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Ambidextrous Product Development

- An investigation into the tension between exploration and exploitation

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Abstract

Title:	Ambidextrous product development - An investigation into the tension between exploration and exploitation
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Authors:	Johan Dreber and Oscar Hedström
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Keywords:	Exploration, exploitation, tension, ambidexterity, product development process.
Purpose:	The purpose of this study is to investigate what drives the tension between exploration and exploitation in a product development process (PDP) as well as trying to understand if and how it can be managed.
Research questions:	What drives the tension between exploration and exploitation in a product development process? How can the tension between exploration and exploitation be managed in a product development process?
Methodology:	A single case study with both deductive and inductive elements was used. Data mainly from interviews support our findings.
Theory:	Theoretical perspectives consist of ambidexterity and product development.
Empirical foundation:	The empirical foundation provides a thorough overview of the case company's product development process and insights into the how decisions are taken and priorities are set throughout the process.
Analysis:	We identified the mode(s) of ambidexterity that characterizes the innovation department and different decision situations, which have an impact on the tension between exploitation and exploration.
Conclusions:	Our findings show that explicit and implicit choices made by management and employees affect the tension between exploitation and exploration in a product development process. Further, we identify a number of 'tools' that managers can use to manage the tension, which may help the firm to achieve ambidexterity.

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1. INTRODUCTION

In this chapter we will introduce the concept of ambidexterity and why it is important to conduct further research in the field. The chapter will end with the purpose and research questions of this study.

1.1 Ambidexterity - an answer for organizational prosperity and growth?

The average life expectancy of a firm has been found to be substantially shorter than a person's. One study suggested that probably less one out of thousand companies are expected to live longer than 40 years (Stubbart and Knight, 2006). Another study found that only 68 % of Swedish companies are still in business after three years¹ (Swedish Agency for Economic and Regional Growth, 2013). Why do firms fail? What is required to be successful in the long-run?

History shows numerous examples of firms that have lost their dominant market positions because they have not been able to adjust to new market conditions or technological changes. Take Kodak for example, the company that invented the digital camera could not adapt its business to the digitalization. Eventually, it went bankrupt after being in business for more than a century. Another example is Nokia, the mobile manufacturer who dominated the market and set the pace for the mobile industry in the run-up up to the current millennia. Despite many years of success they were not able to adjust to the era of smartphones and ultimately went from being in the forefront of the industry to one of the brands at the back of the store.

So, how can firms avoid being outrun by competitors? One of the keys is innovation. The ability to innovate new products is seen as essential both for long-term competitiveness (Björk and Magnusson, 2009) and survival (Adams, Bessant and Phelps, 2006). However, relying solely on innovating new products does not provide a guarantee for success and long-term survival (Booz, Allen and Hamilton, 1982). To survive in the long-run, firms have to find a balance between exploiting their current products to earn money now and to explore new opportunities to earn money in the future (March, 1991). Organizations that are able to

¹ Approximately 57 000 companies started year 2008 and 2011 approximately 39 000 companies were still in business. Hence, 68 % were still in business after three years.

explore and exploit simultaneously are referred to as ambidextrous (Tushman and O'Reilly, 2013).

While the literary meaning of ambidexterity refers to an individual's ability to use both hands equally well, the organizational and managerial literature has generally described ambidexterity as the organization's ability to simultaneously exploit its existing knowledge and explore new opportunities (Raisch, Birkinshaw, Probst and Tushman, 2009; Tushman and O'Reilly, 2013) or to develop both incremental and radical innovations (Gurtner and Reinhardt, 2016). Ambidexterity thus deals with a problem that most managers in most companies face, i.e. how to make sure that the organization engages in activities that ensure its viability in both the short- and the long-run (Levinthal and March, 1993). As the examples above show, focusing too much on making money now is likely to make even the most dominant organization's value proposition obsolete. However, focusing too much on research and development, the organization may not be able to reap the benefits of that research. Thus, finding a balance and being ambidextrous is crucial.

The concept of ambidextrous organizations dates back to 1976, with Duncan proposing that organizations had to shift structures between *initiating* and *implementing* innovation over time. The next idea came in 1996, as Tushman and O'Reilly proposed that organizations should to pursue *incremental* and *discontinuous* innovation simultaneously by using structurally separate units. Gibson and Birkinshaw (2004) further developed ambidexterity by introducing another perspective called contextual ambidexterity, which refers to "simultaneously achieve *alignment* and *adaptability*" (p. 209) within the same unit. While these are seemingly different ways for describing ambidexterity, they essentially refer to the same dilemma; making sure that the organization is successful in both the short-run and the long-run. The theoretical ideas about exploitation and exploration proposed by March (1991) underscore this challenge.

Organisational ambidexterity has received a lot of academic attention in recent years with an exponential growth in published articles in top journals (Birkinshaw and Gupta, 2013). One of the main questions for researchers, which has not been satisfactorily answered, is how the tension between exploitation and exploration should be treated and viewed. Are they competing or complementing activities? Should they be balanced, traded-off, reconciled or

simply managed (Birkinshaw and Gupta, 2013)? This becomes even more problematic seen as the tension between exploitation and exploitation is present on many different levels within the organization (March, 1991). Hence, we aim to contribute to the existing literature on how the tension is viewed by adding new findings on the topic.

1.2 Problem specification

Even though achieving ambidexterity itself does not guarantee the firm's viability in both short- and long-run, it may provide the necessary management style and thinking needed to do so. However, ambidexterity has been argued to be an academic construct, which very few practitioners use (Birkinshaw and Gupta, 2013). Why is that? The literature agrees that ambidexterity is beneficial for firm performance, increased sales growth, innovation, market valuation and firm survival (Tushman and O'Reilly, 2013). This means that managers within companies should be interested in how to achieve ambidexterity.

An interesting context to study ambidexterity is product development. Any firm involved in product development should have the ability to achieve ambidexterity if both explorative and exploitative projects can be conducted. This makes product development a suitable context to take ambidexterity from being an academic construct to be applicable in practice. The literature on how managers actually deal with these problems in practice is scarce. Tushman and O'Reilly (2011) state that there is a gap in the literature in how ambidexterity is managed in practice. If managers do not know about the theoretical concepts of ambidexterity and do not know how what drives this tension, how are they going to be able to achieve it? This thesis aims to bridge this gap.

1.3 Purpose and research questions

The purpose of this study is to investigate what drives the tension between exploration and exploitation in a product development process (PDP) as well as trying to understand if and how it can be managed. We intend to fulfill this purpose by conducting a case study on a medium sized high-tech company.

Hence, we aim to answer two research questions:

- 1. What drives the tension between exploration and exploitation in a product development process?*
- 2. How can the tension between exploration and exploitation be managed in a product development process?*

1.4 Reading guidelines

Chapter 1 – Introduction

The first chapter provides the reader with an introduction to ambidexterity and product development and presents the research gap that we aim to fill. The section concludes by stating the purpose and research questions of the study.

Chapter 2 – Theoretical framework

In the second chapter we provide the reader with information on the case study's two theoretical concepts; ambidexterity and product development.

Chapter 3 – Methodology

In the second chapter we argue for our choice of research strategy and method of data collection and analysis.

Chapter 4 – Empirical foundation

The fourth chapter presents our empirical foundation. The chapter first provides the reader with the context of our case company followed by a detailed description of the case company's product development process.

Chapter 5 – Analysis

The fifth chapter provides the reader with our analysis of the key findings derived from our empirical findings using the theoretical concepts explained in the second chapter.

Chapter 6 – Conclusion and discussion

The last chapter concludes our case study by answering the study's two research questions. This is followed by a discussion of the theoretical and practical implications of our case study. Finally, we consider potential limitations with this study and provide some suggestions for future research.

2. THEORIES AND CONCEPTS

In this chapter, we will introduce the theories and theoretical concepts on which we build our study. We will introduce the concepts of exploration and exploitation, ambidexterity and product development. Consequently, we will link these concepts together and theorize how exploitation and exploration could be viewed and handled in this context.

2.1 The tension between exploration and exploitation

One of the central ideas in the management literature is that explorative and exploitative activities are fundamentally different in their nature, thus requiring managers to make a trade-off between them since they compete for scarce resources (March 1991). This trade-off creates a tension between the two activities, exploitation entailing “refinement, choice, production, efficiency, selection, execution” and exploration entailing “search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” (March, 1991, p. 71). Furthermore, exploitation should be regarded as usage or development of the organization’s current knowledge base within its ‘technological trajectory’, while exploration should be seen as development that potentially shifts the organization’s technological knowledge base forward by introducing new capabilities (Lavie et al., 2010, building on the work of Cohen and Levinthal, 1990). What complicates the managerial aspect is that the returns of exploration are distant and uncertain, often making it more preferable for organizations to choose exploitation, from which returns are close in time (March, 1991). If however, the organization does not engage in enough explorative activities, this will eventually render its value proposition obsolete (Levinthal and March, 1993).

2.1.1 How to view the tension

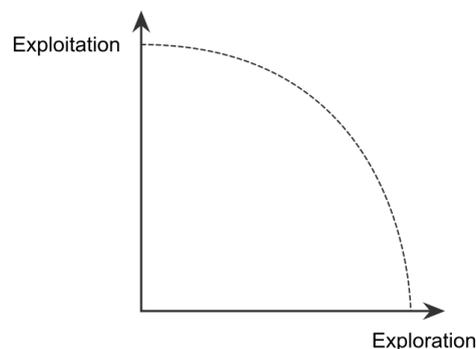
One of the challenges within the research of exploration and exploitation that have been noted in the literature is how to view the tension between them (Lavie et al., 2010; Birkinshaw and Gupta, 2013; Tushman and O’Reilly 2013). Several ways have been proposed, but two different ways stand out; exploitation and exploration should be viewed 1) as opposites on a continuum (Lavie et al., 2010) or 2) as a curvilinear function (Birkinshaw and Gupta, 2013). Viewing the tension on a continuum (Figure 1) fits well with March’s (1991) view that the tension requires a trade-off and that finding a balance is of primary importance for the firm’s future success. The trade-off is seen as unavoidable (Simsek et al., 2009).

Figure 1 - The tension viewed as a continuum (authors' own illustration)



From a practical point of view however, an innovation may build on both existing knowledge and development of new knowledge simultaneously (Lavie et al., 2010). Along this line of reasoning, Simsek et al. (2009) noted that March (1991) implicitly endorsed organizations to pursue both exploitation and exploration at the same time. Exploitation and exploration do not need to be regarded as competing activities; rather they can be viewed as complementing or reconciling activities, in an effort to maximize the achievement of both (Simsek et al., 2009). In this sense, viewing the tension on a continuum would not be practical. Instead, tension could be viewed as a curvilinear function (Birkinshaw and Gupta, 2013) where any position on the curve (Figure 2) is valid and constitutes a balance. This may be a more pragmatic way of viewing the tension as it implies that firms can reach higher levels of both activities. How to achieve a balance is not important; some firms are better at exploiting, some at exploring and some are better at doing both.

Figure 2 - The tension viewed as a curvilinear function (adapted from Birkinshaw and Gupta, 2013)



2.1.2 Managing the tension ambidextrously

March (1991) argued that choices that managers make affect the tension between exploitation and exploration. More specifically, these choices can be either explicit or implicit and constitute situations in which managers have to trade off the activities. Explicit choices are “calculated decisions about alternative investments and competitive strategies” while implicit choices are “buried in many features of organizational forms and customs” (March, 1991, p.

71), i.e. buried in the organizational behavior and culture. In this sense, managing these explicit and implicit choices is a way of controlling the tension and imperative for achieving a balance. An organization that is able to manage both exploitation and exploration is seen as ambidextrous (Tushman and O'Reilly, 2013).

Four ways of achieving ambidexterity have been suggested. First, it has been suggested that organizations can become ambidextrous by temporally separating explorative and exploitative activities (Duncan, 1976; Tushman and O'Reilly, 2013), meaning that the organization focuses first on either exploration or exploitation and then shifts its focus to the other (Lavie et al. 2010). This is called temporal or sequential ambidexterity and can also be done on a unit level within the organization. Shifts in focus often emerge as the organization responds to internal or external changes (Siggelkow and Levinthal, 2003). However, it is unclear how the transitions should be managed (Lavie et al., 2010; Tushman and O'Reilly, 2013). Originally, Duncan (1976) proposed that organizations should create 'dual structures' with different emphasis on the organizational characteristics complexity, formalization and centralization in order to efficiently explore or exploit. Second, organizations achieve ambidexterity by simultaneously exploit and explore as opposed to temporally separating the activities (Lavie et al. 2010). This is achieved by letting autonomous units within the organization focus on either exploitation or exploration supported by a common strategy and by an effective leadership, which coordinates the efforts of the units (Tushman and O'Reilly, 1996, 2013). Third, ambidexterity has been argued to be achieved by domain separation. This type of ambidexterity builds on the notion that an organization specializes in exploiting one domain and at the same time exploring in another and thereby is able to achieve a balance across these domains (Lavie et al., 2010). Domains are characterized by a specific organizational activity within the value chain and may involve partnerships and alliances, e.g. technology or marketing alliances (Lavie, Kang and Rosenkopf, 2011). Fourth, contextual ambidexterity emerged as an alternative perspective to sequential and structural ambidexterity. While these types of organizational configurations inherently bring coordination costs, contextual ambidexterity is grounded in the culture of the organization and avoids these costs by entrusting the individuals in the organization to balance exploitation and exploration (Gibson and Birkinshaw, 2004). As exemplified by Gibson and Birkinshaw (2004, p. 211) "In a contextually ambidextrous unit, the context is dynamic and flexible enough to allow individuals to use their own judgment as to how they divide their

time". Further, Wang and Rafiq (2014) argue that a diverse set of individual skills and knowledge that enable creativity in combination with a shared vision can provide the organizational culture required to achieve contextual ambidexterity. In practice bottom-up mentality within the organization is necessary (Wang and Rafiq, 2014). Finally, recent research has also suggested that managers can use both structural types, i.e. sequential and organizational, and contextual types of ambidexterity to resolve the tension between exploitation and exploration (Agostini, Nosella and Filippini, 2016).

2.2 Product development

If we assume that all products have a limited life span, firms need to continually develop new products in order to reach long-term prosperity and growth. However, alongside fierce competition as industries, technologies and marketplaces change, there is no guarantee of success (Booz, Allen and Hamilton, 1982).

Portfolio management serves as basis for any firm to create successful product innovations. The question is how firms should allocate their resources in order to achieve their innovation objectives (Cooper et al., 1999). Portfolio management entails making strategic choices, that allow for successful resource allocation. What products, technologies and markets should be focused on? What innovation projects should the firm invest in? How should the firm invest its R&D and engineering resources (Cooper et al., 1999)? Additionally, many firms have a lot of ideas (Koen et al., 2002) making it critical to conduct an idea assessment in order to identify and execute the most promising ideas (Herstatt and Nagahira, 2002). Portfolio management provides the means for idea selection (Cooper et al., 1999). Finally, portfolio management is about achieving a balance between e.g. long- and short-term projects, high risk versus low risk projects, and across markets and technologies and how much resources that are at hand. If a company does not achieve a balance, this will lead to poor execution, longer cycle times and low quality new products (Cooper et al., 1999).

How to achieve the optimal portfolio has eluded researchers leading to an extensive area of research in how to allocate resources, selection and termination of projects and evaluation methods (Adams et al., 2006). Some examples are return on investment-models, sophisticated mathematical tools and models, scoring models, economic and benefit models, and algorithms (Adams et al., 2006).

However, new products do not out of nowhere. Instead, new product development is the result of a long and expensive process (Booz et al., 1982). Hence, the product development process will be explained in the next section.

2.2.1 Product development process

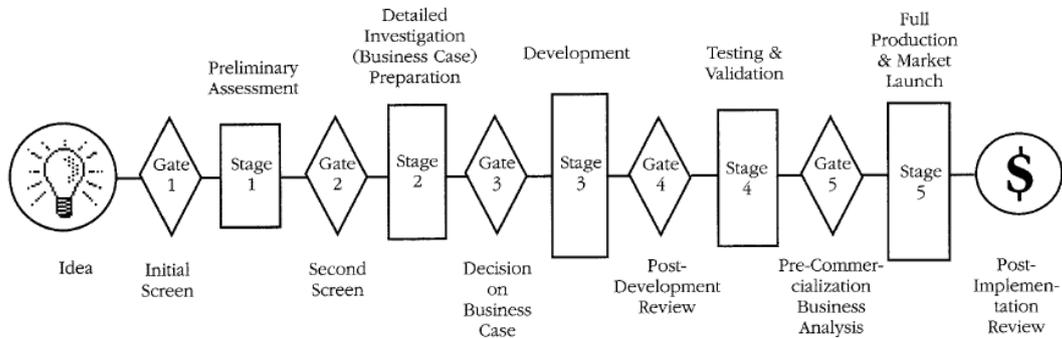
When the portfolio strategy is set, the product development process (PDP) can be divided into three parts; the fuzzy front end², the new product development (NPD) process and commercialisation (Koen et al., 2002). The modeling of innovation processes goes back to Utterback (1971) arguing that the innovation process can be divided into three overlapping phases: idea generation, problem solving and implementation, and potentially a fourth phase, diffusion. The first phase results in either a technical proposal or a design concept that may be synthesized by available information. The second phase results in a solution or invention. The third phase results in the introduction of the innovation to the market. The last potential phase, diffusion, aims towards creating economic impact (Utterback, 1971). Since Utterback, researchers have come up with different activities pertaining to their particular models, where Cooper's (1990) original "stage-gate" model of the PDP may be the most influential (Salerno et al., 2015). These models in general view the innovation process as linear, from idea-to-launch (Cooper and Kleinschmidt, 1993) including mainly four phases: idea generation, idea selection, development and market launch (Salerno et al., 2015).

In Cooper's (1990) original model the PDP is seen as a linear process, with a series of stages with gates with the aim of moving an idea to launch (a typical stage-gate process is illustrated in Figure 3). In each stage, a set of processes or work is conducted. When these processes are completed the process moves on to face scrutiny in a quality checkpoint, or gate. In each gate, there are a number of predetermined quality criteria that the particular product needs to meet before entering the next stage. Here, typically a go-, kill-, hold- or recycle-decision is taken as well as the determination of an action plan for the upcoming stage. Cooper (2014) suggests that more flexible criteria, e.g. more emphasis on strategic criteria rather than financial. This is especially true for technology development and highly innovative projects due to higher uncertainty. In other words, the product development work is being conducted in the stages and the gates ensure sufficient quality of the product (Cooper, 1990).

² Henceforth referred to as front-end or front-end of innovation (Koen et al., 2002).

Figure 3 - The stage-gate process (Cooper, 1990)

An Overview of a Stage-Gate System



However, some authors have put forward criticism to this type of linear PDP. Becker (2006, p. 2) mentions that a Stage-Gate process, or a linear PDP, implementation (1) is slow and have a high overhead, (2) puts emphasis in form rather than substance in discussions and decisions, (3) treats all projects and products the same, (4) it kills innovation and (5) treats all choices as a one off decision. Lenfle and Loch (2010) argue that a linear PDP does not fit highly innovative initiatives since these projects require parallelism, looping back (iterations) and flexibility since the projects may change during the PDP.

Front-end of innovation

The front-end of innovation is defined as “the period between when an opportunity is first considered and when an idea is judged ready for development”³ (Kim and Wilemon, 2002, p. 270). This part of the process is often unstructured, chaotic and unpredictable (Koen et al., 2002). Here, the goal is to create creative new product concepts (Eling, Griffin and Langerak, 2014). The FEI has been regarded as the most important part of the NPD in creating successful innovations (Cooper, 1988) and the front-end poses an opportunity for companies to improve their innovation process (Koen et al., 2001) and create a competitive advantage (Kim and Wilemon, 2002).

Researchers have different opinions about how many stages the front end includes. Koen et al. (2001) describes five elements of the front-end; opportunity identification, opportunity analysis, idea genesis, idea selection and concept and technology development, whilst Cooper

³ In the stage-gate model the front-end of innovation reaches the (third) development stage.

(1988) identifies three stages; idea, preliminary assessment and concept definition. However, the basis for the front end, and innovation, will always be an idea. Hence, firms need to generate a sufficient number of ideas (Adams et al., 2006). The idea generation process is defined as “a combination of an organizational need, problem, or opportunity with a means for satisfying this need, problem, or capitalizing on the opportunity” (Herstatt and Nagahira, 2002, p. 9). Idea generation serves as a basis for a firm’s capability to make incremental and radical innovation (Gurtner et al., 2016) and it will affect the success of a company’s NPD portfolio (Gurtner et al., 2016).

Gurtner et al. (2016) argue that firms should work towards creating an ambidextrous idea generation process thus both generating incremental and radical ideas in order to achieve both short- and long-term goals. Their research indicates that an ambidextrous idea generation increases the general success of NPD. This makes it important to balance exploitation and exploration in the idea generation stage, not only in the later stages of the PDP. It is suggested that managers should work towards generating both incremental and radical ideas in the idea generation stage of PDP (Gurtner et al., 2016).

Further, most businesses have a lot of promising ideas. The challenge is how to pick the ideas that lead to the most value for the firm (Koen et al., 2002). Koen et al. (2001) explain that the idea selection process can be conducted in different ways ranging from that individuals choose between self-generated options to more complex and formalised options as portfolio methods. Herstatt and Nagahira (2002) argue that firms should develop technical and / or economic criteria serving to assess the different ideas. However, there is a difficulty in formalising the resource allocation and project selection at this stage since the organisation has limited information and high uncertainty. This makes estimates of future financial gain often into a wild guess. Hence, the selection of ideas in the FEI should not be as rigorous in the later stages of the NPD in order to allow ideas to grow (Koen et al., 2002). This is in line with Cooper (1990) who argues that the early gate criteria tend to be of qualitative nature.

Further, Eling, Griffin and Langerak (2014) argue that during the front end of innovation, intuition is used in decision making by individuals and teams. Hence, there is more to decision making in the front end, and in the NPD, than formal gate decisions. There are a number of decisions taken in a more informal context, which the authors describe as intuition.

Intuition can be defined as “a gut feeling based on unconscious past experience. Intuition, in other words, involves feeling that something is right or wrong, or that A is better than B, while being largely unaware where that feeling came from, or what it is based on.” (Dijksterhuis and Nordgren, 2006, p. 105). Eling et al. (2014) further describe that intuition may be beneficial for new product concept creativity since it helps teams to navigate through the front-end of innovation.

Back-end of innovation

The back-end of innovation starts after the idea is judged ready for development, or at stage 3 in the stage-gate process (Cooper, 1990). The back-end of innovation typically contains the development-, testing and validation-, full production and market launch and the post implementation review phase. In the back-end of innovation, gates are given a stronger financial orientation (Cooper, 1990).

2.3 The expected tension

As we have described in the previous sections, research has shown that managers make a number of explicit and implicit choices that in the end will affect the tension between exploration and exploitation since the two are competing over scarce resources. In a PDP, choices on product development will have to be made. First, on a strategic level management will set the portfolio strategy of the firm. Second, in the front-end of innovation choices will be made concerning what ideas that are selected and judged ready for development. Third, in the back-end of innovation during the development stage, concerning which projects that will be developed, revised or terminated. This means that these situations should involve explicit and implicit choices that ultimately affect the tension between exploration and exploitation. By investigating and understanding the tension in these situations, we will also understand how it can be managed.

3. METHODOLOGY

In this chapter we describe the method that we have chosen for this study. We present the research strategy and the research method that we have used. Additionally, where applicable, we discuss how the different parts concern validity and reliability.

3.1 Research strategy and case study design

In this study, we use a qualitative research strategy with elements of both deductive and inductive approaches to investigate a single case. We chose to apply the qualitative strategy in the case study since this would let us fulfill the purpose of the study, i.e. to provide a deeper understanding of what drives the tension between exploitation and exploration and how it can be managed in product development processes. According to Bryman and Bell (2011), this strategy is helpful to provide a contextual understanding of the behavior, beliefs and values of organizational members. While the qualitative strategy tends to imply an inductive approach with the objective of generating theory, it may as well be used to deductively test theoretical concepts (Yin, 2009; Bryman and Bell, 2011). Initially, the objective with this study was not to create a theoretical proposition; instead we merely set out to gain an understanding of what is going on in development processes and how the phenomena exploitation and exploration are handled. As the study progressed however, we realized that, as far as we could tell, what we were interested in was not covered in the literature. Consequently, this study uses elements of both deduction and induction, as we aim to look for patterns described by the literature and use our findings to help fill a gap in the ambidexterity literature.

In order to disentangle the explicit and implicit choices that have been argued to drive the tension between exploration and exploitation (March, 1991) we had to thoroughly interview individuals involved in the product development process. This, in order to understand ‘how’ and ‘why’ these choices were made, a case study approach is necessary (Yin, 2009). This approach lets us combine various methods for data collection (e.g. interviews, documentation and observations) as well as come close to the evidence. This is advantageous in generating theory (Eisenhardt, 1989) as the close interaction with the case evidence “often produces theory which closely mirrors reality” (p. 547). On the other hand, theory produced from case studies may become very complex; attempting to capture everything that has been recorded.

In addition, it may become too idiosyncratic, connected to the specific case and unable to provide generalizable findings (Eisenhardt, 1989).

Our choice of conducting a single case study as opposed to a multiple case study, depends on our need to conduct several and thorough interviews with the case company to get an appropriate understanding of the processes in combination with the thesis' limited time-frame of approximately ten weeks. A multiple case study could have produced more generalizable findings. However, we believe that the circumstances and conditions of our case company's product development process may illustrate a representative case, thus making it relevant to conduct a single-case (Yin, 2009). We chose HighTech as our case company because we knew from a preliminary investigation that their innovation department conducted both explorative and exploitative projects. Additionally, the company had recently implemented lean management in their product development. Thus, HighTech provided the settings necessary for conducting the study and additionally made an interesting case to study. HighTech is a medium sized manufacturing company based in Sweden. The specific industry and company name have been disguised on the request of the company's director. We do not believe that this has any negative implications on the study's validity. However, it may impact the study's reliability. If the study would be replicated, contextual circumstances as for example industry as well as all documents would not be available to the researchers, hence potentially decreasing the reliability of the study.

3.2 Research method

3.2.1 Search procedure for theory development

To develop the theoretical foundation of the thesis, we conducted a thorough literature search using mainly two approaches in an iterative process. The first was to search for academic journal articles and books using the keywords derived from the purpose of the study, e.g. exploitation, exploration, ambidexterity and product development. The search was conducted on different databases, e.g. Scopus and Lubsearch, available to Lund University and complemented with some unpublished articles presented at conferences, which we gained access to through Researchgate. The second approach was to identify recent review articles on our research themes and pinpoint the most distinguished researchers and well cited articles. This allowed us to follow significant trends and developments in the theory over

time, from the earliest research and original ideas to some of the latest pioneering theoretic concepts. By combining these two approaches into an iterative process, we could build our theoretical foundation which we used for our data collection.

Alongside developing the theoretical foundation we also searched for articles covering lean product development combined with ambidexterity (i.e. Helander et al., 2015; Lavayssière et al., 2015; Lowik, 2016; Liker and Morgan, 2006). These theoretical concepts have not been included in the theoretical chapter. The reason is simple. As we began interviewing we understood that the implementation of lean in our case company had not come far enough for us to apply all of the theoretical perspectives. However, they still provide an understanding for how certain phenomena in the case company’s product development process affect the tension between exploration and exploitation. For this reason, lean has been used in the analysis to assist in explaining our findings.

3.2.2 Data collection

During the course of the case study, we have been able to gather data from four of Yin’s (2009) six types of case study evidence sources, see Table 1. Our main source of information stems from semi-structured interviews, complemented by one unstructured. Additionally, we have received documentation from the case company and been able to conduct direct observations at the case company work sites. Hence, we use multiple sources of evidence in order to increase the construct validity and the reliability of our case study (Yin, 2009)

Table 1 - Sources of evidence

Sources of case study evidence (Yin, 2009)	Evidence obtained
Documentation	Internal documents
Archival records	List of active projects at innovation department
Interviews	One unstructured and six semi-structured interviews
Direct observations	Whiteboard with current highly prioritised innovation projects
Participant-observations	N/A
Physical artifacts	N/A

We have conducted both semi-structured and unstructured interviews that lasted between 50 and 85 minutes. The first interview, which was part of a smaller pre-study, was semi-structured and covered basic information about the case company, its history and the work in general within the innovation department. This laid the foundation for this thesis. The second interview was conducted with the improvement coordinator in order to understand how the company worked with lean. An unstructured approach was used, since we needed to find out more about lean and the aim of the project at the company. During the remaining interviews our aim was to understand how our specific case company took an idea to launch, i.e. to understand the company's product development process (PDP). Hence, our interviews mainly contained questions concerning the portfolio strategy, the front- and back-end of innovation as well as the impact of the lean project. Here, the aim was to understand the different individuals perspectives on the same topics, how the individuals made priorities and why they did it in the way they did. The main topics covered during the interviews are shown in Table 2.

In order to understand the explicit and implicit choices that are made during the PDP, we favoured semi-structured interviews since they proceed from a pre-determined list of question but can be used flexibly by letting us ask follow-up questions when needed. This is crucial when trying to understand the implicit choices made in the company since these are buried in organisational features (March, 1991), something that would not be possible when using a structured interview setting or surveys.

Table 2 - Interview question examples

Topic	Example of questions
Innovation projects	What projects are you currently involved in? What characterizes them?
Ideas	Where does ideas stem from? Are some types of ideas favored over others?
Decision situations	Which formal decision points in the PDP do you have? What do you base your decisions on? Have you terminated a project in the PDP? If so, why?
Prioritization	How do you set priorities? On what factors do they depend? Are certain projects more important than others? If so why?
Lean	Has the lean project affected your work? If so, how? Are there any queues in your PDP? If so, where?

All interviews were recorded and later transcribed in order to make sure that all important information was captured and to provide an accurate rendition of the interviews (Yin, 2009). Since the aim with the interviews was to understand the tension between exploration and exploitation throughout the PDP on a strategic, operative and individual level in the company, it was crucial to interview employees on different levels in the organisation. This let us to triangulate the data from different interviewees. This is argued to lead to increased construct validity as well as more convincing and accurate conclusions (Yin, 2009). The interviewees' position is illustrated in Table 3.

Table 3 - Interviews

Position	Interview type	Date	Duration
Innovation Director	Semi-structured	17/2-2017	65 min
	Semi-structured	5/5-2017	70 min
Improvement Coordinator	Unstructured	18/4-2017	60 min
Product Development Manager	Semi-structured	25/4-2017	85 min
Project Leader / Product Developer 1	Semi-structured	26/4-2017	55 min
Project Leader / Product Developer 2	Semi-structured	26/4-2017	50 min
Product Portfolio Manager	Semi-structured	2/5-2017	75 min

Further, we received internal documents from the case company. These documents contained information about the innovation department, its vision and mission statement, the development process and information about the lean project. These were used to augment evidence from our other sources (Yin, 2009). Additionally, we received archival records containing all active innovation projects. This provided us with the basis for making the classification between exploration and exploitation projects (see data analysis for classification).

Finally, direct observations were made (Yin, 2009). During our visits at the company site, we observed a whiteboard containing some of the innovation department's active projects. The whiteboard supported us in understanding the context of our research question (Yin, 2009). For example, the whiteboard helped us to understand how the project leaders work entailed during different parts of the PDP. This was possible, since the projects on the whiteboard

were put in different boxes depending on what stage in the PDP it was located. Also, direct observations during our visits helped us understand the specific organizational forms and customs. This is crucial in order to understand the implicit choices that are made in the organisation.

Potential ethical issues regarding the respondents were considered as we signed the confidentiality agreement with the case company. The agreement clearly sets the boundaries for how we should treat our research evidence. Further, in the beginning of each interview we asked the respondent for permission to record the conversation. We also explained that the results from this study will be published, and that the interviewees and the case company could be disguised if they chose to. Interviewee participation was optional.

3.2.3 Data analysis

In order for our case analysis to generate insights (Eisenhardt, 1989) we used a structured approach, as proposed by Yin (2009) while analysing the case study's data. An important first step in our case study was to establish the fact that the innovation department is ambidextrous. To do this, we had to classify the active projects at the innovation department in terms of exploration and exploitation. We received archival records that contained the classification of the project; whether the aim was to develop a new product, research or to refine a current product, and the complexity of the project; whether new technology development was required or if the project was based on existing knowledge within the firm. With this information at hand, we made an initial classification of the different projects guided by March (1991) definition of the concepts, extended by the clarifications provided by Lavie et al. (2010) and Cohen and Levinthal (1990). Here, one potential issue is incorrect classification of the projects. In order to mitigate this issue, we ascertained during the interviews with the PDM and PL/PDs that the classification were correct. We did this by asking for clarification on certain projects with unclear complexity. Consequently, the construct validity of our classifications was increased (Yin, 2009).

Further, to increase the internal validity of the case study we used 'pattern matching' as proposed by Yin (2009) to analyse our data. Hence, we gathered information from each of our interview transcripts. The information from each interviewee (six in total) was later sorted into tables under four main headings; portfolio strategy, the front- and back-end of

innovation as well as lean. These six tables were later complemented with one more table including the information gathered during direct observations, archival records and internal documents. These were subsequently sorted into the same categories. Consequently, we ended up with seven tables that were printed out and compared to each other which allowed us to find patterns and contradictions in our collected data. Contradictions and patterns were highlighted and we were given a clear picture of our empirical data. In order to ensure a fair view of the data, the empirical findings were sent back to the case company for approval. Finally, our findings were put in relation to our theoretical foundation in order for us to find patterns and contradictions between our empirical findings and theory.

4. THE CASE COMPANY'S PRODUCT DEVELOPMENT PROCESS

In this section, we will tell the story about a company takes an idea to a market ready product. In addition, we will describe situations in which the company prioritizes as well as makes decisions on different organisational levels in the front- and back-end of innovation.

4.1 Setting the scene

The company's current strategy is three-folded; to be experts on their particular commodity⁴, to expand globally and to mainly give the customer a better and more sustainable product than what is currently available on the market. More specifically, the strategy is to provide the customers with an alternative type of product compared to what is currently available on the market. In order to realise this strategy, the company needs to innovate new products, some which require new and complex technology in order to be better and more sustainable compared to competitors' existing products. Thus product development is crucial for the company's future success, alongside with refining and nurturing their current product portfolio. The innovation director states that the current strategy is flexible and ready to adapt to changing business conditions. Furthermore, the director approximates that the current strategy will require innovation projects for the next 5-10 years ahead.

The company has a strong organisational culture with several of the respondents corresponding to the mission and vision statement of the firm. Several respondents, the product portfolio manager (PPM), the product development manager (PDM), the innovation director all say that they want to "make a difference". The PPM describes that one main motivational driver is the fact that the company has a "higher mission" and that the company "wants to do good [...] and change things, with our products, to the better". The PPM further describes that the mission is "always in the back of our heads" that "our company does not only make products, we have a higher mission than that".

The company has an innovation department consisting of nine people, see Table 4. The department consists of five employees that are both project leaders (PL) and product developers (PD). They manage the innovation projects from idea to launch. The PL/PDs are given great autonomy in their work of creating new products, assisted by the innovation director and the product development manager (PDM) who supports the day-to-day work and

⁴ The commodity is of major strategic importance for the firm and its innovative ability.

in prioritizing between projects. The PDM acts as an operative manager in the department. The PDM is also responsible for the product development process (PDP).

Table 4 - The innovation department

The Innovation Department	
Position	Responsibilities
Innovation Director (1)	Overall responsible of the innovation department. In charge over setting the innovation strategy together with PPT.
Product Development Manager (1)	In charge of the PDP and the operative work supporting project leaders with day-to-day activities.
Project Leader and Product Developer (5)	Manages innovation projects from idea to launch.
Lab Technician (1)	Assisting product developers with lab tests.
Development and Pilot Technician (1)	Assisting the product developers with pilot tests.

In addition, the product portfolio manager (PPM) is active in the innovation projects for the commercial department. The PPM coordinates and heads the meetings with the steering group (see section 4.3) once a month, but she has a broad role in the innovation projects. Additionally, she participates in all innovation projects, one of the tasks being the design of the packaging. Her main duty, however, is to take care of the product portfolio and make sure that it contains the right products; and that the right products are being launched. This means that she is also involved in the process of defining the product.

Currently, the innovation department handles, leads or is active in 60 different projects spanning from refinement of current products and process innovations to the creation of new radical product innovations (see Table 5).

Table 5 - Active projects

Classification	Complexity	Number of projects	%
New product	New technology	11	18%
New product	Existing technology	12	20%
Research	New technology	5	8%
Product care	Existing technology	24	40%
Product care	New technology	1	2%
Production	Existing technology	7	12%
Total		60	100%

On average, every PL/PD is active in 10-20 projects which they either lead (PL) or are active in as a PD. These projects are in different stages in the PDP. In addition, as a part of their current strategy, the innovation department engages in and coordinates explorative projects using external collaborations with industrial research centers, suppliers or universities. These projects aim to find new technology and ways of handling the commodity to create new radical product innovations. The innovation director explained that some innovation projects need specific expertise, thus making it more efficient to seek collaborations in complex R&D projects rather than keeping all competence in-house. Further, the company outsources some parts of their production to external suppliers. The innovation director put emphasis on the importance of having close relationships with these suppliers since the production process is complex hence putting a high demand on the suppliers' knowledge.

However, not only new product development projects fit within the company's current innovation strategy. It is also important to refine and develop their current product portfolio. The innovation director explained that the increased focus on product care projects is largely due to increased amounts of new products that have been developed during the last years. Hence, the need for product care projects increase. These innovation projects often involve refining their current products and improving processes.

Furthermore, according to the innovation director, the firm puts significantly more resources on innovation, as a percentage, compared to the industry average. The budget is distributed amongst current innovation projects in the beginning of the year, but resources can be reallocated between projects during the year. The director pointed out that the innovation budget needs to be flexible in order for the company to be agile and redistribute resources to

more prioritised projects during the year. The distribution of resources to the different innovation projects are made after strategic priority, market demand, level of competition and what value it brings to the company.

Since last year, the company has also initiated a lean-project in order to make the product development process more efficient. So far the lean project has covered educating the PL/PDs in the lean concept and mindset in an effort to empower and encourage them to continuously making improvements in the development process. Additionally, the PDM explains that the product development process (see Figure 5 below) and its steps has been more clearly defined and outlined.

4.2 The case company's product development process

In this section, we will describe the key steps of the case company's product development process (PDP) from the idea processing until it is judged ready for development, i.e. the front-end of innovation (see Figure 4) and the company's PDP after the idea is judged ready for development, i.e. the back-end of innovation (see Figure 5).

Figure 4 - Front-end of innovation

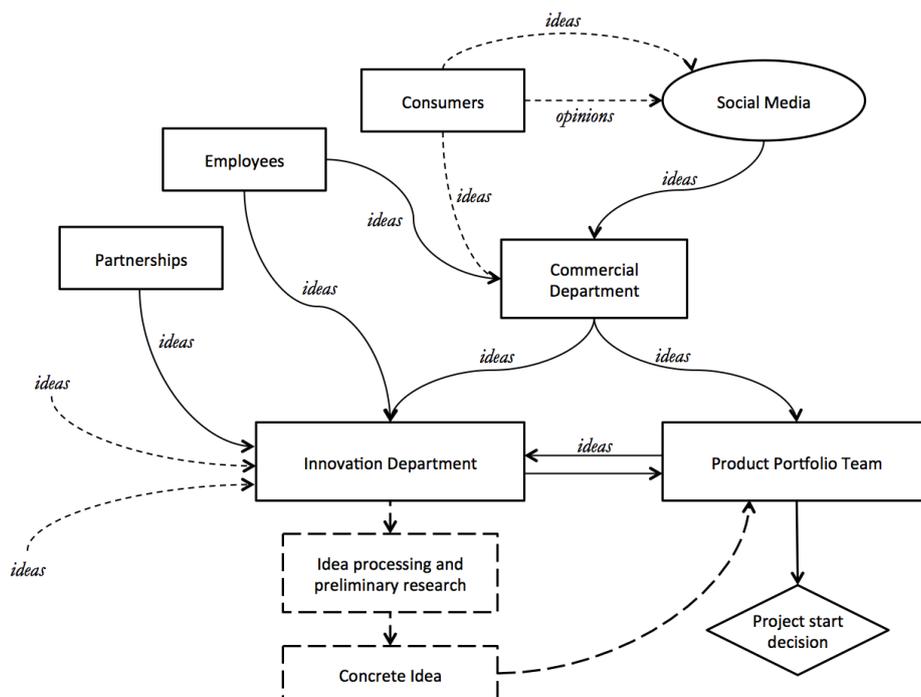
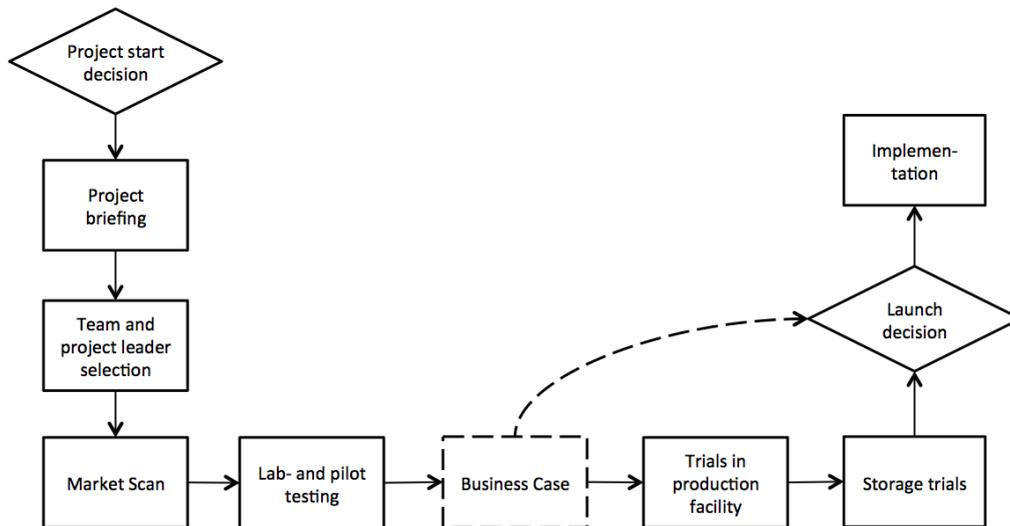


Figure 5 - Back-end of innovation



4.3 Front-end of innovation

The innovation director explained that the company has a lot of ideas that they want to realise. These ideas can come from different sources. The high-tech company’s idea flow is illustrated in Figure 4. The figure shows that ideas can come from anyone in the firm, e.g. employees, the commercial or innovation department or the Product Portfolio Team (PPT)⁵. Ideas can also come from e.g. partnerships, through customer demands or through fairs.

Earlier, the firm had an ‘idea box’ aimed at picking up ideas within the firm. All of the firm’s employees were encouraged to share their ideas. However, the idea box rather became a forum for other types of ideas, for instance how to improve the working environment rather than a forum for radical and explorative innovation. Thus, the idea box is no longer active. Today the ideas that come from the company, are picked up by employees or the PPM informally, for instance when an employee sends an email or through informal interaction. However, the firm has other tools on how to pick up ideas. The innovation director explained that the company continuously interacts with customers by creating polls or asking direct questions: “what products would you like to have?”. The customers’ wishes and opinions are

⁵ The PPT is the steering group consisting of the CEO, the creative director, the innovation director, the PPM, a business controller, the commercial director and the chief operating officer (COO). The group is in charge of the product portfolio, i.e., deciding on which ideas that are going to be developed, make priorities amongst current innovation project, as well as take the launch decision.

consolidated by the corporate communications group, who is in charge of social media interactions, and then sent to the commercial department which forwards a compressed version to the PPT. However, often PPT notes that the products that are demanded by the customers are projects that are often already in the PDP. As the innovation director explained, most of the products that the customers are demanding are logical since the company currently is not offering alternatives to all products on their market. Thus, innovative or radical ideas, do in general not come from the customers. As a manager put it “most of the ideas come from within the company [...] and they often coincide with what the customers are suggesting”.

One of the product developers agreed with the notion that most ideas come from the commercial department, which monitors market trends. However, while working on a project there are times when the developers themselves or the team comes up with an idea. The product developer explained that ideas for projects can come during the work on other projects as discoveries in technology can be used in the same way to create a new product. In addition, ideas can pop up during brainstorming sessions in the project teams. Ideas that come from the innovation department may be more processed than ideas that come from other parts of the firm (see Figure 4). One of the developers gave an example where the project group had an idea for a new product that was chiseled out during brainstorming. The project group processed the idea further and conducted preliminary research, which let them concretize the idea. The concrete idea was later made into a brief and thereafter sent to PPT for a start decision where it was later accepted and the project was initiated. One PL described that the firm previously had been able to put more time on idea processing and preliminary research of ‘raw ideas’. However, the rule of thumb is that ideas go directly from raw idea to a brief rather than formally being processed and chiseled out into a concrete idea before becoming a brief. But as the innovation director explained, most of the ideas coming from the company are informally processed before they are put into a brief since they “don’t just pop up out of nowhere”.

The idea is then put into a brief written by either the innovation director or the PPM. The brief is a short document covering the ‘what’, the ‘why’, the ‘how’, the ‘challenges’, a ‘time plan’ and the ‘project leader’. Before a start-decision is taken by the steering group, the brief is discussed in order to determine how well the project fits with certain strategic criteria, e.g.

if it a wow-product, can we earn money on the product, is it a simple project that does not require much resources? And is the product aligned with the firm's values? The decision is later based on professional judgement and intuition of managers in the PPT. As the PPM put it "we do not base our decision on a scorecard or anything equal. Instead, we rely on our intuition and if the project feels right or not".

As the new CEO came in, the innovation director was appointed and the company changed their procedures to make sure that ideas are not killed too early in the process. The new mentality is to encourage ideas. Previously, a lot of emphasis was put on market and financial data which served as basis for the first go-kill decision. This could lead to that ideas were killed even before they were presented in the management group. One distinct difference today is that the firm can choose ideas that create value in other ways. For instance, ideas that are good for the brand, not just business case driven.

The PPM, the innovation director and one manager all explained that the firm has a challenge with how to prioritize amongst many new promising ideas. The firm does not keep statistics over how many ideas that go from raw idea, to brief and to launch. However, the innovation director's feeling is that the majority of the ideas that have been put into a brief are also decided to be launched by the PPT. This is something that is supported by the PPM who explained that the majority of the briefs are judged ready for product development. In the few cases when a brief has not been accepted it has either been put on hold and later been brought forward or stopped for priority reasons because there is not enough production capacity to move forward.

The innovation director finally explained that the new ideas that are judged ready for development by the PPT can both be new products or product care innovation projects. However, the main body of new ideas entail new product development projects rather than refinement on existing products.

4.4 Back-end of innovation

The starting point of the development process, back-end of innovation, (see Figure 5) is the brief that had been accepted by the PPT. During the first stage of the development process the project is defined closer, the market is scanned and preliminary lab-testing is conducted.

When lab-testing is complete, the project continues to pilot-testing. As pilot-testing is completed, the business case⁶ is laid out and if the requirements are met, the first large scale trials can be started. During this stage, the products may have to be modified and the trials repeated until they pass, depending on their complexity. This stage is the most costly, since it requires the production department to temporarily shut down production and setup for testing new products. Provided that the large scale trials are successful, storage trials may be started and when they are finished the company takes a decision to either launch and implement the product or terminate the project, go back and be modified or be paused. The PPM described one situation where a project was terminated in the launch decision. The reason was that the end customer cost became too high and that the new product did not fit with the strategy. The PDM agreed that fit with current strategy can be one reason to terminate projects since they no longer are a priority. The PDM continued by explaining that most projects are terminated due to lack in the production department's capacity to test the new products. This since, generally, production is prioritised over testing new products.

There are two formal decision-points in the product development process; the first is the decision on whether or not to start a project (see section 4.3 for clarification) and the second is whether or not to launch and implement a project. As a consequence, the project leaders become very autonomous. However, at any point during the process, the PDM, specific members of the PPT (often the PPM) or the whole steering group can be called in for consultation. For example one of the managers explains that, when queues have formed in the process the PPT is often brought in to decide on which project has priority or when a critical decision has to be made. The launch decision is based on all the information gathered during the PDP. For example, the business case and the information provided by the large scale and storage trials.

4.4.1 Resource allocation- and support-meeting

The first thing that happens after a project has been given the go ahead from the PPT is that another meeting, 'Product Development and Commercial' (PDCO)⁷, takes place within a

⁶ The business case contains information on: estimated sales volumes during year 1, 2 and 3, an estimation of the product cost during the development cycle and a cost estimation about the end-price to customer. With those numbers, the business case estimates what contribution margin the product will yield.

⁷ The PDCO-meetings consist of the innovation director, PPM, PDM and all the project leaders and take place within a week after the PPT-meetings.

week after the PPT-meeting and resources are allocated to the project so it can start. In practice, this means that the project leader and project team are appointed and it is decided how much resources are supposed to be given to the project. However, the process of allocating resources is under revision since the workload may have been unevenly distributed among the product developers in the past. For example one PL had three of her projects in the same launch window and all of them required extensive pilot testing. According to the PDM, this type of situation was not feasible, so the priorities had to be changed.

The brief from the PPT serves as the foundation for the meeting and the process as a whole until the product has been clearly defined. It may be the case that the brief is not totally finished when it reaches the project and that it rather comes in the form of an idea. However, if a brief is unclear, there is a risk that the work is being focused on incorrect tasks according to a product developer: “in one project where we did not have a clear brief, we had a checkup with PPT just before large scale trials and they explained that we’re heading in the wrong direction. We put a lot of work into it. If you would have put more work [into the brief] earlier, you would have known this [...] but we have become better at this”. However, during the course of innovation projects, project leaders, in discussions with the managers, are able to make changes in the product definition. If they find that a project is going in the wrong direction, the success of the project relies on them to correct these deviations. In case the correction requires a major decision, the PL can engage the PPM, the PDM or the innovation director. For example during the market screening analysis, one project leader became aware that the project team was on the verge of creating a product which had received low ratings by customers. After bringing the matter up with the PPM, who agreed with her, she changed the direction immediately. Another example, explained by the PDM, is that projects entailing new technology sometimes due to market demand need to be launched earlier. Since new technology often entails patents which takes time, a strategic choice can be made to produce the product using existing technology currently available to the firm in order to enable its earlier release. However, the innovation director maintained, the new technology project will still be continued parallelly to create the next generation solution on the concept.

The PDCO-meetings are not just about starting projects and allocating resources. It also functions as a forum where the project leaders able to raise questions and discuss how projects progress with the senior managers. If the PL/PDs have problems with their current

projects, they will receive help and guidance. Thus the PDCO serves as a complementary forum to PPT, the prioritisation meetings and the day-to-day guidance by the PDM.

4.4.2 Priority-setting situations

In general, both managers and product developers at the company describe that setting priorities for the projects as one of the biggest current challenges. There are too many high priority projects which are continuously under scrutiny and priorities are frequently changed. Priorities between innovation projects are mainly set on two managerial levels within the firm. Firstly, on a strategic level by the PPT, with the objective to create an overall prioritization, which covers all projects that are in progress. Secondly, on an operative level the senior managers have prioritization meetings with each of the PL/PD, which are supposed to guide them in the short-run.

Managerial prioritization

On the strategic level, the projects are given a priority level between 1 to 5, where 1 is high priority. However, the senior managers involved in this process, have acknowledged that there is a need for more structure in order for the priorities to be useful. One of the managers suspected that the current priority list may under-prioritize product care-projects. As of now the prioritization is derived through a brief discussion on each project, the critical factors being how well they fit with the strategy and their time-to-launch. Other factors that may influence the prioritization are customer complaints and competition. Additionally, one of the senior managers explained that the priorities are also based on professional judgment and how important a specific project feels. The innovation director believes that some important parameters to consider when prioritizing are project complexity, how important the project is to the firm and how time-consuming the project will be. As a consequence of the unstructured process in the steering group, the director explained, the prioritization also relies on the meetings that seniors have with the product developers.

On the operative level, the prioritization meetings with the product developers take place once every second week and planning stretches up until the next meeting. During the meeting, both the innovation director and the product development manager are present and a number of factors that affect the prioritization, similar to the strategic prioritization factors, are brought up, e.g. market conditions, competition and if there is high potential with the

product. As the innovation director explained, it comes down to what is important for the firm and laying out a plan for how the product developer is going to be able to keep the time schedule. The deciding factor is often keeping the launch-date. At the same time, the PL cannot have too many highly prioritized and simultaneously highly resource-demanding projects. As a PD/PL explained, if she takes on more projects than she can handle, then another project may become less prioritized. Taking on more projects can take time from other activities. One PL/PD described that due to the units work with lean, parts of the PDP have become more standardised. The PL/PD described that efficiency improvements have reduced the administrative burden, hence liberated time that could be spent on other activities. He explains that this time is often used to take on more projects. However, if it were up to one of the PL/PD, he would like to put this time on processing new ideas. The PL/PD believed that it would result in more thought-through ideas on a firm level, and increased motivation on an individual level.

The current prioritisation between innovation projects are shown is shown in Table 6. Currently, the firm has 36 out of 60 projects on priority level 1 or 2 at different stages in the process.

Table 6 - Priority level 1 and 2 projects

Classification	Complexity	Number of projects	%
New product	New technology	8	22%
New product	Existing technology	10	28%
Research	New technology	3	8%
Product care	Existing technology	12	33%
Product care	New technology	0	0%
Production	Existing technology	3	8%
Total		36	100%

Project leader prioritization

The individual project leaders manage their time autonomously and are trusted by management to execute the projects within the provided deadlines. According to the PDM, the PL/PDs and the managers are often in tune on which projects that are supposed to be prioritized. For example, the project leaders were asked to put up the projects they felt they

wanted to have on a whiteboard, with time schedules and deadlines. This was part of the lean project, to get an overview of the most important projects. When the PDM later checked the projects on the whiteboard they matched the priority list from the steering group.

Indeed the product developers explained that they devote most of their time to high priority projects, especially those with close launch dates and deadlines⁸. As one of the product developers put it: “You don’t want to stand there and tell them that we didn’t get it done”. Additionally, syncing with production partners’ time-frames and structures is an important part of the product developer’s job. Product trials at partners are often prioritized, since it is easier to change the dates for the firm’s in-house trials than asking the partner to reschedule. Further, one PL/PD indicated that when projects require a lot of new technology development they may receive a high priority.

An issue or dilemma, when focusing a lot of effort on high priority projects unavoidably brings, is how to deal with low priority projects. The innovation director explained that low priority projects are sometimes put on ice for longer time periods and as a consequence, keeping these projects alive is a big challenge. The PL/PDs have the same view; projects with low priority are seldom in focus, because there is not enough time. However, these projects may still be present in the minds of the PL/PDs. One product developer described low priority projects as associated with a “bad conscious” and that she periodically has had to tell her manager “nothing new with this one”.

Apart from having to deal with juggling high and low priority projects one of the PL/PDs felt that her priorities sometimes change too often at the individual priority meetings and instead she wished for more long-term planning. The other PL/PDs indicated that different types of projects require different mindsets. For example, switching between ‘product care’ projects and ‘new product’ may require a mind shift. This coincides with the innovation director’s opinion that product developers should not have to shift projects too often. Her suspicion is that this may lead to a loss in creativity for the PL/PDs.

⁸ PL/PD-1 had 10 active projects. He estimated that he spends 70 % of his time on three projects that entail developing new products. Typically, this PL reported, he may have time to work on 2 - 3 projects during one day. The other PL/PD is active in 17 innovation projects. The PL/PD-2 estimated that she spends 75 % of her time on the five prioritised projects

5. ANALYSIS

In this chapter we use relevant theories to explain our empirical findings. The chapter is divided into two sections. The first section discusses the mode of ambidexterity in the case company and innovation department. The second describes how different situations in the product development process affect the tension between exploration and exploitation.

5.1 Different modes of ambidexterity co-exist

Our data shows that the case company conducts both explorative and exploitative activities simultaneously. One of the reasons why they are able to do so is by having a separate innovation department within the firm, with a clear role to innovate and manage incremental and radical innovations, i.e. exploit and explore (Tushman and O'Reilly, 2013). Out of the total number of projects handled by the innovation department, 72 % are based on existing technology, i.e. exploitation and consequently 28 % of the projects are based on development of new technology, i.e. exploration. The strategic priorities set by the steering group are the deciding factors on what project should be prioritized. Managers on an operative level then make sure that project leaders' priorities are aligned with the firm's. However, the PL/PDs divide their own time in their day-to-day work meaning that they are ultimately in charge of balancing exploration and exploitation set by the steering group, as they focus their efforts and resources on different projects (e.g. new products based on either new or existing technology, product care, research or process improvements). Also, the PL/PDs are involved in how the priorities are set. The PL/PDs were asked to put up their most important projects on the whiteboard. This points to that the PL/PDs are participating and involved in the organisational prioritization.

Our data points to that two modes of ambidexterity are present in the case company. Firstly, the case company is able to conduct both explorative and exploitative activities simultaneously by using a separate innovation department. This indicates that the organization is structurally ambidextrous (Tushman and O'Reilly, 1996). Secondly, on a unit level we note that both explorative and exploitative projects are in progress, indicating that structural ambidexterity is not the sole explanation for the conditions in the case company and further indicating a contextually ambidextrous unit (Gibson and Birkinshaw, 2004). This is supported by the fact that the project leaders seem autonomous as they are entrusted to divide their own time between their projects. This, even though their ability to manage the

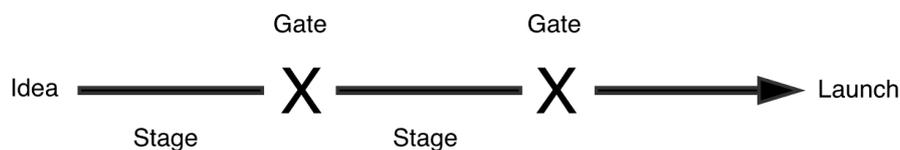
tension between exploitation and exploration completely autonomously is limited due to the requirement to follow the priorities set by the steering group, consistent with Davila's (2005) 'strategic innovation strategy'. The involvement of the PL/PDs indicates a bottom-up culture, which is argued to be of practical importance to contextual ambidexterity (Wang and Rafiq, 2014).

It seems possible that these two modes of ambidexterity co-exist within the case organization. Although a strict interpretation of Tushman and O'Reilly's (1996) proposition would mean that the structurally separated unit solely conducts one activity, the fact remains that the innovation unit is a structurally separated unit with a clear role of innovating radical ideas. Our finding is supported by recent research that suggests that managers can use structural and contextual modes of ambidexterity to resolve the tension between exploitation and exploration (Agostini et al., 2016).

5.2 Decisions that affect the tension

Our empirical findings revealed decision situations, which affect the tension between exploration and exploitation in the product development process. Figure 6 illustrates these decision points in a simplified model of a PDP. We will show, that within these decision situations, explicit and implicit choices are made that affect the tension. Consequently, we will analyse our findings under three topics; strategic focus, gates and stages.

Figure 6 - Decision points affecting the tension in the PDP (inspired by Cooper, 1990)



5.2.1 Strategic focus

The choice of innovation strategy is an explicit choice made by the firm (March, 1991). The explicit choice is to provide customers with an alternative to the traditional products on the market. Since these products sometimes need new technology, it drives exploration in the company. In order for the company to realise their strategy they need to engage in explorative activities in order to be sustainable in the future (March, 1991). Further, the PDM describes an increased focus on refining existing products and to make new variants using existing technology. In other words, an increased focus on exploiting their current knowledge base in order to be viable in the short-term (Levinthal and March, 1993). Thus, the portfolio strategy is ambidextrous since the aim is to simultaneously exploit its existing knowledge and explore new opportunities (Raisch et al., 2009; Gupta et al., 2006; Tushman and O'Reilly, 2013). This indicates that in the strategy, exploration and exploitation could be seen as complements rather than competing activities (Birkinshaw and Gupta, 2013). This, since they are both needed in order to realize the strategy. This provides an opportunity, or a 'tool', for managers to indirectly manage the tension between exploration and exploitation by setting guidelines for resource allocation.

In the two following sections, we will show that the ambidextrous portfolio strategy seems to trickle down on the entire PDP. This, since it affects the priorities on a strategic, operative and individual level and the resource allocation to innovation projects. Thus, the portfolio strategy lays the foundation for the explicit and implicit choices that are taken in the PDP, ultimately affecting the tension between exploration and exploitation.

5.2.2 The gates provide an opportunity to manage the tension

There are two points in the firm's PDP that serve as formal decision situations, or gates (Cooper, 1990), in which managers have the ability to manage the tension between exploration and exploitation. These are the project start decision and the launch decision.

In the two gates decisions are made as to go, revise or terminate. We can see that the explicit choices take certain strategic criteria into account, e.g. competition situation, brand value and the complexity of the project (March, 1991). Also, the managers' professional judgment and intuition seem to serve as the basis for implicit choices. For example, in the project start decision, one manager indicated that the steering group used the strategic criteria as basis and

chose what felt right. This may be explained by that the case company has made a strategic choice, an explicit choice, to put less emphasis on the market and financial data in order to keep ideas from being terminated too early in the process. Further, the launch decision is an explicit choice based on all available information that has been collected during the PDP, e.g. the business case containing financial information as well as information gathered from all tests during the PDP. Here, it seems like the gates we have identified are different. It seems like the project launch decision is taken in a more calculative manner, where strategic criteria are considered together with data from the business case and large scale trials etc. The project start decision, on the other hand, seems to be based more on feeling, i.e. intuition (Dijksterhuis and Nordgren, 2006) involving professional judgment. Intuition is argued to be beneficial for creativity (Eling et al., 2014). The decisions are also affected by a shared vision not to terminate ideas too early in the process (Wang and Rafiq, 2014). This is in line with Cooper's (1990) suggestion that later gates have stronger emphasis on financial information whilst earlier gates are more based on qualitative criteria. Hence, we argue that gates that rely more on implicit choices than explicit choices could be referred to as 'loose gates' and consequently, gates that rely mainly on explicit choices as 'tight gates'. Having a loose gate, e.g. loosening up the financial criteria for the decision, may drive exploration since this provides the foundation for ideas that have uncertain and distant financial returns to grow (March, 1991). Also, Davila (2005) suggests, that the use of financial criteria favours incremental rather than radical innovation. In a sense, this is also consistent with what the lean literature suggests, that front-loading the product development (Liker and Morgan, 2006) drives exploration (Lavayssière et al., 2015). Hence, we argue that 'loose' gates drive exploration, whilst 'tight' gates drive exploitation, thus providing managers with opportunities, or a 'tool', to manage the tension.

The argument above should apply to all gates in a Stage-Gate PDP, apart from the final gate. In the final gate, the tension towards exploration or exploitation is more complex. The tension will be driven to exploration or exploitation depending on whether management decides to implement, terminate or revise the project. First, if the project is given the go to be implemented, this drives exploitation (March, 1991). The returns of the project will be realized and the product may be subject to future refinements and improvement. Second, if the product is decided to be terminated, it will drive neither exploration nor exploitation directly. Indirectly, the decision to terminate a product may drive exploitation if the

knowledge gathered by the individuals during the development stage is can be reused in another project, in which case exploration and exploitation could be seen as complements (Lavie et al., 2010). In our case company, the decision to terminate a project is often an explicit choice by management that is based on fit with strategy, cost analysis or production capacity. Third, if the product has to be revised it may drive exploration, in case new technology development is required to solve the potential problem.

5.2.3 The stages affect the tension

During the innovation process the case company's original idea or product definition, can change. These changes can be made during any part of the PDP. For example, changes can be made in the front-end of innovation; in the idea generation stage where the ideas are processed and conceptualised; during the development process in priority setting situations or when resources are redistributed. Changes are often made during feedback sessions in consultation with management where the PL/PDs discuss challenges that occur during the stages. During these feedback sessions the tension may shift. As the PDM explained, exploration projects can become exploitation projects due to the need of a fast launch. Consequently, the work being conducted in the different stages in the PDP has the ability to affect the tension between exploration and exploitation. Yet, we are not able to identify whether these changes in general are affecting the tension towards exploration or exploitation. However, we have identified a number of situations that give managers the ability to actively manage the tension between exploration and exploitation during the stages in the PDP. This provides management with the ability to keep a desired balance between exploration and exploitation, not only on a strategic level, but also to enforce it on an operative level.

Ideas as the basis for innovation

The front-end of innovation in our case company has been made 'loose' by strategic choice, i.e. through an explicit choice. The current idea-to-launch process is flexible and to relies on on a 'loose' gate in order to make sure that ideas are not killed too early in the process in line with Koen et al., (2002) that argues that ideas should not be terminated early in the process.

The company's idea generation process is broad and provides both exploitative and explorative ideas. The generation of ideas that lead to exploration seems to be a natural

outcome of the firm's strategy to develop products that are new to the market and require new technology, at the same time as the generation of ideas that lead to exploitation seems to be a natural outcome of having a portfolio that needs improvement and refinement. Thus, the idea generation seems to be ambidextrous as proposed by Gurtner and Reinhardt (2016) since the idea generation stage seems to balance exploration and exploitation. In more detail, ideas are picked up internally and externally where there seems to be an emphasis on internally generated ideas. It was also noted during the interviews that customer's ideas were mainly of incremental character, whereas ideas stemming from internal sources, i.e. the commercial department, innovation department or members of the steering group may be of both incremental and radical character.

Our data show that ideas are often informally proposed to members of the steering group where they do not go through initial screening and preliminary testing before the steering group accepts or rejects them. Some interviewees indicated however, that internally derived ideas from the innovation department sometimes are processed in preliminary testing before they are presented to the steering group. This seems especially likely to be the case when an idea is generated during another innovation project. When a company puts heavy emphasis on the front-end of innovation, in order to carefully explore alternative solutions (Liker and Morgan, 2006), it is perceived to drive exploration (Lavayssière et al., 2015). This could indicate that when the case company engages in preliminary testing of ideas, they are more likely to come up with radical ideas that lead to explorative projects which in the end increases tension towards exploration. Additionally, we note that exploration may drive exploitation in sequences (Lavie et al., 2010). As a product developer described it, sometimes, new technology that originates from an exploration project can be applied in another project, thus exploiting the new technology to make another new product. This points to that exploration and exploitation may be complements over time (Knott, 2002).

Decision situations within the stages of the PDP affect the tension

Our data shows that prioritisation situations; when priorities are set and project A (explorative project) is chosen over project B (exploitative project) or vice versa, affect the tension between exploration and exploitation. These situations occur during either planned prioritization meetings or continuously during the process as prioritization is required, e.g. in case of queues. The priorities are based on explicit choices, e.g. the strategy, competition and

time-to-launch, but they may as well be of implicit nature, programmed into the organizational behavior (March, 1991). As one product developer exemplified, it is possible that projects involving partners are prioritized because it is more difficult to reschedule new product trials with partners than in-house production.

A recurring theme during the interviews was the importance of keeping project deadlines. When there is a priority situation, projects with close deadlines tend to receive high priority and resources are allocated in order to keep the deadlines. This points towards that deadlines entail effects on the tension between exploration and exploitation. If the manager advances an exploration project's deadline, it will shift the tension towards exploration and vice versa. This is our third identified tool in how managers can manage the tension.

One project leader experienced that the priorities were often changed, resulting in that she needed to switch between projects. This is an example of a situation in which the employee experiences 'disturbances'. It has been argued that disturbances may lead to less creativity and exploration (Helander et al., 2015). Thus, disturbances may shift the tension towards exploitation. To some extent, the lean project has clarified certain steps in the development process, e.g., the pilot testing and the implementation stage (Liker and Morgan, 2006), which in turn may have freed up time for some of the PL/PDs. One of the PL/PDs indicated that the freed up time is used to engage in starting more projects rather than being used in a flexible way. This points to that the standardization thus far may have affected the tension in favor of exploitation (Lavyssière et al., 2015; Lowik, 2016).

Finally, the tension is affected in situations where resources are allocated. In the case company, resource allocation is carried out on two levels; on a strategic level where the annual innovation budget is distributed and on the operative level in the PDCO-meetings and the continuous prioritisation meetings. The amount of resources a project receives depends on a number of factors, e.g. strategic priority, market demand, level of competition and what value it brings to the company. Here, managers will have an opportunity to actively manage the tension between exploration and exploitation by making an explicit or implicit choice.

6. CONCLUSION AND DISCUSSION

In this section we will answer our two research questions. Further, we will discuss the theoretical and practical implications from this study. Finally, we consider the limitations of the study and discuss areas for future research.

6.1 Conclusion

The purpose of this study was 1) to investigate what drives the tension between exploration and exploitation in the product development process (PDP) and 2) to provide an understanding for how this tension can be managed.

Concerning the first part of the purpose, our findings reveal a number of decision situations in the PDP in which explicit and implicit choices are made that ultimately affect the tensions between exploration and exploitation, consistent with March's (1991) ideas. First, we have found that every gate in the PDP represents a specific point during the process where the tension is affected. Second, we have identified situations that occur continuously during the PDP that affect the tension. These are situations where priorities are set, resources are allocated and decisions that are taken change the definition of the project. Third, the portfolio strategy has been found to be pivotal in determining whether the tension is tilted toward exploration or exploitation. More specifically, our findings show that the portfolio strategy trickles down through the organization and affects the whole PDP; from the priorities set on strategic, operative and individual level to resource allocation of the projects. Thus, the portfolio strategy lays the foundation for the all decisions that are taken in the PDP that ultimately affect the tension. Additionally, our findings reveal several phenomena, apart from the decision situations, that will have an effect on the tension. First, standardisation seems to drive exploitation. Second, disturbances have a negative effect on exploration (Helander et al., 2015). Third, project deadlines seem to have an effect on the tension since it will affect how resources are allocated.

Concerning the second purpose, our findings indicate that these decision situations can be used as 'tools' that managers can use in order to control the tension between exploration and exploitation in a PDP. The first tool is the portfolio strategy. Here, management makes explicit and implicit choices on how (scarce) resources should be allocated. Management can decide to divert 'X' percent of the resources into exploration and 'Y' percent of the resources

on exploitation, hence managing the tension already on a strategic level. This is in line with Cooper et al., (1999) who state that portfolio strategies entail making strategic decisions. The second tool concerns all gates during the PDP. We suggest that gates can drive the tension toward either exploitation or exploration depending on how they are used since our findings indicate that ‘tight’ gates drive exploitation and ‘loose’ gates drive exploration. This means that managers, on a strategic level, can decide to drive the tension towards exploration by using tight gates or towards exploration by using loose gates. The third tool is prioritizations, as priorities can be used to direct resources to either exploration or to exploitation projects. We have also noted that priorities are especially sensitive and effective when they entail project deadlines. This, since individuals seem to associate deadlines with strong responsibility and an urge to make the deadline.

6.2 Discussion

Our case study yields both theoretical and practical implications on how ambidexterity can be viewed and managed in a PDP. Below, we discuss the key findings as well as provide the reader with limitations of our study and areas for future research.

6.2.1 Theoretical implications

Firstly, our findings show that managers affect the tension between exploration and exploitation by making explicit and implicit choices on how to allocate scarce resource. This is consistent with March’s (1991) original theoretical concept.

Secondly, we contribute to the product development literature by adding two new theoretical concepts; ‘tight’ and ‘loose’ gates, to the original Stage-Gate model (Cooper, 1990). These two concepts help clarify the concept of ‘flexible criteria’ suggested by Cooper (2014). We argue that tight and loose gates allow for an improvement of the stage-gate model and can help to understand what effect the type of gate has on the outcome of innovation.

Thirdly, we also contribute to the ambidexterity literature by providing new empirical findings on what modes of ambidexterity that exist in an organization. Our research also shows that an innovation department can contain elements of both structural and contextual ambidexterity, in line with the findings of Agostini et al. (2016).

Finally, our findings also provide some insights into how the exploitation and exploration should be viewed. Our findings indicate that in decision situations where either an explorative or an exploitative path can be chosen, trade-offs between the exploration and exploitation are unavoidable as March (1991) predicted. In the moment of decision, exploration and exploitation can be regarded as competing activities. This is what creates the tension. However, our findings indicate that as these decisions accumulate over time, the characterization as competing activities is no longer accurate. It seems like the activities interact. More specifically, explorative activities seem to lay the groundwork for exploitation by building up exploitable technologies and conversely exploitation activities seem to lay the groundwork for exploration by providing the necessary resources (Lavie et al., 2010). Thus, exploration and exploitation seem to be complements or reconcilable consistent with Birkinshaw and Gupta (2013). Hence, we contribute to the literature by clarifying that both ways of viewing the exploitation and exploration are valid. Exploration and exploitation will always be competing in decision situations, but over time they should be seen as complements. If they were not, how would you achieve a sustainable balance?

6.2.2 Practical implications

Derived from our conclusions in section 6.1, our case study provides managers with tools to manage ambidexterity. We have identified a number of decision situations where managers can actively manage the balance between exploration and exploitation hence giving managers the chance to achieve ambidexterity in the PDP. In detail, every gate in the PDP represents a moment in time where managers can control the tension. This means that a preferred level of the tension, set on management level, can be upheld on an operative level. Further, we have pointed out situations that continuously occur during the stages (e.g. situations in which priorities are set, resources are allocated and situations in which the product definition is changed). Here, through prioritization managers can allocate resources thus controlling the tension.

6.3 Limitations

There are limitations to this study. Bryman and Bell (2011) pose a number of critiques toward qualitative research to which our study is subject. Firstly, our findings may be affected by our own subjectivity as researchers (Bryman and Bell, 2011). This means that we may have overlooked certain aspects that may have been valuable to solve our purpose in trying to

understand what drives the tension between exploration and exploitation in the PDP as well as how this tension can be managed. Further, our empirical findings mainly consist of data from seven interviews. The interviewees may have been biased or uneager to share certain information potentially leaving us with an incomplete data set. This should be seen as a limitation of our study. Further, there might be elements in the decision situations that March's (1991) explicit and implicit choices do not capture. It could therefore have been beneficial to expand the theoretical framework with decision theory in order to capture nuances of the managers and employees answers.

Secondly, the results and conclusions of qualitative research and especially case studies may be hard to generalize (Eisenhardt, 1989; Bryman and Bell, 2011). However, in order to understand the different explicit and implicit choices that managers make in a PDP it was necessary to interview and meet the individuals involved in the process. Thus, we needed to conduct a qualitative case study in order to fulfill its purpose. Additionally, results may differ between industries, other contextual settings or cultures. Hence, our conclusions should merely be seen as indications rather than absolute truth (Bryman and Bell, 2011).

6.4 Future research

Our case study has contributed to the ambidexterity literature in a number of ways. However, how ambidexterity should be applied in practice still remains an underresearched field. Since we cannot determine whether our findings are generalizable, more studies are needed. Future research could look into if the drivers of the tension differ depending on context, culture and industry. Additionally, our aim was to understand how managers can manage ambidexterity. We have made practical contributions by identifying certain tools that can be used to manage exploration and exploitation. Consequently, an interesting avenue for future research would be to look into if these tools are used in other cases and if so, if there is an optimal way in which managers could use these tools in order to increase the overall performance of the product development.

Finally, since our findings are limited to a case company that does not actively try to be ambidextrous, it would be interesting for future research to study what drives the tension and how the tension is managed in a firm which has adopted an 'ambidextrous mindset'. Does the result differ?

7. REFERENCES

Academic Articles

- Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, 8(1), 21-47.
- Agostini, L., Nosella, A., & Filippini, R. (2016). Towards an Integrated View of the Ambidextrous Organization: A Second-Order Factor Model. *Creativity and Innovation Management*, 25(1), 129-141.
- Becker, B. (2006). Rethinking the Stage-Gate process—A reply to the critics. *Management Roundtable*.
- Birkinshaw, J., & Gupta, K. (2013). Clarifying the distinctive contribution of ambidexterity to the field of organization studies. *The Academy of Management Perspectives*, 27(4), 287-298.
- Björk, J., & Magnusson, M. (2009). Where do good innovation ideas come from? Exploring the influence of network connectivity on innovation idea quality. *Journal of Product Innovation Management*, 26(6), 662-670.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 128-152.
- Cooper, R. G. (1988). Predevelopment activities determine new product success. *Industrial Marketing Management*, 17(3), 237-247.
- Cooper, R. G. (1990). Stage-gate systems: a new tool for managing new products. *Business Horizons*, 33(3), 44-54.
- Cooper, R. G. (2014). What's Next?: After Stage-Gate. *Research-Technology Management*, 57(1), 20-31.
- Cooper, R. G., & Kleinschmidt, E. J. (1993). Major new products: what distinguishes the winners in the chemical industry?. *Journal of Product Innovation Management*, 10(2), 90-111.
- Cooper, R. G., Edgett, S. J., & Kleinschmidt, E. J. (1999). New product portfolio management: practices and performance. *Journal of Product Innovation Management*, 16(4), 333-351.

Davila, T. (2005). The promise of management control systems for innovation and strategic change. *Controlling Strategy*, 37.

Dijksterhuis, A., & Nordgren, L. F. (2006). A theory of unconscious thought. *Perspectives on Psychological Science*, 1(2), 95-109.

Duncan, R. B. (1976). The ambidextrous organization: Designing dual structures for innovation. *The Management of Organization*, 1, 167-188.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.

Eling, K., Griffin, A., & Langerak, F. (2014). Using Intuition in Fuzzy Front-End Decision-Making: A Conceptual Framework. *Journal of Product Innovation Management*, 31(5), 956-972.

Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47(2), 209-226.

Gurtner, S., & Reinhardt, R. (2016). Ambidextrous Idea Generation—Antecedents and Outcomes. *Journal of Product Innovation Management*, 33(S1), 34-54.

Helander, M., Bergqvist, R., Stetler, K. L., & Magnusson, M. (2015). Applying lean in product development-enabler or inhibitor of creativity? *International Journal of Technology Management*, 68(1-2), 49-69.

Herstatt, C., Verworn, B., & Nagahira, A. (2002). The “fuzzy front end” of product development: an exploratory study of German and Japanese innovation projects. Working Papers / Technologie- und Innovationsmanagement, *Technische Universität Hamburg-Harburg*, No. 16

Kim, J., & Wilemon, D. (2002). Focusing the fuzzy front-end in new product development. *R&D Management*, 32(4), 269-279.

Knott, A. M. (2002). Exploration and exploitation as complements. *The strategic management of intellectual capital and organizational knowledge*, 339-358.

Koen, P., Ajamian, G., Burkart, R., Clamen, A., Davidson, J., D'Amore, R., ... & Karol, R. (2001). Providing clarity and a common language to the “fuzzy front end”. *Research-Technology Management*, 44(2), 46-55.

Lavayssière, P., Blanco, E., Le Dain, M. A., & Chévrier, P. (2015). Innovation Ambidexterity in Medium Size Enterprises. In DS 80-8 Proceedings of the 20th International Conference on Engineering Design (ICED 15) Vol 8: *Innovation and Creativity*, Milan, Italy, 27-30.07. 15.

Lavie, D., Kang, J., & Rosenkopf, L. (2011). Balance within and across domains: The performance implications of exploration and exploitation in alliances. *Organization Science*, 22(6), 1517-1538.

Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and exploitation within and across organizations. *Academy of Management Annals*, 4(1), 109-155.

Lenfle, S., & Loch, C. (2010). Lost roots: how project management came to emphasize control over flexibility and novelty. *California Management Review*, 53(1), 32-55.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, 14(S2), 95-112.

Liker, J. K., & Morgan, J. M. (2006). The Toyota way in services: the case of lean product development. *The Academy of Management Perspectives*, 20(2), 5-20.

Lowik, S. (2016). Resolving the paradox of lean thinking and ambidexterity: moderating factors that reinforce or inhibit innovation in lean SMEs. *University of Twente, Netherlands Institute for Knowledge Intensive Entrepreneurship*

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71-87.

O'Reilly, C. A., & Tushman, M. L. (2011). Organizational ambidexterity in action: How managers explore and exploit. *California Management Review*, 53(4), 5-22.

O'Reilly, C. A., & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. *The Academy of Management Perspectives*, 27(4), 324-338.

Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organizational ambidexterity: Balancing exploitation and exploration for sustained performance. *Organization Science*, 20(4), 685-695.

Salerno, M. S., de Vasconcelos Gomes, L. A., da Silva, D. O., Bagno, R. B., & Freitas, S. L. T. U. (2015). Innovation processes: Which process for which project? *Technovation*, 35, 59-70.

Siggelkow, N., & Levinthal, D. A. (2003). Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Organization Science*, 14(6), 650-669.

Simsek, Z., Heavey, C., Veiga, J. F., & Souder, D. (2009). A typology for aligning organizational ambidexterity's conceptualizations, antecedents, and outcomes. *Journal of Management Studies*, 46(5), 864-894.

Stubbart, C. I., & Knight, M. B. (2006). The case of the disappearing firms: empirical evidence and implications. *Journal of Organizational Behavior*, 27(1), 79-100.

Tushman, M. L., & O'Reilly, C. A. (1996). The ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, 38(4), 8-30.

Utterback, J. M. (1971). The process of technological innovation within the firm. *Academy of Management Journal*, 14(1), 75-88.

Wang, C. L., & Rafiq, M. (2014). Ambidextrous organizational culture, contextual ambidexterity and new product innovation: a comparative study of UK and Chinese high-tech firms. *British Journal of Management*, 25(1), 58-76.

Books

Bryman, A. & Bell, E. (2011). Business research methods. (3. ed.) *Oxford: Oxford University Press*.

Booz, A. (1982). Hamilton (1982) New Product Management for the 1980's. Booz, Allen & Hamilton. *Inc., New York*.

Koen, P. A., Ajamian, G. M., Boyce, S., Clamen, A., Fisher, E., Fountoulakis, S., Johnson, A., Puri, Pushpinder & Seibert, R. (2002). *Fuzzy front end: effective methods, tools, and techniques*. Wiley, New York, NY.

Yin, R. K. (2009). *Case study research: Design and methods* (4th Ed.). Thousand Oaks, CA: Sage.

Online sources

Swedish Agency for Economic and Regional Growth (2013). Uppföljning av 2008 års nystartade företag - tre år efter start. Retrieved from:

https://www.tillvaxtanalys.se/download/18.636af32a14deed3059b5d67b/1434544580187/Statistik_2013_01.pdf (Accessed online 2017-05-21)