looking at different actors inside the customer's organization. When downplaying the heterogeneity of interests within the customer's organization, some of the difficulties and solutions related to succeeding with discontinuous innovation may be overlooked, in particular when innovations are sold to industrial customers. In the case study above, the discrepancy between where the value was created and how it used to be appropriated was identified as a particular innovation adoption barrier. In addition to this, the caregivers did not know really how to use the product.

The paper has also given some suggestions regarding how these challenges can be managed. It has underlined the importance of changing the value proposition in order to align it with the new value that the product created. In the case study above, this was done by extending the value proposition and changing the sales channel. One important element in this shift was the launch of a service organization. The case illustrates how product and service innovations are sometimes interrelated. Neither the customer nor the supplier had requested the launch of a service organization. Instead, it was the product's new way of creating economic value that forced the case company to build a service organization. Moreover, the article has illustrated the importance of aligning incentives throughout the supply chain in order to succeed with discontinuous innovations.

There are several important managerial implications that emerge from this research. The article suggests that firms need to maintain a more nuanced view of the different interests in the customer's organization. All stakeholders that are affected need to be identified in the first phase. Then an analysis of the different incentives that govern

these actors should be undertaken. In this case study, the company used this input in order to identify barriers and then sought to align both the incentive structure and the value proposition to the innovation.

The findings in this paper indicate that products which create new value throughout entire supply chains may be even more problematic to commercialize. When more actors with diverging internal interests are affected by the introduction of an innovation, the challenges are likely to become even greater. Moving further into those issues may be fruitful for future research regarding discontinuous innovation.

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